Powering a climate-neutral economy

The Energy System Integration and Hydrogen Strategies

15th Energy Community Gas Forum

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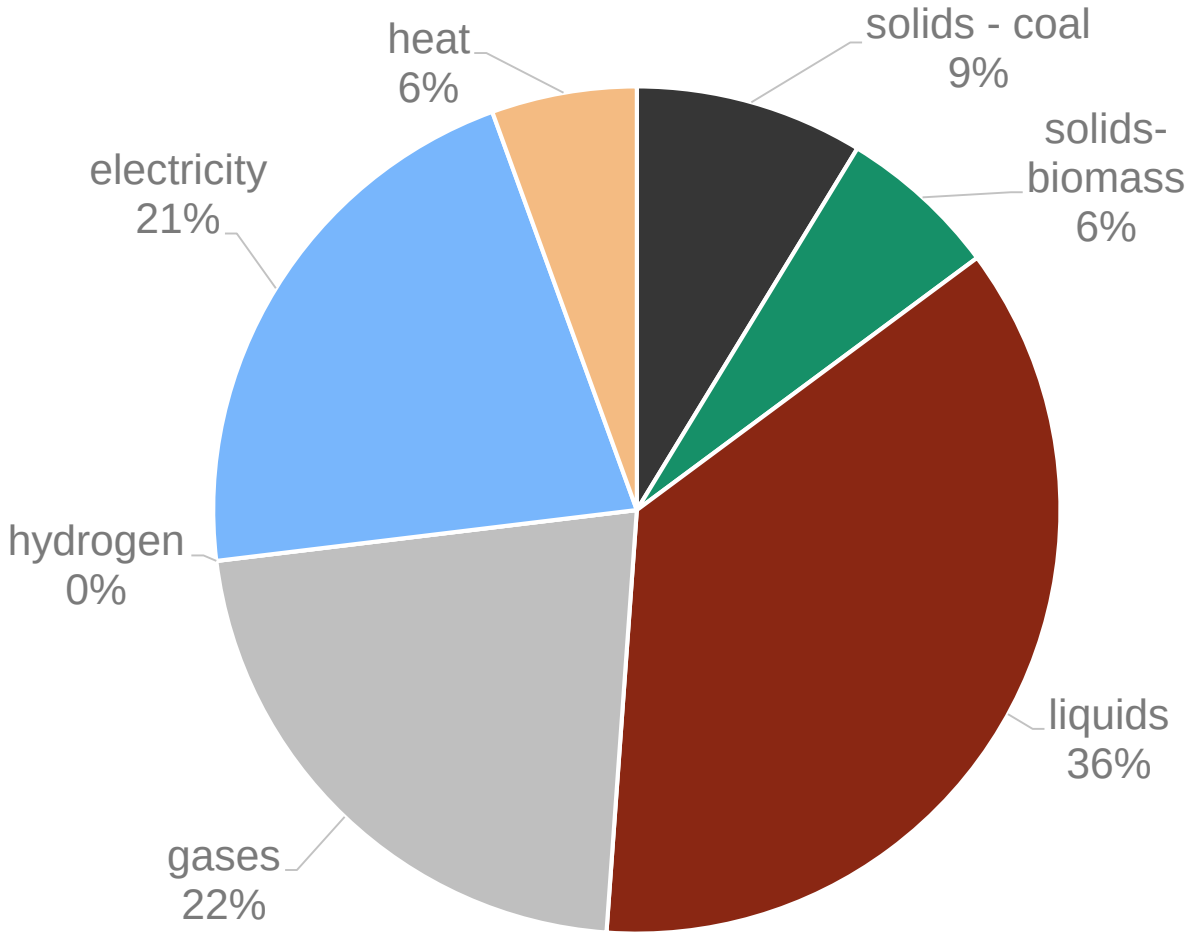
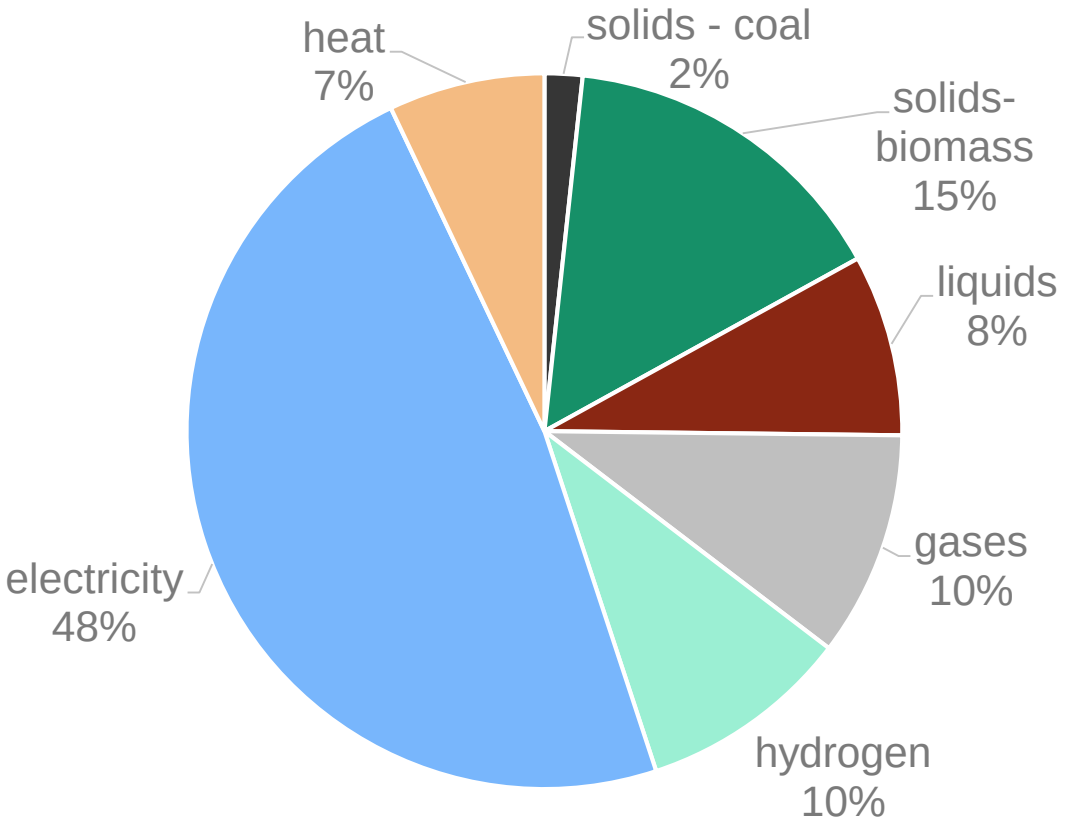
A changing energy landscape towards 2050

Changing energy carriers



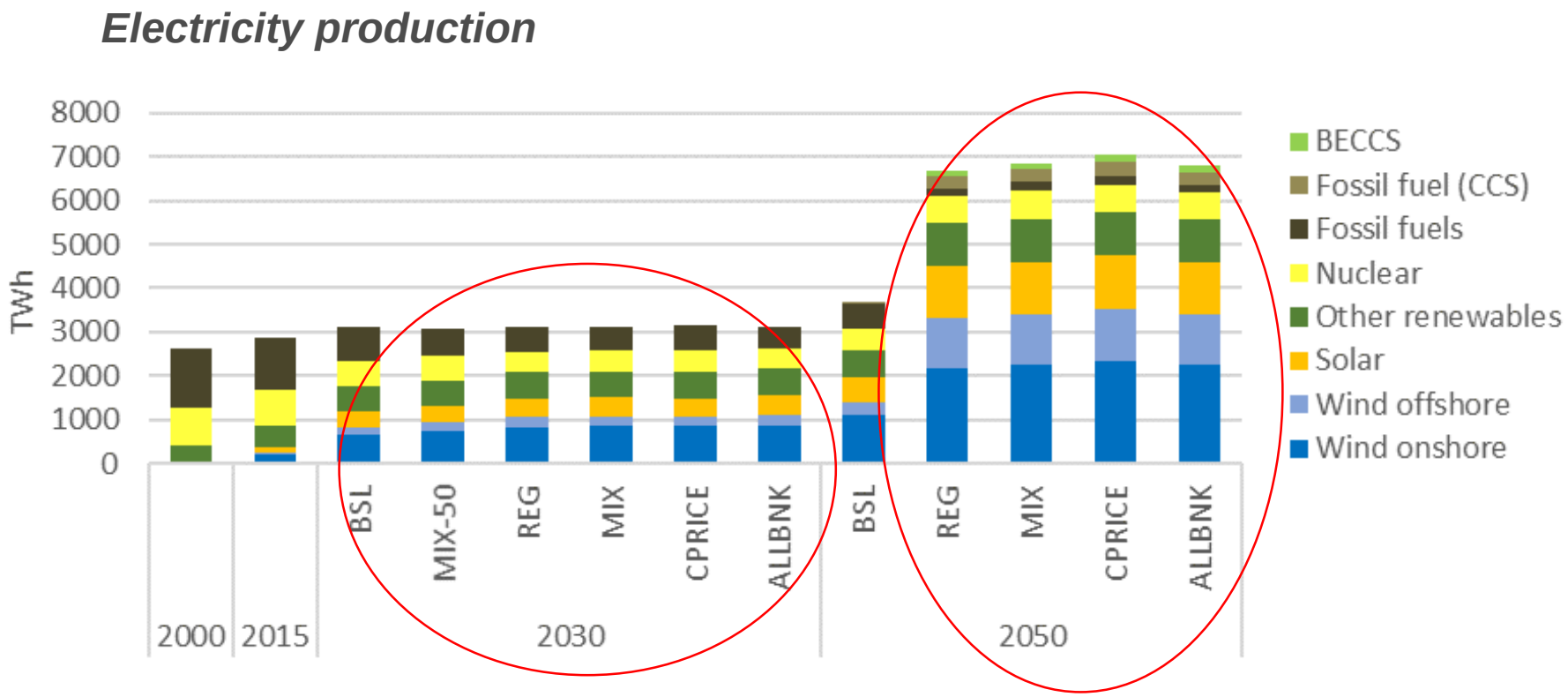
2018 (1648 MToe)



2050 (1213 Mtoe)

Source: Based on EU28 Eurostat/LTS 1.5LIFE/TECH scenarios

Electrification, based on renewables



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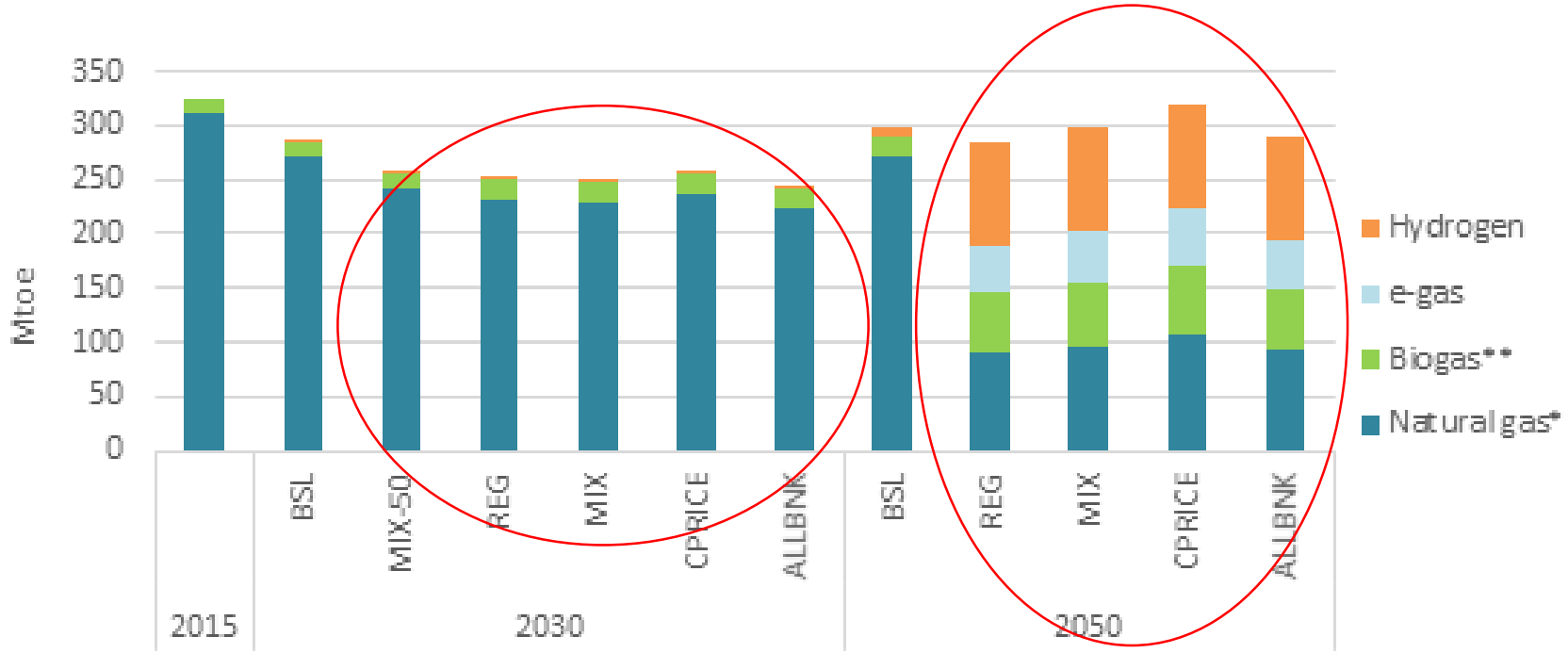
Transformation for the gas industry

Consumption of gaseous fuels per gas type



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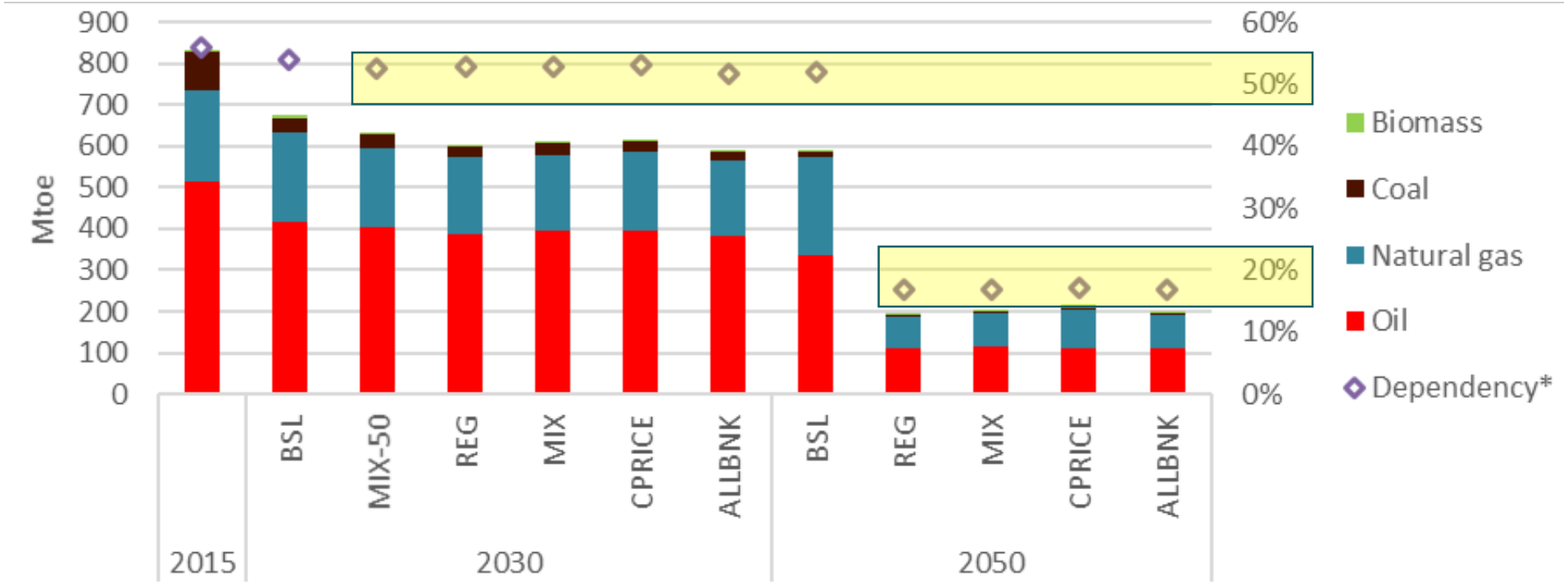
Reduced import dependency

Energy imports



European Commission

The Energy System Integration and Hydrogen strategies

Why a Strategy for Energy System Integration? Why now?

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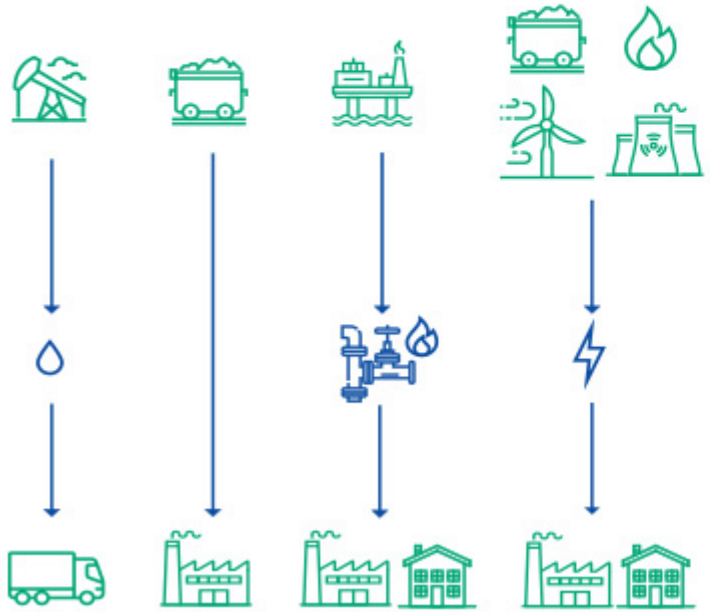
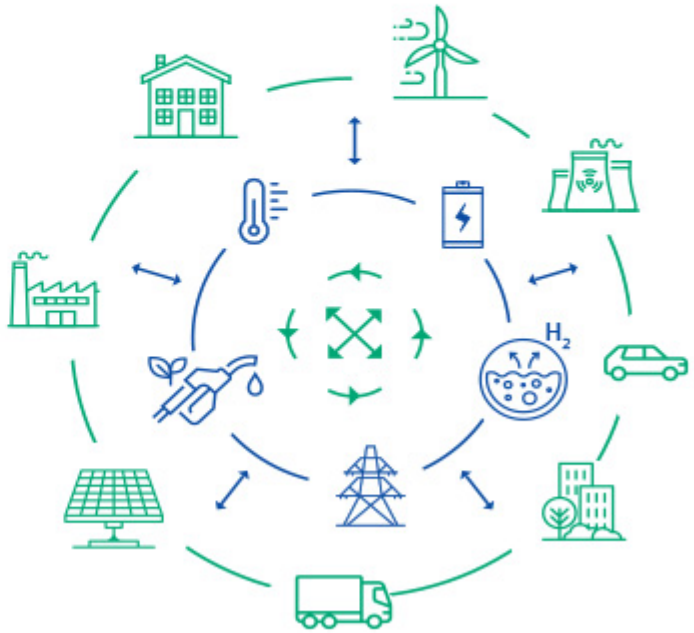
What is energy system integration?

The energy system today :
linear and wasteful flows of energy,
in one direction only



Future EU integrated energy system :
energy flows between users and producers,
reducing wasted resources and money



Energy System Integration (ESI) is the integrated planning and operation of the energy system 'as a whole', across multiple carriers, infrastructures and consumption sectors

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The Energy System Integration Strategy

1

A more **circular and energy efficient** energy system

2

More **electrification** of consumption, based on renewables

3

Renewable and low carbon fuels (incl. hydrogen) in hard-to-abate sectors

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- **Consumers** can choose the best clean option for their needs
- **Infrastructure** is planned in an integrated way, looking jointly at gas, electricity, heat and hydrogen
- **Digitalisation** fully enables a smarter system

The Hydrogen Strategy – A roadmap to 2050

2024

- 6 GW of renewable hydrogen electrolysers
- **Replace existing hydrogen production**
- Regulation for liquid hydrogen markets
- Start planning of hydrogen infrastructure

2030

- 40 GW of renewable hydrogen electrolysers
- **New applications in steel and transport**
- Hydrogen for **electricity balancing** purposes
- Creation of “Hydrogen Valleys”
- **Cross-border** logistical infrastructure

2050

- Scale-up to **all hard-to-decarbonise sectors**
- Expansion of hydrogen-derived **synthetic fuels**
- **EU-wide** infrastructure network
- An open international market with € as benchmark

The Hydrogen Strategy – A full value chain approach

- An investment agenda
- Boosting demand and scaling up production
- Develop hydrogen infrastructure and markets
- Research and innovation
- International cooperation

Thank you for your attention!

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The Energy System Integration Strategy

A more circular and energy efficient energy system

A system in which:
- unavoidable waste streams are reused for energy (circularity)
- the least energy-intensive options are prioritised

Energy efficiency

- EC guidance to MS on the energy efficiency first principle (non-legislative)
- Review of the “Primary Energy Factor” (EED)

A more circular energy system

- Regulatory framework for the reuse of waste heat from industry and data centres (RED / EED)
- Funding for mobilization of agriculture waste and residues and “circular” rural energy communities (CAP, structural funds, LIFE)

A deep electrification of consumption, based on renewable electricity

A system in which:
- consumption is increasingly electrified, in particular buildings, transport and some industrial processes
- electricity is largely produced from renewables
- new loads (electric vehicles, heat pumps) are integrated and contribute to system flexibility

Ensure continued growth in renewable electricity supply
- Offshore renewable strategy
- Explore green public procurement for renewable electricity (RED)
- Tackle remaining barriers and ensure high ambition through RED review

Accelerate electrification of energy consumption
- Renovation Wave
- Additional measures for electrification of heating, cooling and transport in RED revision
- Electrification of industry through Industrial Emissions Directive review
- Revise CO2 emission standards for cars

Accelerate roll-out of electric vehicles infrastructure and their integration
- Support 1 million charging points by 2025 through InvestEU and CEF
- Revision of the AFID
- Revision of TEN-E and TEN-T
- Network code on Demand Side flexibility

Renewable and low carbon fuels for hard-to-abate sectors (incl. hydrogen)

A system in which:
- the potential for sustainable biogas and biofuels is fully exploited
- renewable and low carbon hydrogen increasingly plays a role in industry and transport
- carbon capture is used to produce synthetic fuels, as a last option

A greater uptake of renewable and low carbon fuels

- Terminology and certification framework for all renewable and low carbon fuels
- Additional demand-side measures to “pull” RES and low carbon fuels (RED, transport initiatives)
- Financing of flagship carbon-neutral industrial clusters
- Financing for fertilisers based on renewable hydrogen
- Scale up carbon capture and use for the production of synthetic fuels
- Certification of carbon removals

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Actions under the **Hydrogen Strategy**

Transversal enablers: markets, infrastructure, digitalisation

A system in which:

- Consumers receive clear information, price signals, to choose the best clean option for their needs
- Markets are fit for decentralised, renewable electricity and gases
- Infrastructure is planned in an integrated way, looking jointly at gas, electricity, heat and hydrogen
- Digitalisation fully enables a smarter system

Markets	• Guidance to MS on non-energy price components (taxes, charges and levies) • ETD revision and ETS extension; State aid framework revision • Revision legislative framework for a competitive decarbonized gas market
Consumers	• Consumer information campaign (non legislative) • Information on sustainability of industrial products
Infrastructure	• TEN-E and TEN-T revisions • Review scope and governance of TYNDP process (TEN-E, other) • Stronger incentives for smart district heating and cooling (RED, funding)
Digitalisation	• Digitalisation of Energy Action Plan (non legislative) • Network Code on Cybersecurity in electricity • New clean energy research/innovation outlook to drive R&I agenda

Markets

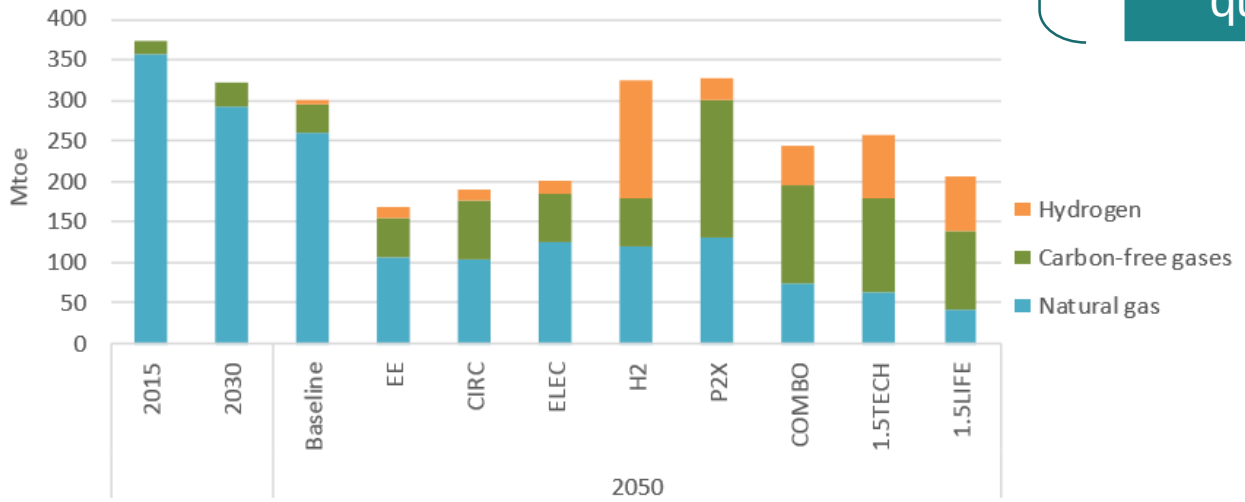
Clean Energy Package

- **Made electricity markets fit to**
  - Integrate renewable electricity and flexibility
  - Improve market signals
  - **Challenge:**
    - implementation, esp. completion of market coupling (day-ahead and intraday trading)

Revision of legislative framework

- **For a competitive decarbonized gas market**
  - Distributed production of renewable gases: connect to infrastructure and provide for market access
  - Ensure interoperability across gas systems and Member States (revision of technical rules, e.g. gas quality specifications)

Figure 33: Consumption of gaseous fuels



Note: "carbon-free" gases refer to e-gas, biogas and waste-gas.

Source: Eurostat (2015), PRIMES.

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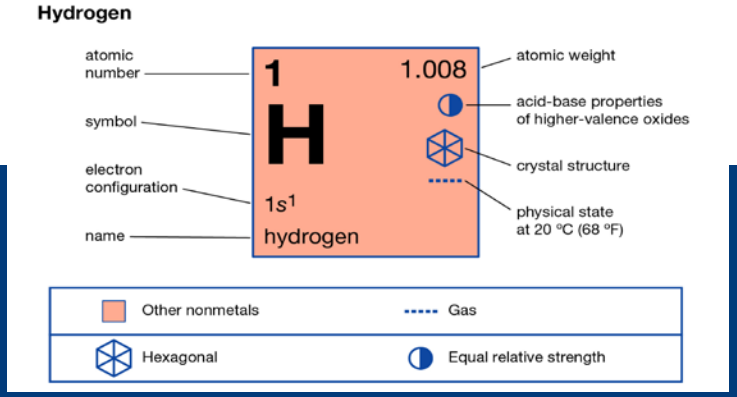
The Hydrogen Strategy

Hydrogen – What and Why?



Hydrogen:

- Feedstock, fuel, energy carrier / storage
- Does not emit C02, no air pollution
- Essential to reach our climate ambition (hard-to-abate sectors)
- Europe is highly competitive in clean hydrogen technologies manufacturing

Which hydrogen:

Currently: fossil- based hydrogen

Our vision: Renewable, and in a transitional period **low-carbon hydrogen** (fossil-based hydrogen with carbon capture and electricity based) for:

- Replacing existing hydrogen production
- Industry (fertilisers and steel) and transport (e.g. heavy duty road vehicles; in the longer term: maritime and aviation)

Issues:

- **Cost-competitivess**
- **Technological maturity (cost-effective electrolysers)**
- **Renewable energy & scale : 2x40 GW by 2030**

Hydrogen – fostering demand

Renewable, and in a transitional period low-carbon hydrogen, for:

- Replacing existing hydrogen production
- Green fertilisers and green steel
- Local buses, commercial fleets, or specific parts of the rail network
- Heavy duty road vehicles
- In the longer term, maritime and aviation

Supporting end-consumers

- EU strategy on clean steel
- Sustainable and Smart Mobility Strategy

Creating markets

- Specific end-use sector quotas of renewable hydrogen or its derivatives
- Liquid markets with commodity-based hydrogen trading
- Open and competitive hydrogen market with solid price signals
- Hydrogen infrastructure access to all consumers

Hydrogen – supply and infrastructure

Scaling up renewable hydrogen, and in a transitional period low-carbon hydrogen, through:

- Supporting producers through support mechanisms
- Develop a EU-wide hydrogen infrastructure

Producers

- Common low-carbon threshold for hydrogen production facilities
- Certification of renewable and low-carbon hydrogen
- Revision of the Emission Trading Scheme
- Carbon Contract for Differences
- Market-based support schemes for renewable hydrogen

Infrastructure

- Revision of the TEN-E and internal gas market legislation to ensure interoperability, common quality standards, and cross-border operational rules
- Network of refuelling stations through Alternative Fuels Infrastructure Directive
- Revision of TYNDPs to ensure full integration of hydrogen infrastructure

Hydrogen – research and innovation

Maintain and strengthen **EU's global leadership role** through support:

- Establish Clean Hydrogen Partnership
- Targeted research and innovation in Horizon Europe
- ETS Innovation Fund

Scale-up production	• Larger size, more efficient and cost-effective electrolysers • Mass manufacturing capability and new materials • Break-through solutions like direct solar hydrogen
Infrastructure	• Distribute, store and dispense hydrogen at large volumes • Repurposing of existing gas infrastructure • Adaptation of LNG terminals
End-use applications	• New industrial processes • Multi MW-fuel cells • Hydrogen-derived synthetic fuels for the maritime and aviation sector
Cross-cutting areas	• Improved harmonized safety standards • Reduced environmental impacts and sustainability • Critical raw materials, re-use and recycling

Hydrogen – the international dimension

Strengthening Europe's global leadership role and putting renewable hydrogen high on its strategic agenda

Bilateral and regional cooperation

- Clean hydrogen support under Neighbourhood Investment Platform
- Joint hydrogen research and development programmes through Association Agreements
- Hydrogen collaboration under the Africa-Europe Green Initiative
- Mainstream hydrogen in energy diplomacy, climate, research, trade and international cooperation

Multilateral fora

- Set common GHG emission reduction standards and sustainability criteria
- New Clean Hydrogen mission within Mission Innovation and the Clean energy Ministerial Hydrogen Initiative
- Further collaboration through e.g. UN, G20, IRENA, EnC