H₂ Energy
an enabler of the
Grand Energy Transition

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Four major levers are needed to enable the energy transition

Final energy consumption 1,2, 2013 and 2050, in EJ

1. Increasing energy efficiency limits the rise of energy consumption
2. CCS/U decarbonizes the use of fossil fuels
3. Switch to zero emission energy carriers, e.g., electricity or hydrogen
4. Renewables replace fossil fuels

- Final energy consumption within the 2DS of the IEA
- Increase of energy demand is determined via the relative increase of CO₂ emissions w/o energy efficiencies
- The fossil fuels amount processed using CCS/U was determined to be 25% of the total amount of fossil fuels by relating the CO₂ emission reduction compared for the 2DS and 6DS
- The fossil fuel power sector also includes nuclear energy

Enable the renewable energy system

There are seven roles for hydrogen in the energy transition:

1. Enable large-scale renewables integration and power generation
2. Distribute energy across sectors and regions
3. Act as a buffer to increase system resilience
4. Decarbonize transportation
5. Decarbonize industry energy use
6. Help decarbonize building heating and power
7. Serve as feedstock, using captured carbon

Low carbon hydrogen pathways

- Biomethane
- Electrolysis with low carbon electricity
- Natural Gas + Carbon Capture and Storage (CCUS)
Ex: Hype, H2 taxi, Paris

- greater ranges and faster charging time compared to BEV
- city and national support for ZEV
- 1st H2 taxi fleet in the world, launched during COP 21
- starting with 5 taxis, then 100 to date and targeting 600 by 2020
- 4 HRS to support the growth
Zoom: Power-to-Gas

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

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
Key insights

**Hydrogen** may enable the Grand Transition through *systemic impact* to the whole energy system

Hydrogen **technology is mature** and is starting to be deployed to decarbonize different sectors across the globe

**Industry** leads early market deployment to anticipate *incoming regulation* [ex. **Hydrogen Council** counts from 13 to 53 multinational companies in two years]

**Need for** coherent low carbon regulation to ensure short term profitability of hydrogen solutions

**Need for** extensive communication, education and future workforce training to enhance social acceptance of hydrogen technologies
Looking beyond

Early movers prove that it is sustainable

Need to further increase the momentum:

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

Voice your vision and use cases for hydrogen

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