EU-perspective on the role of hydrogen

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The Role of Large Scale Hydrogen
HYPER Closing Seminar

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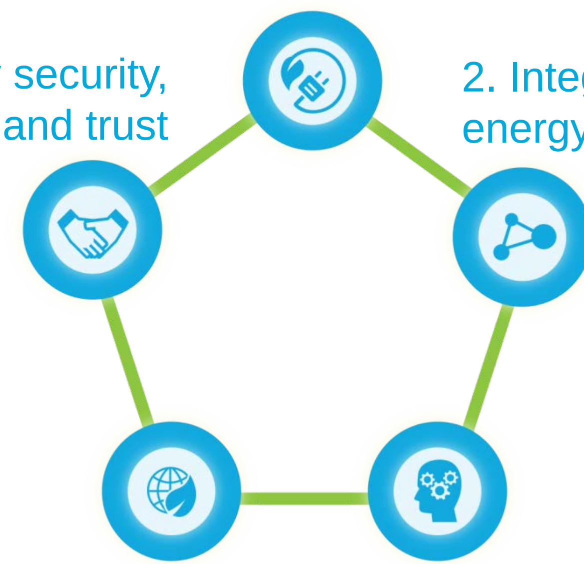
EU main energy policy developments [1]

Energy Union: a secure, sustainable, competitive, affordable energy for every European

- Modernised economy
- Renewable energy and efficiency
- Fair and social transition

ENERGY UNION STRATEGY



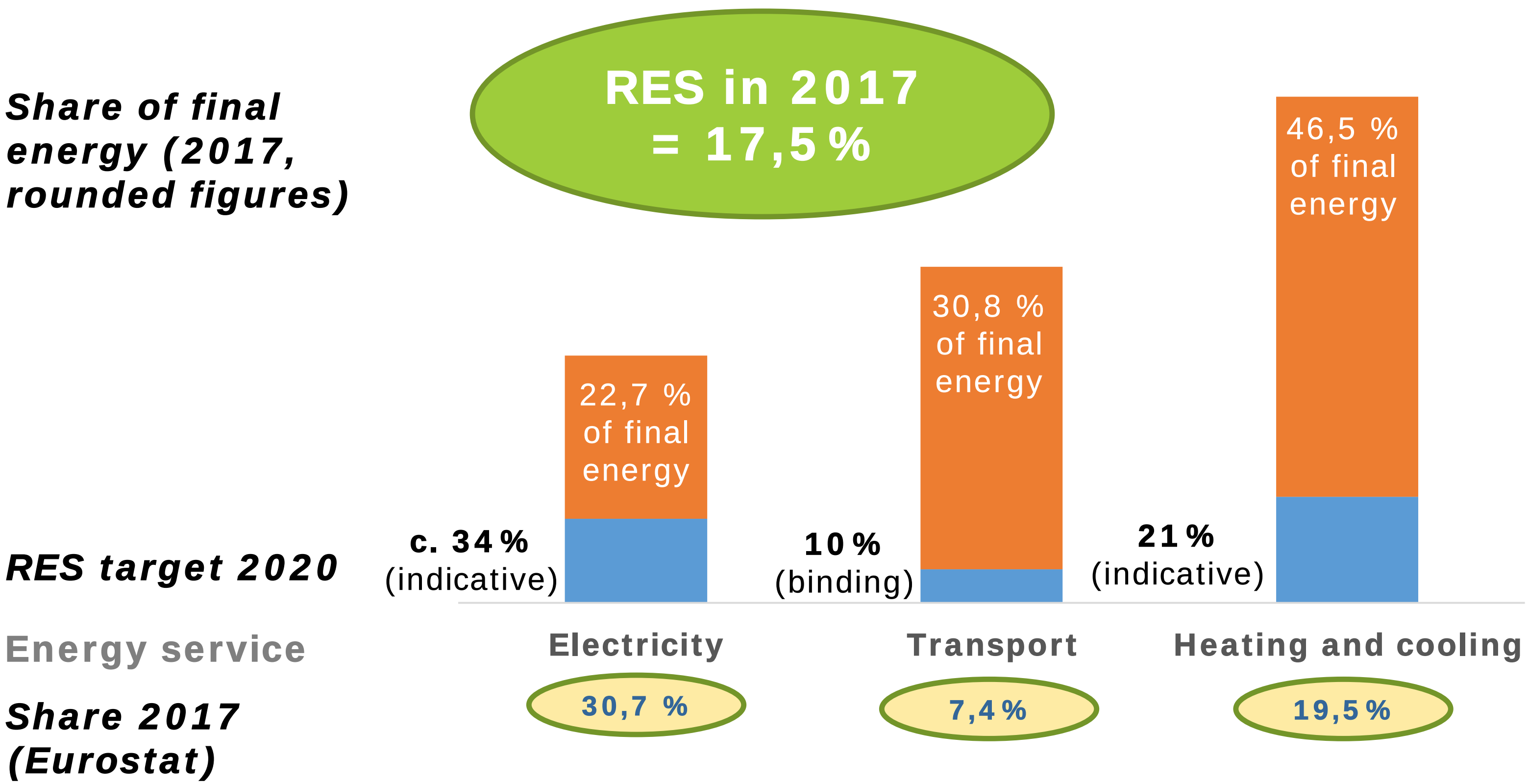
EU main energy policy developments [2]

The Clean Energy for All Europeans (CE4AE) package:

- Energy Performance of Buildings Directive
- Energy Efficiency Directive
- Renewable Energy Directive
- Governance regulation
- Electricity Market Directive and Regulation
- Risk Preparedness Regulation
- Regulation establishing an Agency for the Cooperation of Energy Regulators

The EC Strategy for long-term EU GHG emissions reductions: A vision to achieve climate neutrality by 2050, through a fair transition encompassing all sectors of the economy.

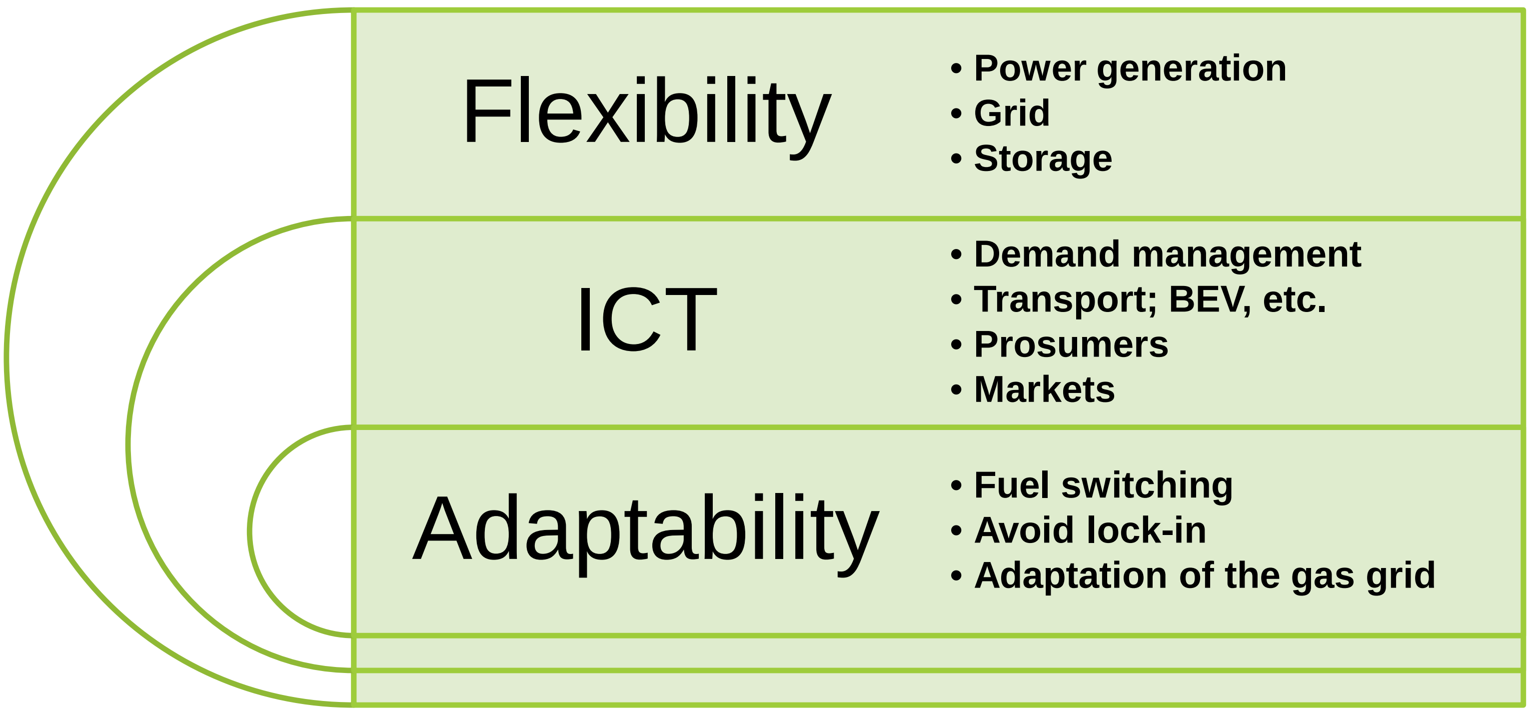
Renewables in the EU – progress per sector towards 2020



A flexible and adaptive energy system

Smart Energy System

- Generation
- Demand
- Electricity, gas and heat networks
- Storage



Sectoral Integration at EU level – ASSET study

Assuming the following hydrogen uses:

- Mix up to 15% in gas distribution
- Use fuel cells using H2 in vehicles that cannot run in batteries, such as trucks, buses, taxis, duty vehicles. Combine with large-scale HRS, which may include electrolysis and H2 storage
- Use H2 directly in high temperature furnaces in industry combined with local electrolysis and storage
- Produce clean methane in methanation plants using CO2 captured from air, integrated in power utility facilities well interconnected. H2 produced in these locations also serve electricity storage
- ¾ of total directly used in final consumption and ¼ of total as a feedstock to produce clean methane (CH4)

RESULTS

✓ **96% CO2 emissions reduction** in 2050 (relative to 1990) against -84% CO2 in the basic decarbonisation scenario

✓ The balanced scenario abates CO2 at an **average cost of €88/t CO2** (cumulatively in the period 2030-2050) against €182/tCO2 abated in the basic decarbonisation scenario

RED revision

- **32%** EU binding target for 2030
- Empower consumers, including energy communities, and self-consumption
  - Right to **self-consume and store energy**
  - **Non-discriminatory grid fees and charges**
- More targeted **non-distortive market** support
  - Coherence in support schemes across EU
- Revised **renewable** targets in **transport**
  - Focus on advanced biofuels & fuels from **non-biological origin**

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RED revision – provisions relevant to H_2 and storage

- Art. 19 on **Guarantees of Origin**
- Art. 20(1): *Where relevant, Member States shall assess the need to extend existing* ***gas network infrastructure*** *to facilitate the integration of gas from renewable sources*.
- Art. 24(8): **Thermal storage:** DSOs and DH operators to assess at least every 4 years the potential of thermal storage (district heating/cooling) to assess if more resource- and cost-efficient than alternative solutions
- Art. 25(2): *The GHG emissions savings from the use of* ***renewable liquid and gaseous transport fuels of non- biological origin*** *shall be at least 70 % from 1 January 2021*.
- Art. 27(3) on **electricity used to produce RFNBO**
- Art. 28(5) *By 31/12/2021, the EC shall adopt* ***delegated acts*** *[…] specifying the methodology for assessing* ***greenhouse gas emissions savings from renewable liquid and gaseous transport fuels of non-biological origin*** *[…]*.

Energy storage in the electricity system

- Energy storage services should be a **market-based activity** and developed under competitive terms.
- **Efficient use of storage facilities** and **fair access** to storage services for all market participants.
- **Avoid distortion of competition** and cross-subsidization between storage and distribution/transmission of electricity.
- The new Electricity Directive and Regulation under the CEP, put in place a new framework for energy storage in the electricity system:
  - **Energy storage definition** which accommodates the different storage technologies
  - **Specific role** of network operators
  - Participation of energy storage in the market and provision of **flexibility services** at a level playing field with other energy resources

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Long-term decarbonisation strategy (1)

Analysed scenarios in line with Paris Agreement

<table>
<tr><th colspan="9">Long Term Strategy Options</th></tr>
<tr><th></th><th>Electrification (ELEC)</th><th>Hydrogen (H2)</th><th>Power-to-X (P2X)</th><th>Energy Efficiency (EE)</th><th>Circular Economy (CIRC)</th><th>Combination (COMBO)</th><th>1.5°C Technical (1.5TECH)</th><th>1.5°C Sustainable Lifestyles (1.5LIFE)</th></tr>
<tr><td>Main Drivers</td><td>Electrification in all sectors</td><td>Hydrogen in industry, transport and buildings</td><td>E-fuels in industry, transport and buildings</td><td>Pursuing deep energy efficiency in all sectors</td><td>Increased resource and material efficiency</td><td>Cost-efficient combination of options from 2°C scenarios</td><td>Based on COMBO with more BECCS, CCS</td><td>Based on COMBO and CIRC with lifestyle changes</td></tr>
<tr><td>GHG target in 2050</td><td colspan="5">-80% GHG (excluding sinks)
[“well below 2°C” ambition]</td><td>-90% GHG (incl. sinks)</td><td colspan="2">-100% GHG (incl. sinks)
[“1.5°C” ambition]</td></tr>
<tr><td>Major Common Assumptions</td><td colspan="8">• Higher energy efficiency post 2030
• Deployment of sustainable, advanced biofuels
• Moderate circular economy measures
• Digitilisation
• Market coordination for infrastructure deployment
• BECCS present only post-2050 in 2°C scenarios
• Significant learning by doing for low carbon technologies
• Significant improvements in the efficiency of the transport system.</td></tr>
<tr><td>Power sector</td><td colspan="8">Power is nearly decarbonised by 2050. Strong penetration of RES facilitated by system optimization (demand-side response, storage, interconnections, role of prosumers). Nuclear still plays a role in the power sector and CCS deployment faces limitations.</td></tr>
<tr><td>Industry</td><td>Electrification of processes</td><td>Use of H2 in targeted applications</td><td>Use of e-gas in targeted applications</td><td>Reducing energy demand via Energy Efficiency</td><td>Higher recycling rates, material substitution, circular measures</td><td rowspan="3">Combination of most Cost-efficient options from “well below 2°C” scenarios with targeted application (excluding CIRC)</td><td rowspan="3">COMBO but stronger</td><td>CIRC+COMBO but stronger</td></tr>
<tr><td>Buildings</td><td>Increased deployment of heat pumps</td><td>Deployment of H2 for heating</td><td>Deployment of e-gas for heating</td><td>Increased renovation rates and depth</td><td>Sustainable buildings</td><td>CIRC+COMBO but stronger</td></tr>
<tr><td>Transport sector</td><td>Faster electrification for all transport modes</td><td>H2 deployment for HDVs and some for LDVs</td><td>E-fuels deployment for all modes</td><td>• Increased modal shift
• Electrification as in ELEC</td><td>Mobility as a service</td><td>• CIRC+COMBO but stronger
• Alternatives to air travel</td></tr>
<tr><td>Other Drivers</td><td></td><td>H2 in gas distribution grid</td><td>E-gas in gas distribution grid</td><td></td><td></td><td></td><td>Limited enhancement natural sink</td><td>• Dietary changes
• Enhancement natural sink</td></tr>
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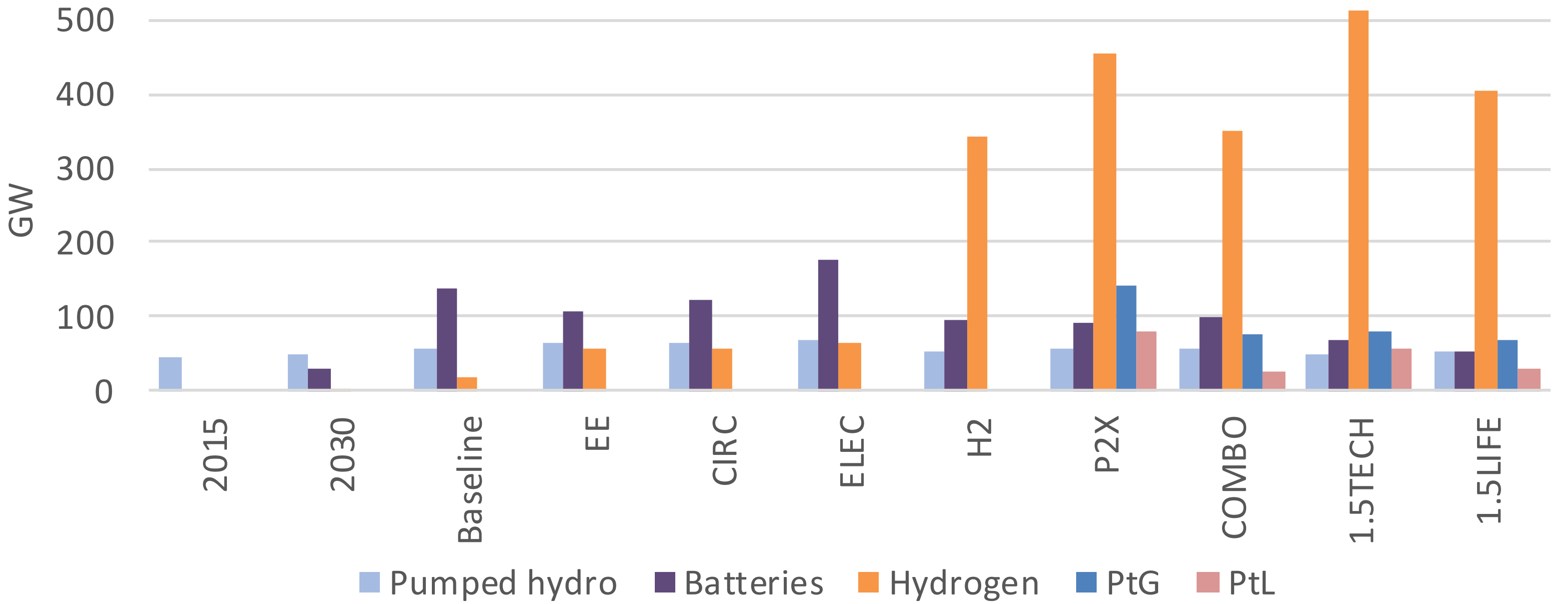
Long-term decarbonisation strategy (2)

Storage capacity in 2050



Relevant initiatives at EU level

The **Hydrogen Initiative** launched by the **Austrian Presidency**

- Signed by 27 MS + CH, IS and the EC, together with 100 private stakeholders
- Puts emphasis on hydrogen for **seasonal storage** of electricity and to **decarbonise industry and gas networks**

The **Sustainable and Smart Gas Infrastructure declaration** launched by the **Romanian Presidency**

- Signed by 17 MS + Switzerland, Norway and Liechtenstein
- Aims to maximise the potential of the gas grid to **accommodate growing shares** of near-zero carbon hydrogen and renewable gases
- Concerns **existing as well as planned infrastructure**, in order to avoid stranded assets

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The Hydrogen Energy Network

- DG ENER set up an **informal network of experts** from Ministries in charge of Energy.
- Aim: offer to Member States a **platform to exchange information and best practices** to help them advance in a coherent manner on developing hydrogen solutions for the energy sector, discussing
  - Paths and solutions for hydrogen as a **decarbonised energy carrier**.
  - Hydrogen use for **large-scale energy storage** and for **sector integration/coupling**.
  - **Opportunities offered by the results of the research activities** undertaken by Member States, industry and the Commission.

R&I on hydrogen

- **Fuel Cells and Hydrogen Joint Undertaking:**

» Finances R&D on FC and hydrogen with EU contribution of **EUR 646 million** from Horizon 2020 for 2014-2020.

» The EC proposed to have it continue under Horizon Europe, with a stronger focus on hydrogen **production, distribution and storage** next to selected **end-use applications** with focus on **integrating renewables and decarbonising other economic sectors**.

» The Impact Assessment is ongoing.

- **Innovation Fund** (DG CLIMA): at least EUR 10 billion

- **IPCEIs** (DG GROW)

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Hydrogen in the energy market
Regulatory and policy topics - electricity and gas

- Key role for **innovation**: H2020, FCH JU, Informatics and data exchange
- Reinforce the **policy framework**, (Clean Energy Package - incl. RES, distributed generation (RE), storage, smart technologies, capacity markets etc.)
- Important role for **balancing and** for **demand side flexibility**.
- Energy prices and network **tariff structures** which could integrate the increasing variability of power generation and secure investments.
- **Certification** (=market) for low-carbon gas (P2G), linking to the electricity market.
- Mechanisms for **linking energy storage to other economic sectors** (transport, industry).
- **Standardisation** - infrastructure, equipment and gas quality (incl. Hydrogen and bio-methane)
- International collaboration

International cooperation on hydrogen

- **IPHE:** launched in **2003**, it is organised in two working groups:
  - the Education & Outreach Working Group and
  - the Regulations, Codes, Standards & Safety Working Group

- **MI-IC 8 “Renewable and Clean Hydrogen”**: launched in **2018**, it is co-led by Australia, European Commission, Germany and focuses on multinational research and large-scale demonstration efforts from both public and private sectors on industry-directed breakthroughs (e.g. Hydrogen Valleys).

- **CEM Hydrogen Initiative (CEM H2I)**: launched in **2019**, it is co-led by the EC (DG ENER), Japan, Canada, the Netherlands and the US. It aims to advance awareness, information on policies, programmes and projects that accelerate the commercialization and deployment of hydrogen and fuel cell technologies across all aspects of the economy.

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Thank You for Your Attention!

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http://ec.europa.eu/energy/index_en.htm