EUSEW Workshop

The role of renewable Gases in a smart low-carbon energy system: Hydrogen

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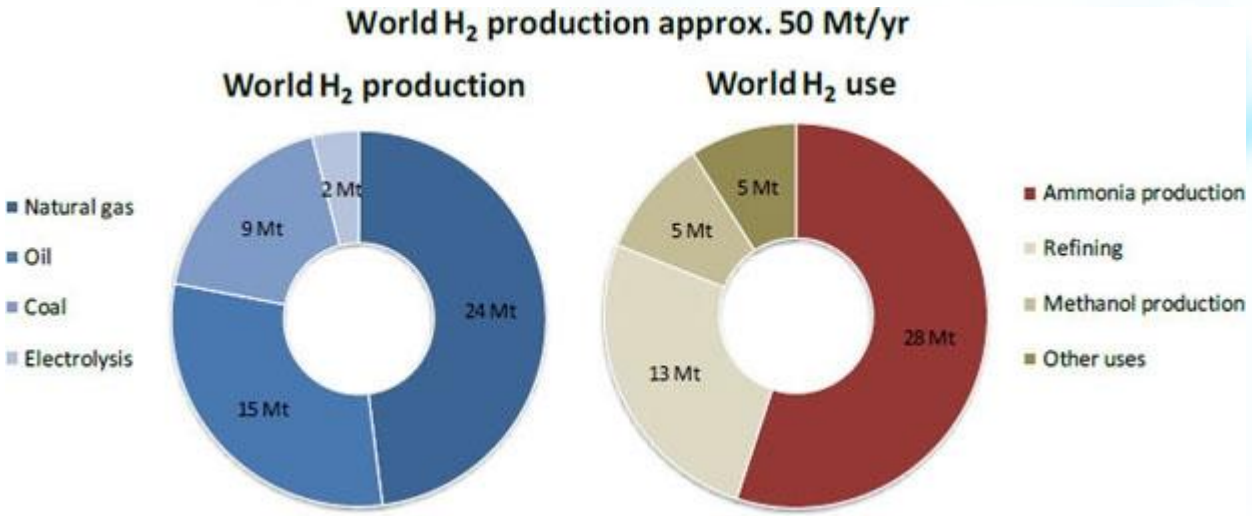
The FCH JU

- The Fuel Cells and Hydrogen Joint Undertaking is a PPP between the EU and European Industry and Researchers, supporting RTD activities in FCs and H_2 in Europe
- Launched in 2008 (FP7), 2nd phase granted in 2014 (H2020)
- Total budget of > €2.2bn (0.94+1.33)
- Till now contracted 185 projects (155+30)
  - Supporting FC applications in Transport sector for zero emission vehicles and in Stationary sector for reliability & higher energy efficiency
  - Supporting H2 energy applications given its flexibility as an energy vector that can facilitate the integration of intermittent renewables

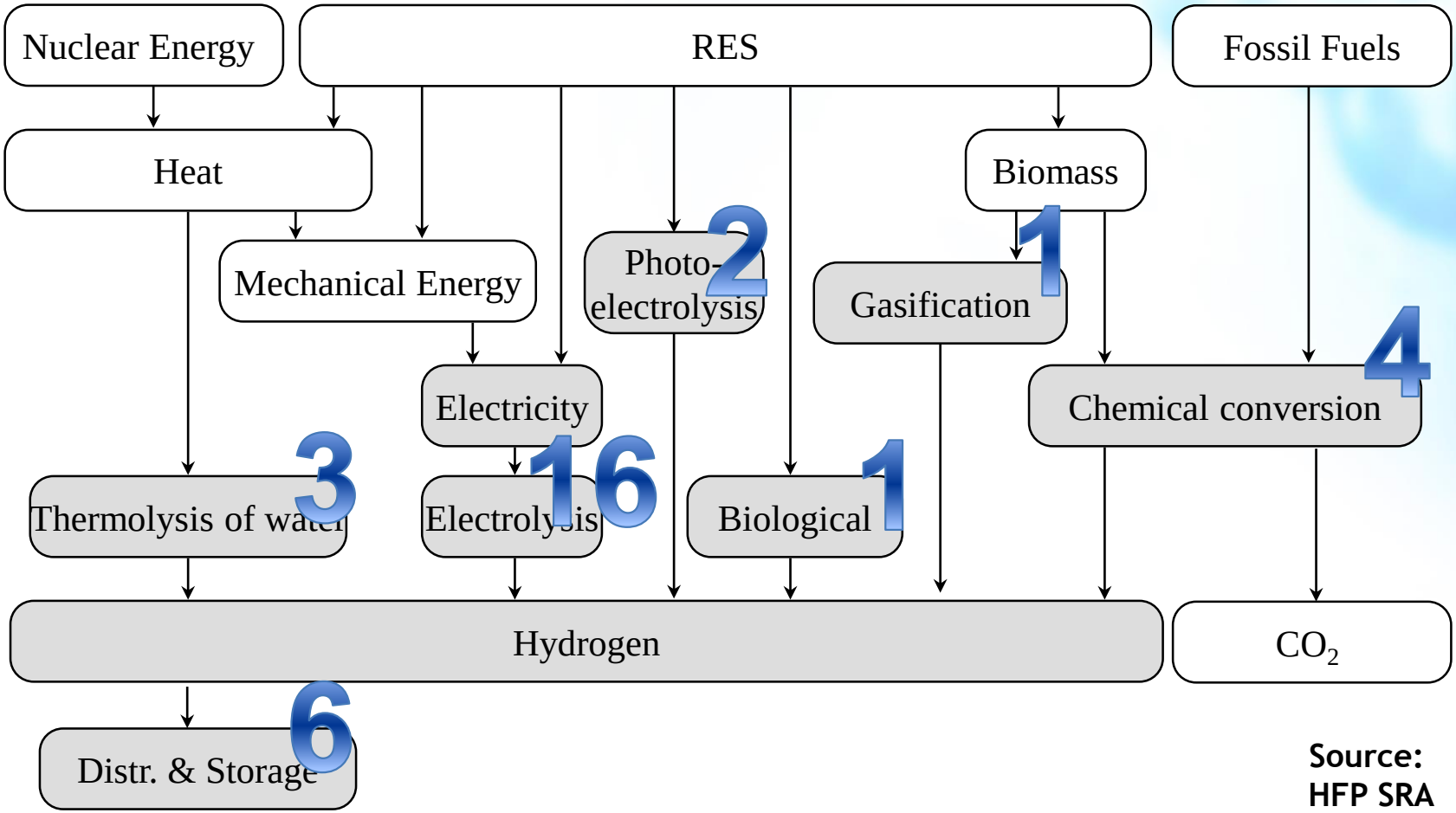
The H_2 molecule



H2 Production	NG SMR	Electrolysis (grid mix)	Electrolysis (Wind)
Emissions (gCO_2/kWh_{H2})	300	450	27
Cost (€/kg)	2	6	10

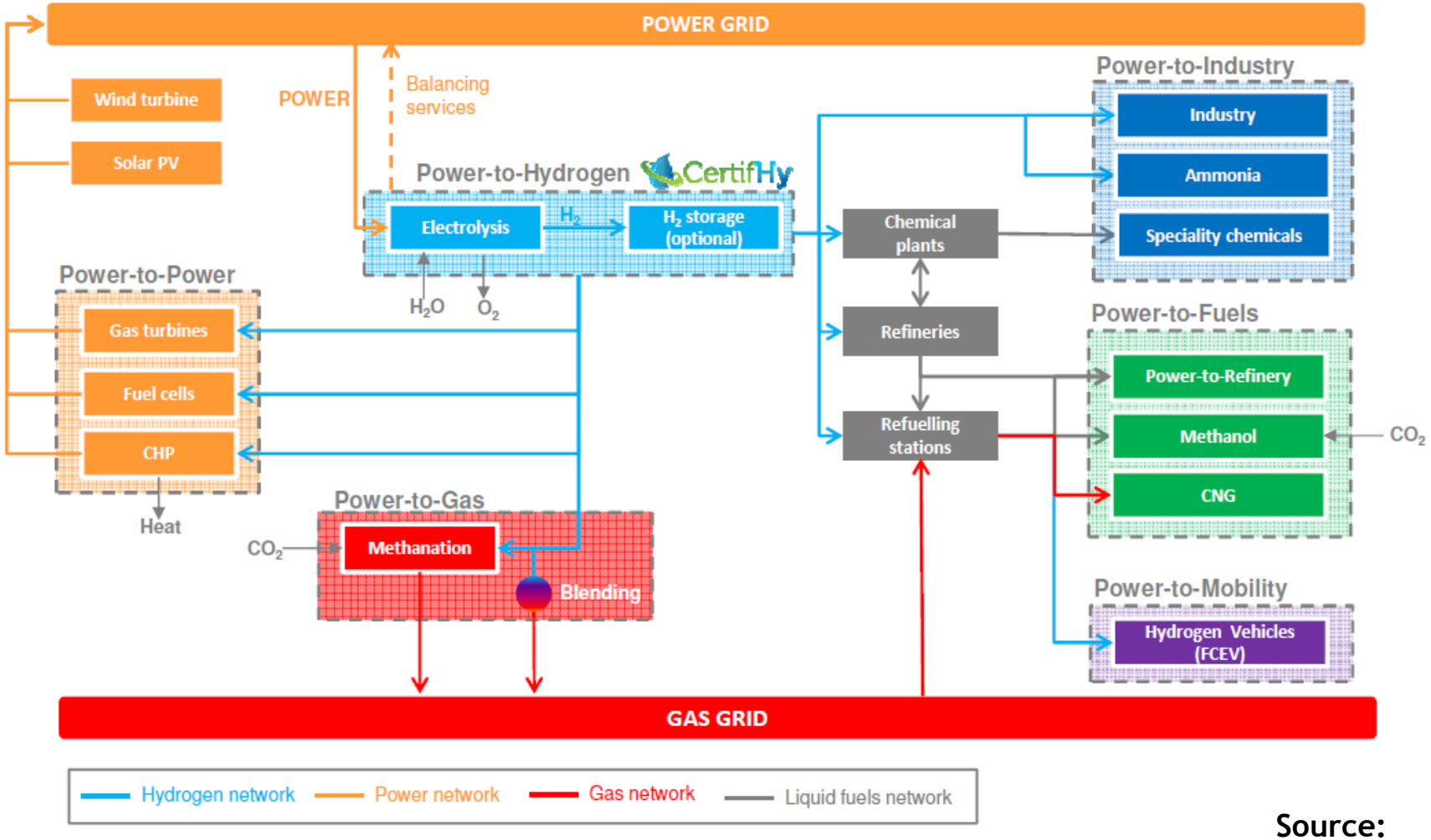
ENERGY APPS	Density (kg/Nm^3)	LHV (kWh/kg)	LHV (kWh/m^3)
H_2	0.09	33	3
CH_4	0.7	13	10

Hydrogen Production - Technical Coverage



Source:
HFP SRA

H2: Connecting Power, Gas and Transport



Source: Hydrogenics

2015 FCH JU Energy Storage Study: Main findings

At realistic values of hydrogen, large installed electrolyzer capacity would be viable and able to utilize nearly all excess RES energy in the 2050 horizon

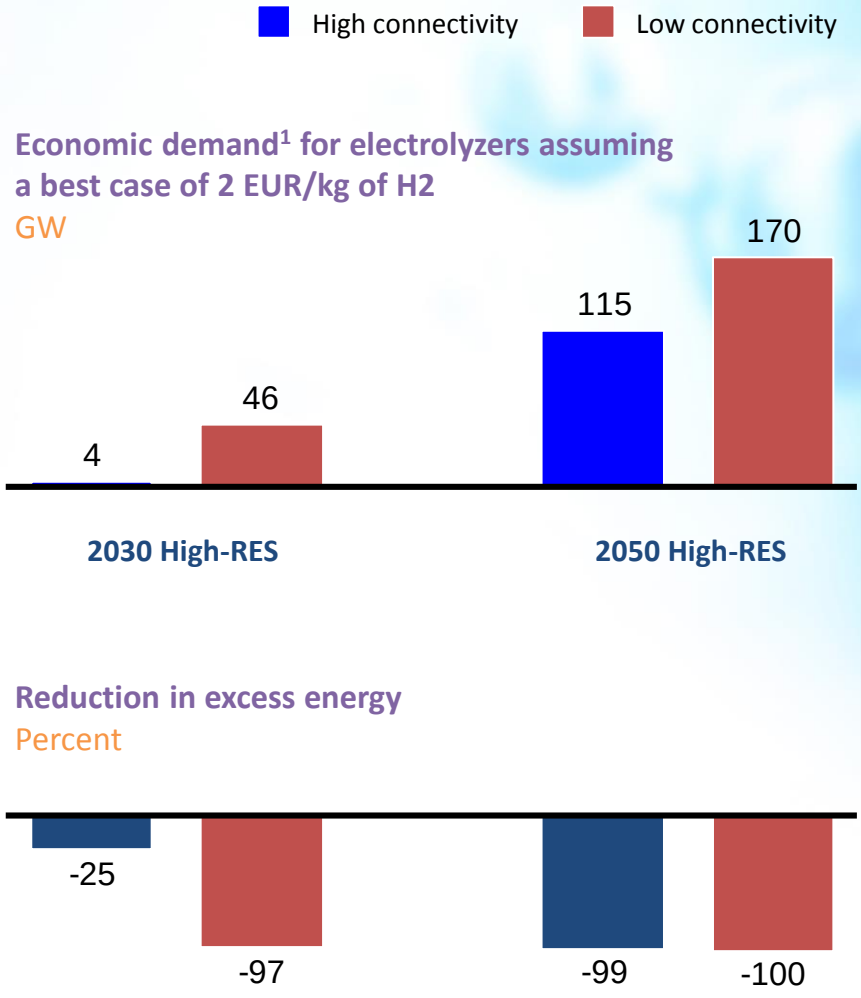
Non-hydrogen P2P and heat storage will only be able to absorb a small part of the excess energy generated, resulting in the necessity of curtailment – from societal point of view, such electricity could be used at close to zero cost

The excess energy can be used to produce hydrogen via water electrolysis for re-electrification or use outside of the power sector

If the value of hydrogen at the point of production can reach a price in the range of 2-4 €/kg very large installed electrolyzer capacity would be economically viable and able to utilize nearly all of the excess electricity

Such use of the excess electricity would create value for the society and the surplus could be divided between the electricity and hydrogen producer

Germany archetype



Source: http://fch.europa.eu/studies

1 Installed electrolyzer capacity achieving 60 EUR/installed kW per year of benefits at given hydrogen plant gate cost – this corresponds to 370 EUR/kW capex, 8% WACC, annual opex at 1.2% of total capex and 10 years lifetime (FCH JU 2014)
Assumes electricity for free, no grid connections fees and no time-shift storage is in place.

Benefits to the consumer

- European industrial sectors like Gas, refineries, steel industry can reduce their CO2 footprint by displacing dirty H_2 with green H_2
- ex. Germany: In the long term (2050) 170GW of electrolysers could produce 1.4 MtnH_2 in a financially viable way using excess RE, avoiding 14-20 MtnCO_2
- Green Hydrogen can be used to recycle captured CO2 (CCS) through methanation step using the existing NG infrastructure

Thank you for your attention!