Energy storage in European energy policies

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8e journées du stockage d'énergie et du power to gas

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Energy

EU main policy developments

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

5 guiding dimensions:

- Energy security, solidarity and trust
- A fully integrated internal energy market
- "Energy efficiency first" (including the transport sector)
- Transition to a long-lasting low-carbon society
- An Energy Union for Research, Innovation and Competiveness

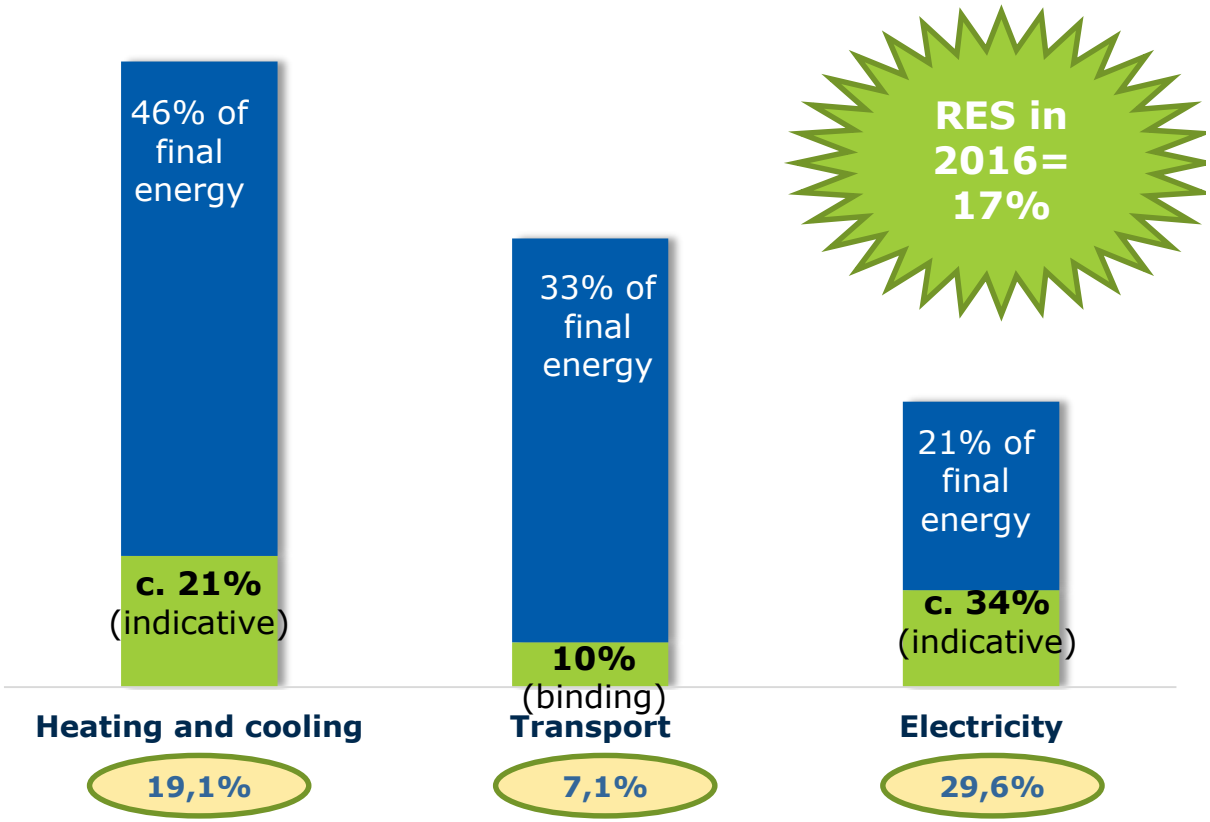
The Clean Energy Package:

- Political agreement on the revised Renewable Energy Directive, with a binding EU level target of 32% renewable energy by 2030
- Agreement on an energy efficiency target for 2030 of 32.5%
- Political agreement on a new Energy Union Governance Regulation
- The revised Energy Performance in Buildings Directive entered into force in July.
- Electricity Market Design legislative proposals are under negotiations.

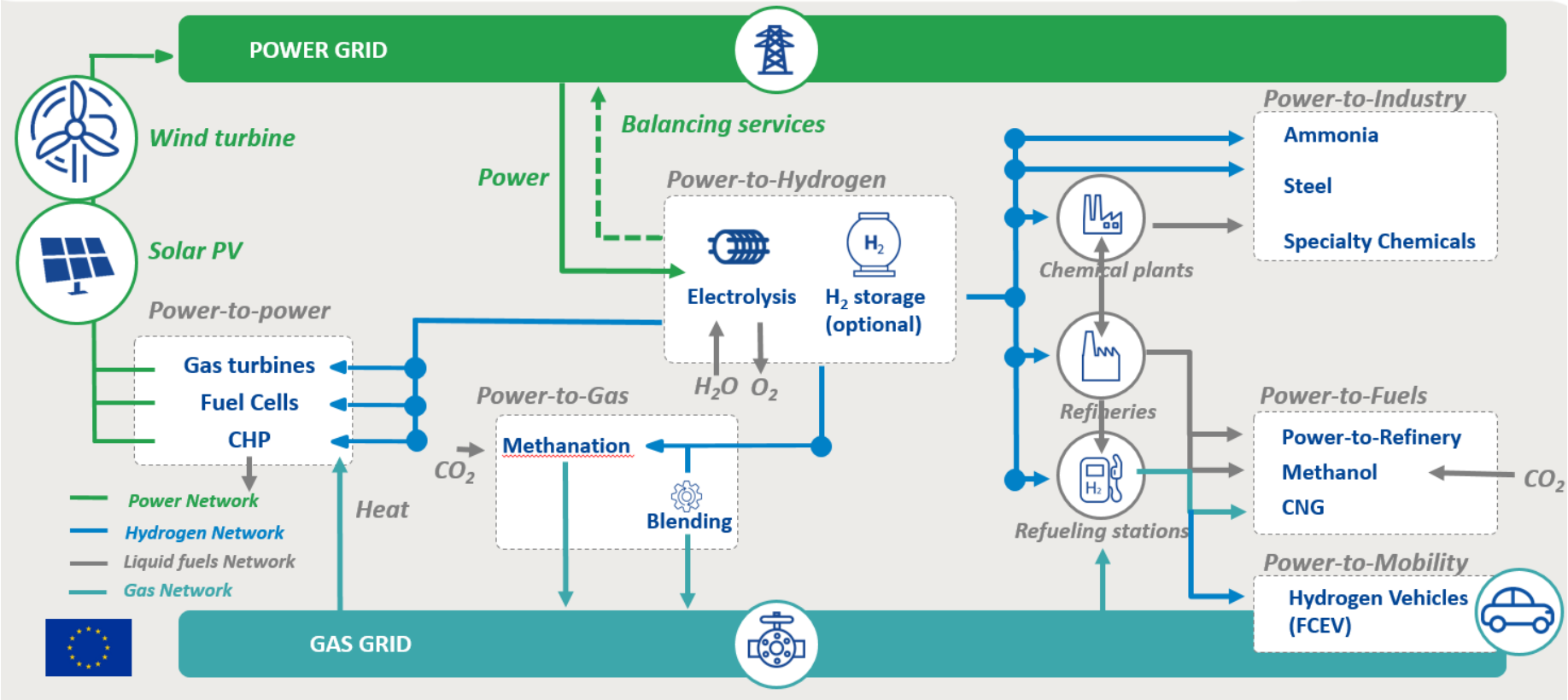
The Strategy for long-term EU GHG emissions reductions:

- The Council and the EP invited the EC to develop a Strategy for long-term EU GHG emissions reductions, in the context of the Paris agreement

Renewables in the EU – progress per sector towards 2020



Integrating various economic sectors

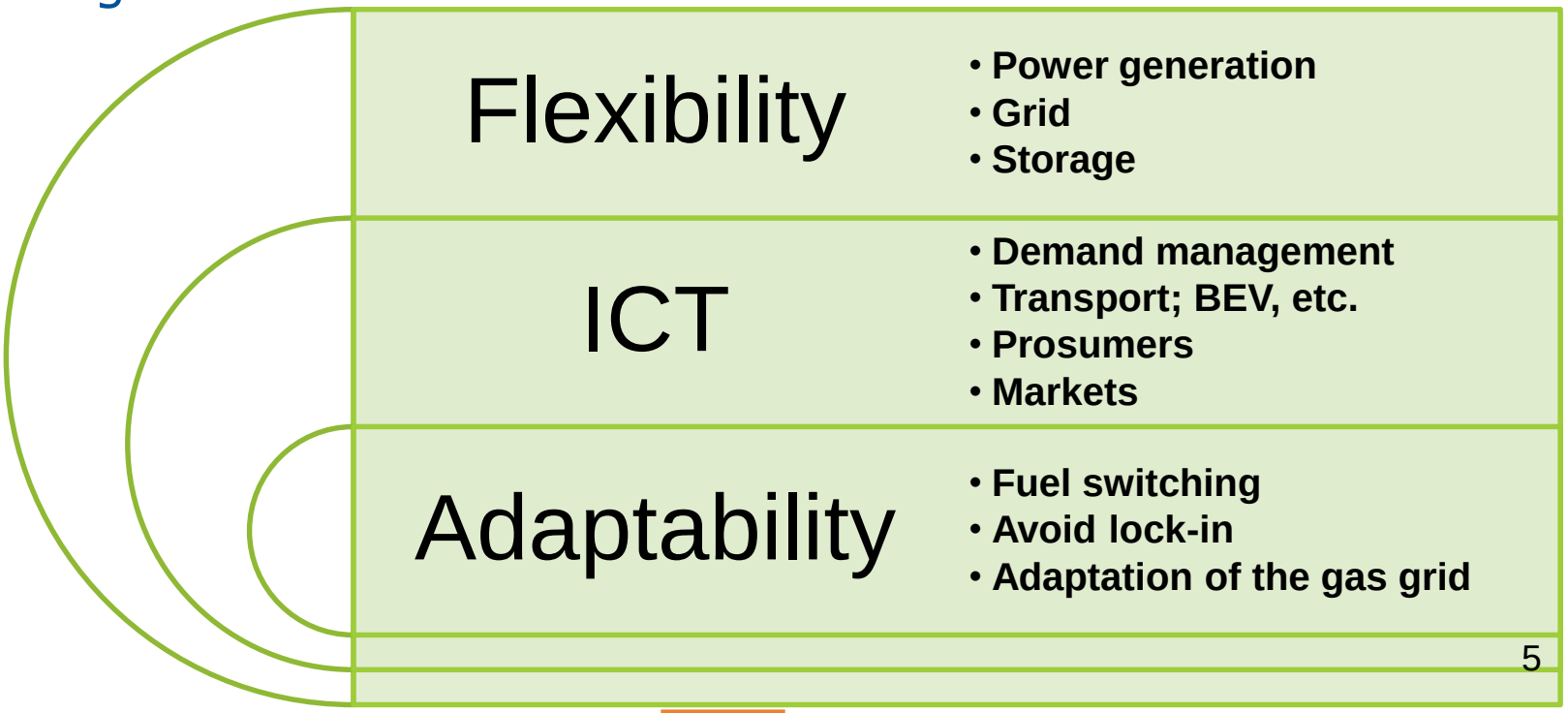


Source: Fuel Cells and Hydrogen Joint Undertaking

A flexible and adaptive energy system

Smart Energy System

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



RED revision

- 27% (**32%** agreed in trilogues) 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**
- **Thermal storage**: DSO's and DH operators to assess annually the potential of thermal storage (district heating/cooling)
  - To assess if more **resource- and cost-efficient** than alternative solutions

Electricity Market Design Directive - Storage

- **Storage definition**: 'energy storage' means, in the electricity system, deferring an amount of the electricity that was generated to the moment of use, either as final energy or converted into another energy carrier.
- **Cross-border** flows… including for energy storage
- **Services** to be procured by DSO's… including storage
- **Standardised market products** to be defined by DSO's
  - Such services to be **included in DSO's cost base**
- **Network planning** by DSO's and TSO's... including energy storage
- **Ownership of storage** by TSO's and DSO's excluded, with some exceptions
- **Access**: Regulatory authorities to facilitate storage access, TSO's to allow non-discriminatory connection of new power plants and energy storage.

Electricity Market Design Regulation – Storage (1/2)

- **Balancing**: All market participants shall aim for system balance
  - Financial responsibility
- **Day-ahead and intraday**: the imbalance settlement **15 minutes** and bid size **not above 1 MW**
- **Price caps**: **No maximum** (or <value of lost load), **no minimum** (or minus 2000 €)
- **Priority dispatching**: **Only** for small RE generators and high-eff. CHP & "old" RE & CHP assets.
- **Curtailment or redispatching:** when **economically efficient** and does **not exceed 5 %**
- **Bidding zone:** shall be based on long-term, structural congestions

Electricity Market Design Regulation – Storage (2/2)

- **Network congestion:** to be addressed with non-discriminatory market-based solutions
- **Grid fees:** To reflect **actual costs; non-discriminatory** (incl. energy storage), not distance-related, customer profile could impact the fees (incl. storage), procured storage services would be included in the system operators cost base, recommendation on the structure of fees by ACER.
- **Regional TSO cooperation**: by performing functions of regional relevance.
- The "**EU DSO entity**": (a) coordinate operation and planning of T&D networks; (b) integration of renewable energy resources, distributed generation …energy storage; ...
- **Network codes:** The Commission may adopt delegated acts, such as network codes on the basis of text proposals developed by the ENTSO for Electricity, or, by the EU DSO entity and ACER.

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

Hydrogen roadmap to 2050: Technological and market developments

- Linking the power and mobility sector & Usage of H2 in transportation
- Linking the power sector and H2-demanding industry
- Linking the power sector with transport and heating sectors
- Energy storage, integration of RES and sectorial integration
- Analysis by country

Modelling the impact of sectoral integration

- We analyse the following three scenarios:
  - H2 as a carrier
  - H2 as feedstock
  - H2 for power storage
- and a
- Balanced realistic scenario
- The new assumptions add to a basic decarbonisation scenario (EUCO)

PRIMES modeling

- Full projections for each EU MS up to 2050
- Impacts on the EU energy system including costs and infrastructure investment
- Modeling market equilibrium with complete integration of demand and supply
- Explicit policy and technological drivers

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
- ¾ of total directly used in final consumption and ¼ of total as a feedstock to produce clean methane (CH4)

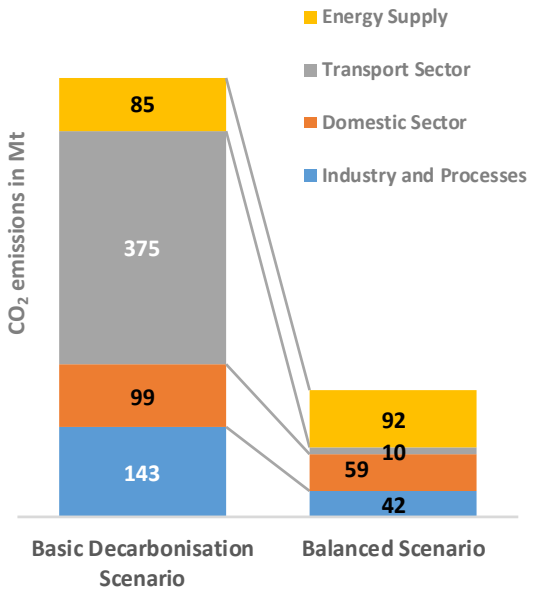
Rest of Options

- 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

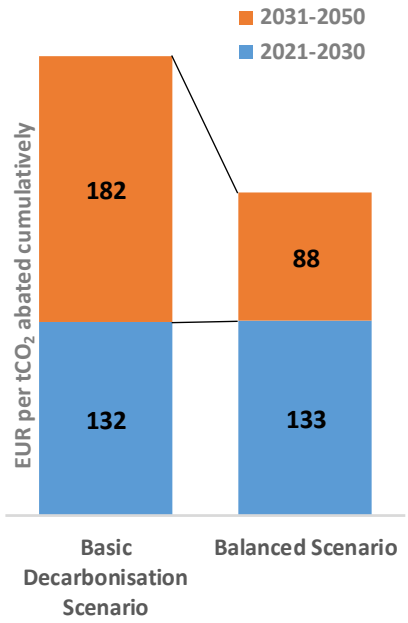
First study on Sectoral Integration at EU level – ASSET - preliminary evaluations (2) -

Emissions and costs in the Balanced Scenario

PRIMES projections



Remaining CO_2 Emissions in 2050



Average unit cost of emissions reduction

- 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

Studies by the EC

1. Study on the role of trans-European gas infrastructure 2050

Objective: assess the role of TEN-E gas infrastructure in the light of the EU's long-term decarbonisation commitments, based on three storylines:

- strong **electrification**
- a coordinated role of the gas and electricity infrastructures with a focus on **carbon-neutral methane**
- a coordinated role of the gas and electricity infrastructures with a focus on **hydrogen**

2. Study on sector coupling

Objective: identify barriers which might limit the potential for sector coupling to contribute to cost-effective decarbonisation in the EU

- discuss the possible **role of gas** to contribute to decarbonisation (system flexibility, seasonal storage, cost-efficient transportation of energy, etc.).
- help policy makers establish a suitable **regulatory framework**

Research on energy storage

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.

On batteries:

» At least EUR 100 million committed by ENER for battery technologies or battery integration under H2020 until the end of last year.
» EUR 114 million for battery-related topics under Horizon 2020 call opening on 24/1/2019 + EUR 70 million in 2020.

Other H2020 calls under Energy Work Programme

» Using power-to-gas concepts to solve the variability problem of RES (e.g. Store&GO)
» Conversion of captured CO2 using hydrogen made from renewable energy
» Flexible operation of fossil fuel power plants through power-to-X-to-power
» Coupling of hydrogen production and CCS, possibly using common infrastructure
» Flexibility measures and electricity grid services provided by power to-X

European Battery Alliance (EBA)

- Launched in **October 2017**, the EBA gathers the EC, interested EU countries, the EIB and over 260 industrial and innovation stakeholders

- Main outcomes:
  - Strategic Action Plan for Batteries adopted in **May 2018**
  - industrial investments announced in the area of battery materials and battery cells

- Key actions of the **strategic action plan**:
  - **Regulatory framework** (work on Eco-design regulation to set the performance and sustainability criteria to be met)
  - **Raw materials**: High Level Conference on Raw Materials in Brussels on 14/11
  - **Interregional Partnership on Batteries**
  - **Research**
  - **Skills**

- In addition, DG ENER, together with other DGs, is currently setting up **Batteries Innovation Platform** that will cover R&I across the entire battery value and will be driven by the industry.

Energy markets and Storage
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)

European Commission

Thank You for Your Attention!

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