



Sector integration and the EU energy and climate targets

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**Fuel Cells and Hydrogen Joint Undertaking
Stakeholder Forum**

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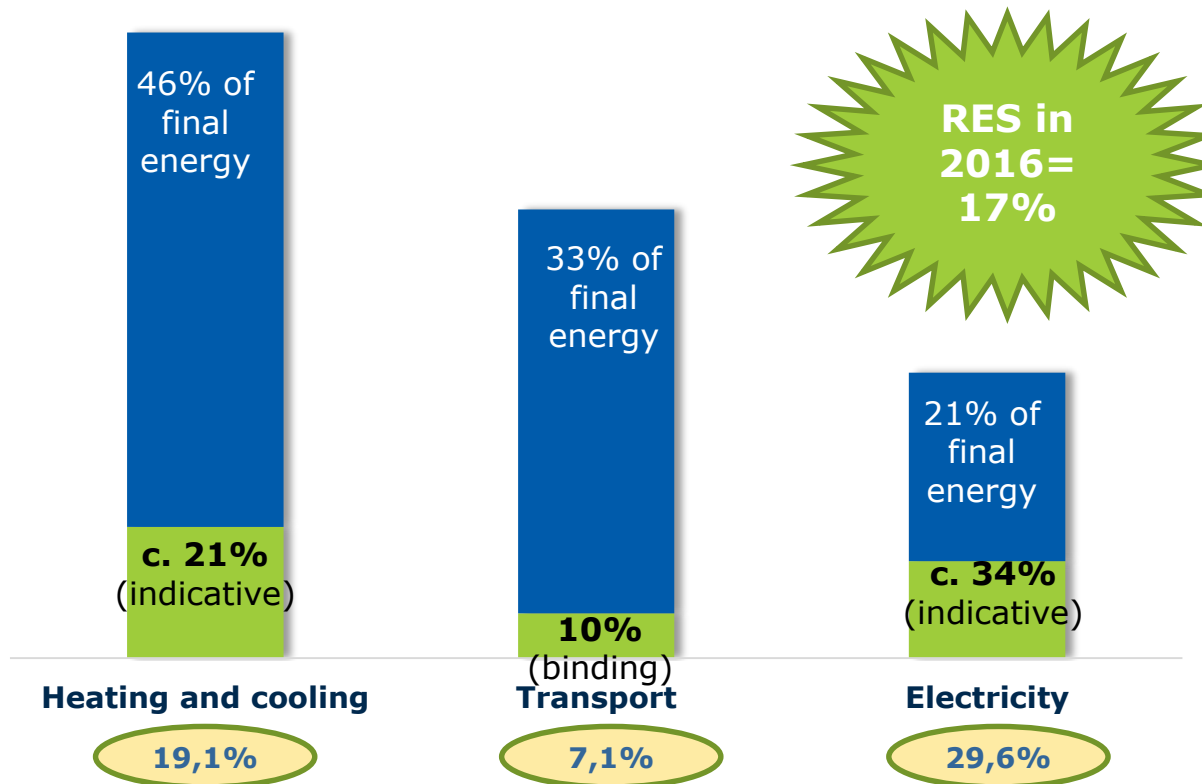
Renewables in the EU – progress per sector towards 2020

Share of final energy (2016, rounded figures)

RES target 2020

Energy service

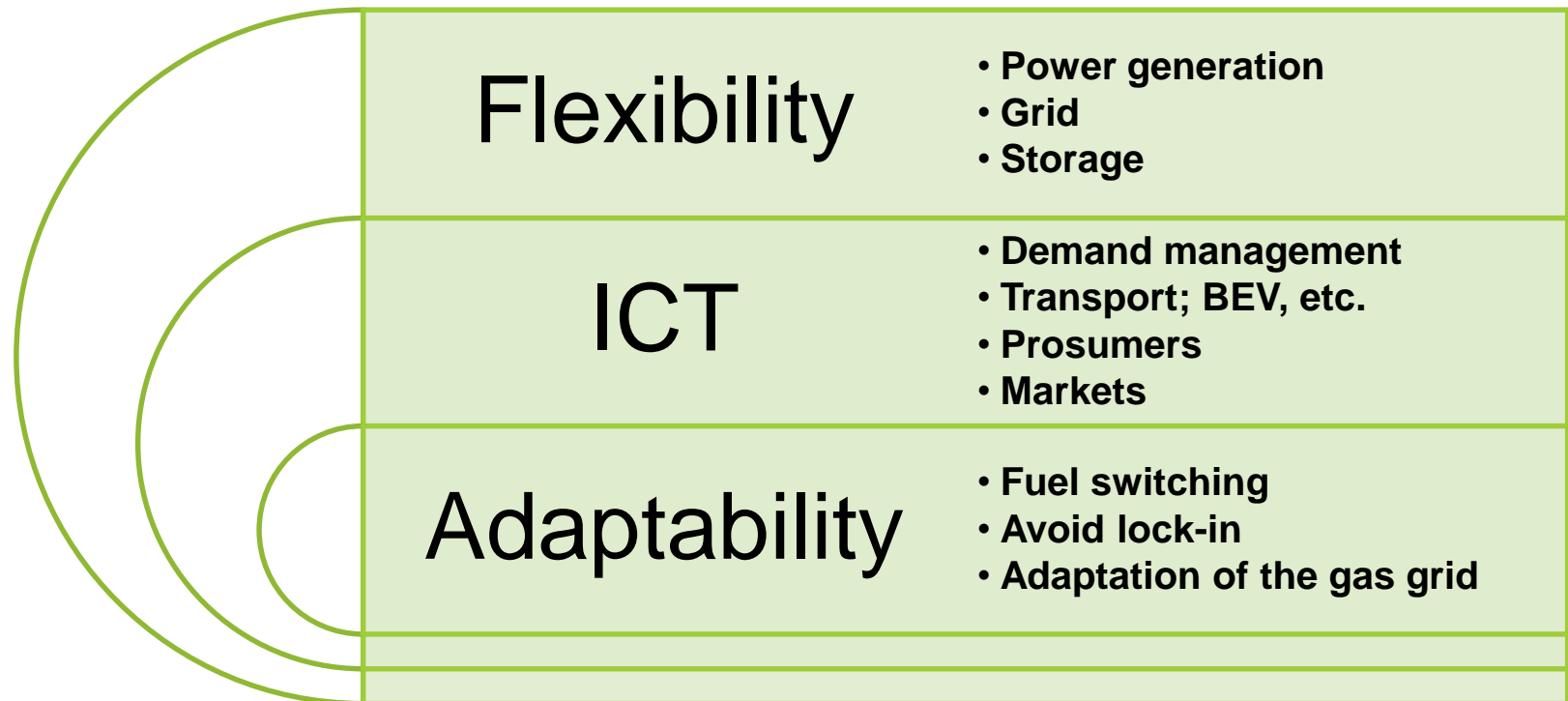
Share 2016 (Eurostat)



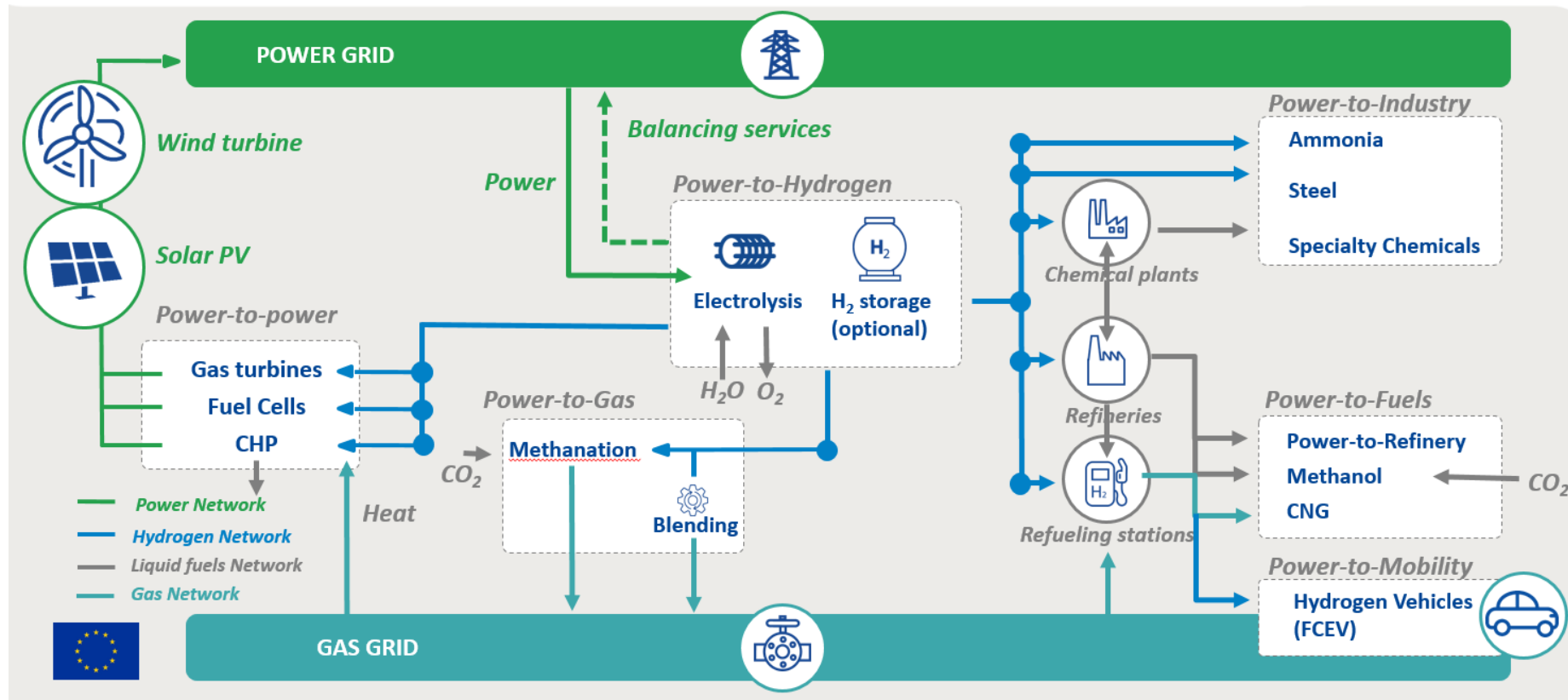
A flexible and adaptive energy system

Smart Energy System

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

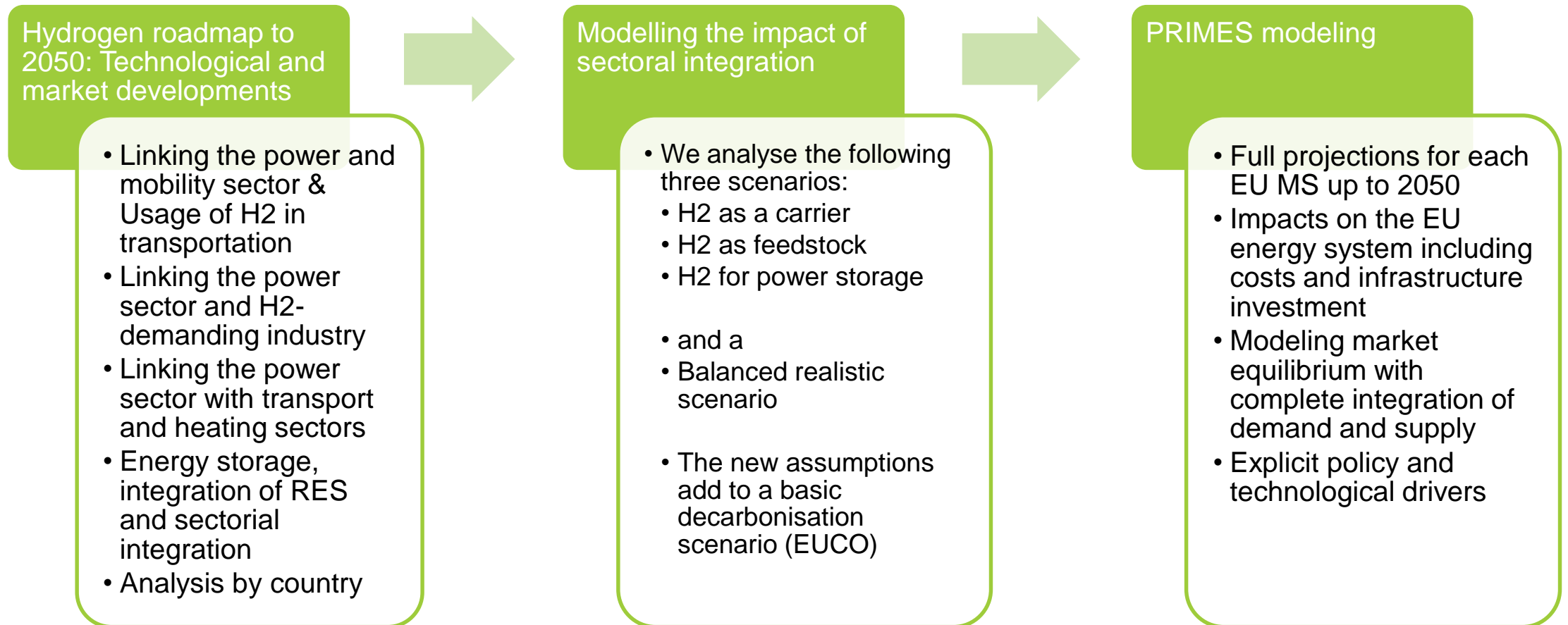


Integrating various economic sectors



Source: Fuel Cells and Hydrogen Joint Undertaking

First study on Sectoral Integration at EU level – ASSET - preliminary evaluations -



A combined – realistic scenario achieving zero emissions

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 H₂ refueling stations, 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
- $\frac{3}{4}$ of total directly used in final consumption and $\frac{1}{4}$ of total as a feedstock to produce clean methane (CH₄)

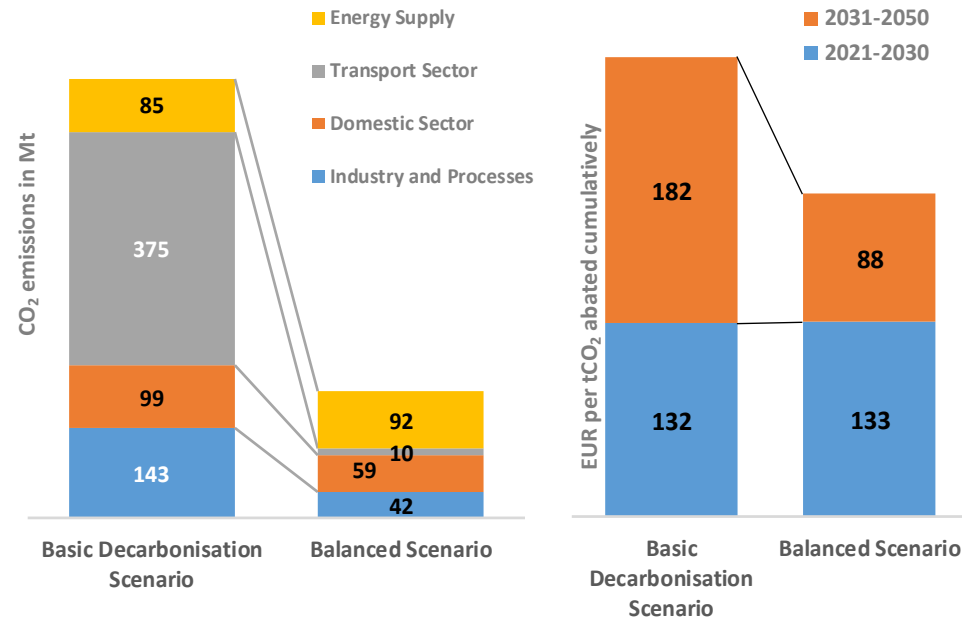
Rest of Options

- Fully decarbonize power generation using maximum contribution by RES, dispersed and centralized, complemented by nuclear and CCS where possible. Direct storage and chemical storage, as well as interconnections, succeed to balance the RES.
- Develop advanced sustainable biomass feedstock to produce fungible jet fuels and ship fuel, as well as bio-methane mixed in the gas grid
- Exploit to maximum possible potential energy efficiency in buildings and industry
- Electrify car mobility and heating

First study on Sectoral Integration at EU level – ASSET - preliminary evaluations (2) -

Emissions and costs in the Balanced Scenario

PRIMES projections



- 96% CO₂ emissions reduction in 2050 (relative to 1990)
 - » 12 percentage points more than in the basic decarbonisation scenario (-84% CO₂ in 2050)
- The balanced scenario abates CO₂ at an average cost of €88/t CO₂ (cumulatively in the period 2030-2050)
 - » Which is less than half of the cost in the basic decarbonisation scenario (€182/tCO₂ abated)
- The performance owes to the multiple roles of hydrogen in sectoral integration, and its particular role in the transport sector

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)

Thank You for Your Attention!

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

