El papel del gas en la descarbonización del sistema energético de la UE

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EU member states; achievement of RES targets, 2020

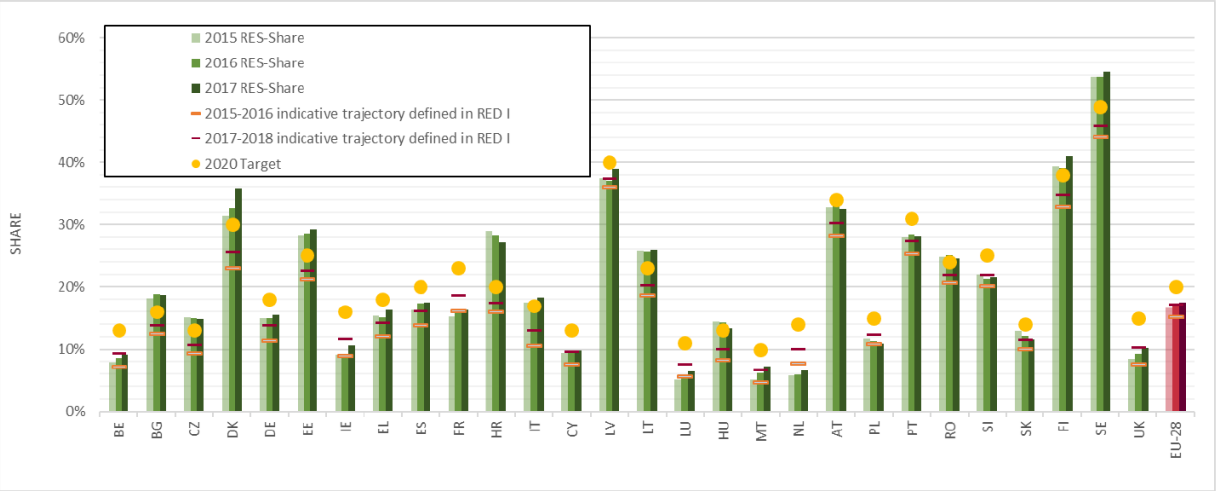
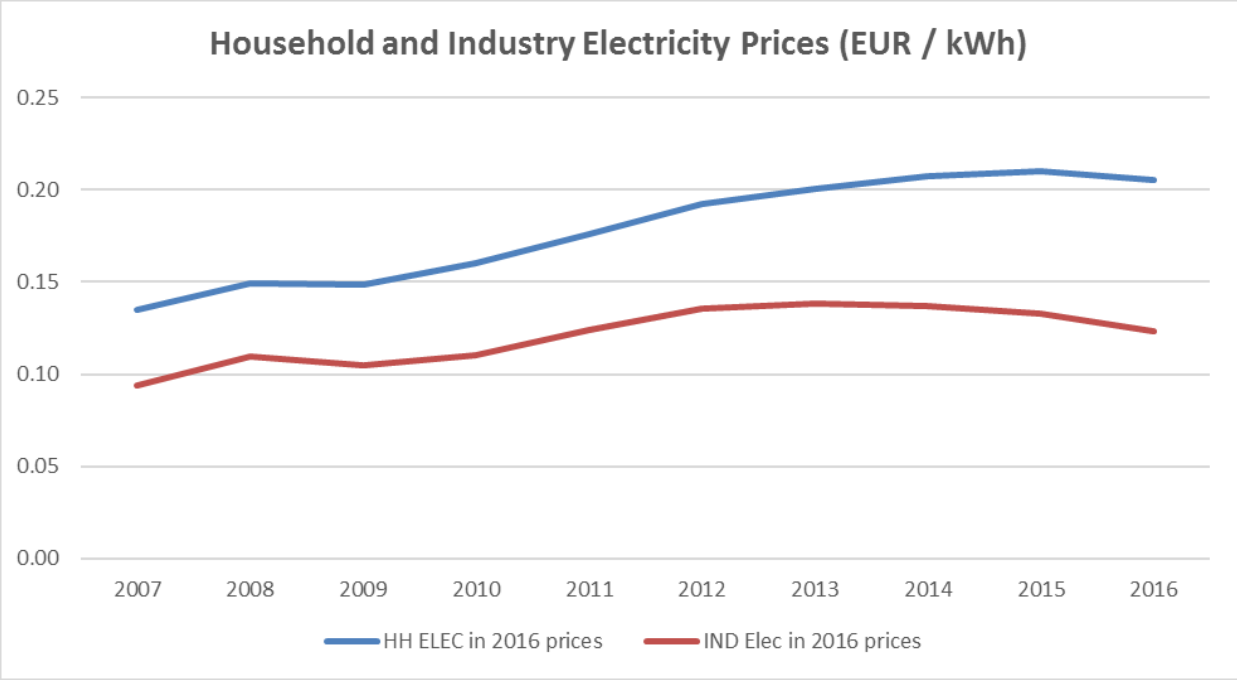
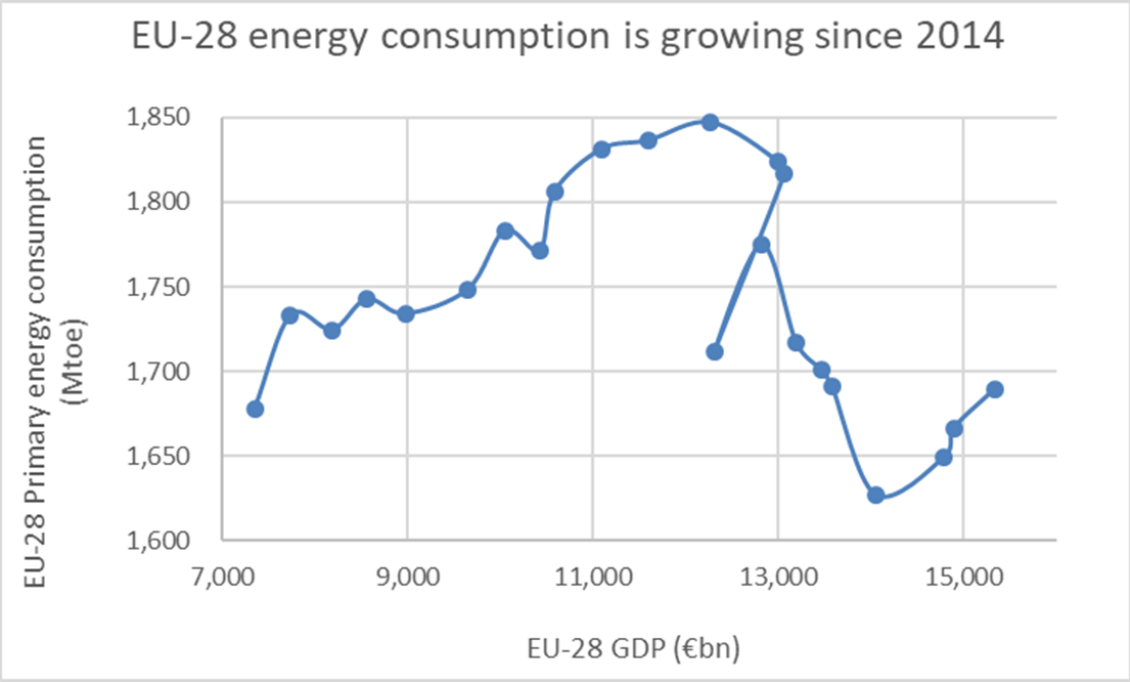


Figure 2: *EU and Member States renewable energy shares in gross final energy consumption 2015-17 vs. trajectories set in* RED I *(source: Eurostat)*

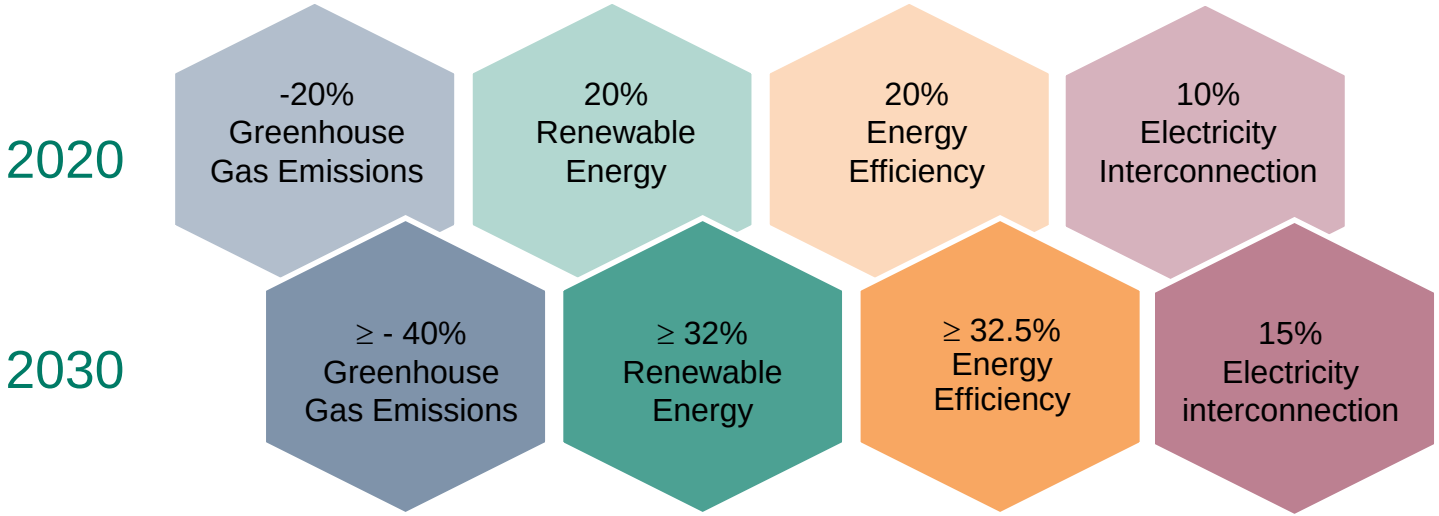
Household and industry electricity prices



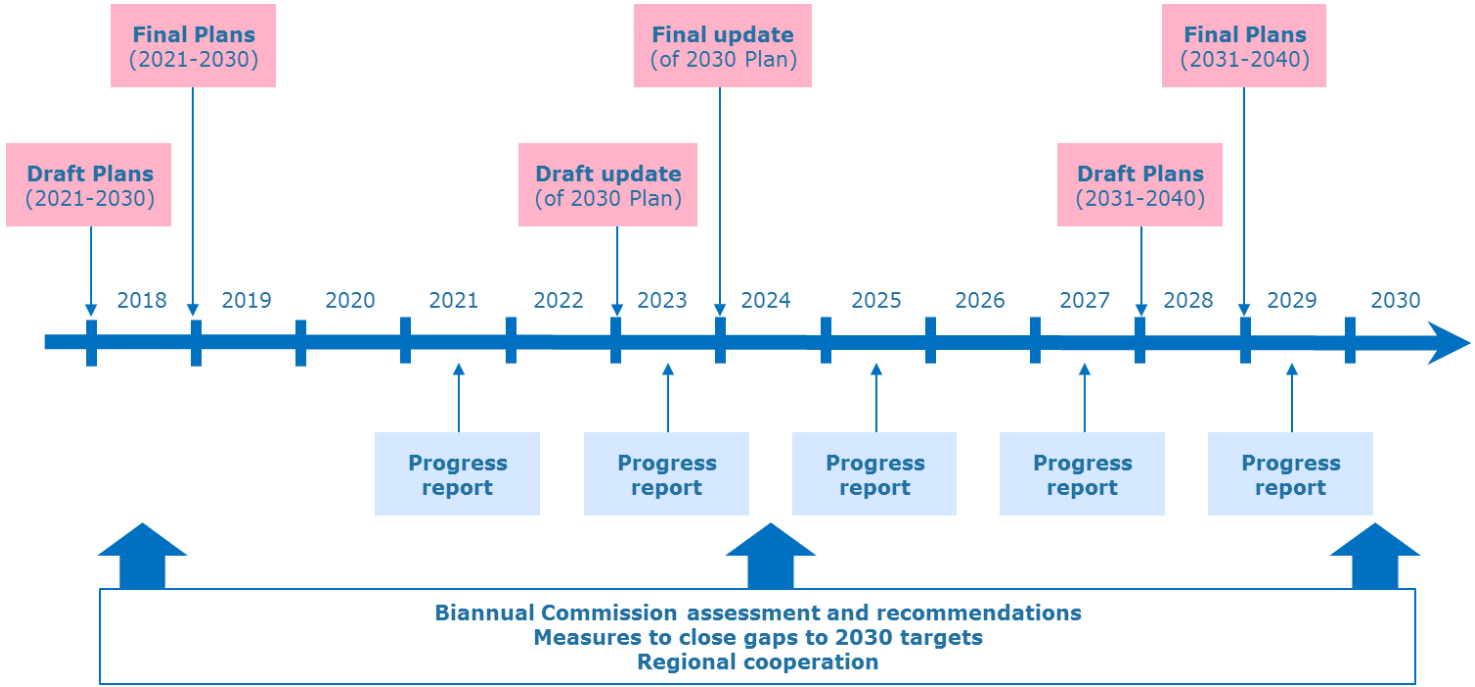
EU energy intensity



The clean energy package: updated 2030 targets



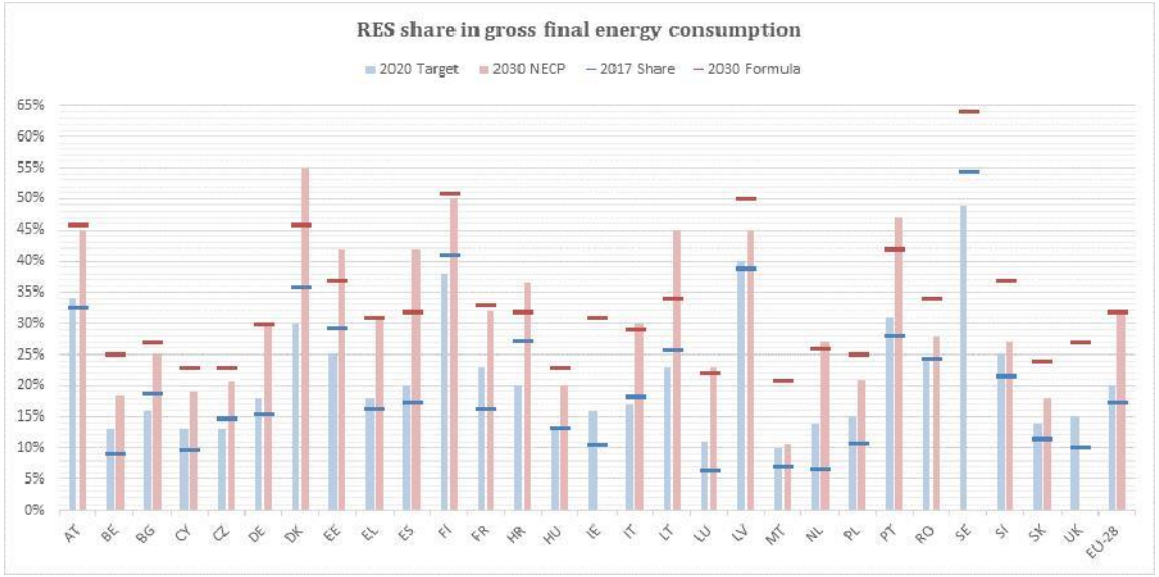
The clean energy package: governance timeline



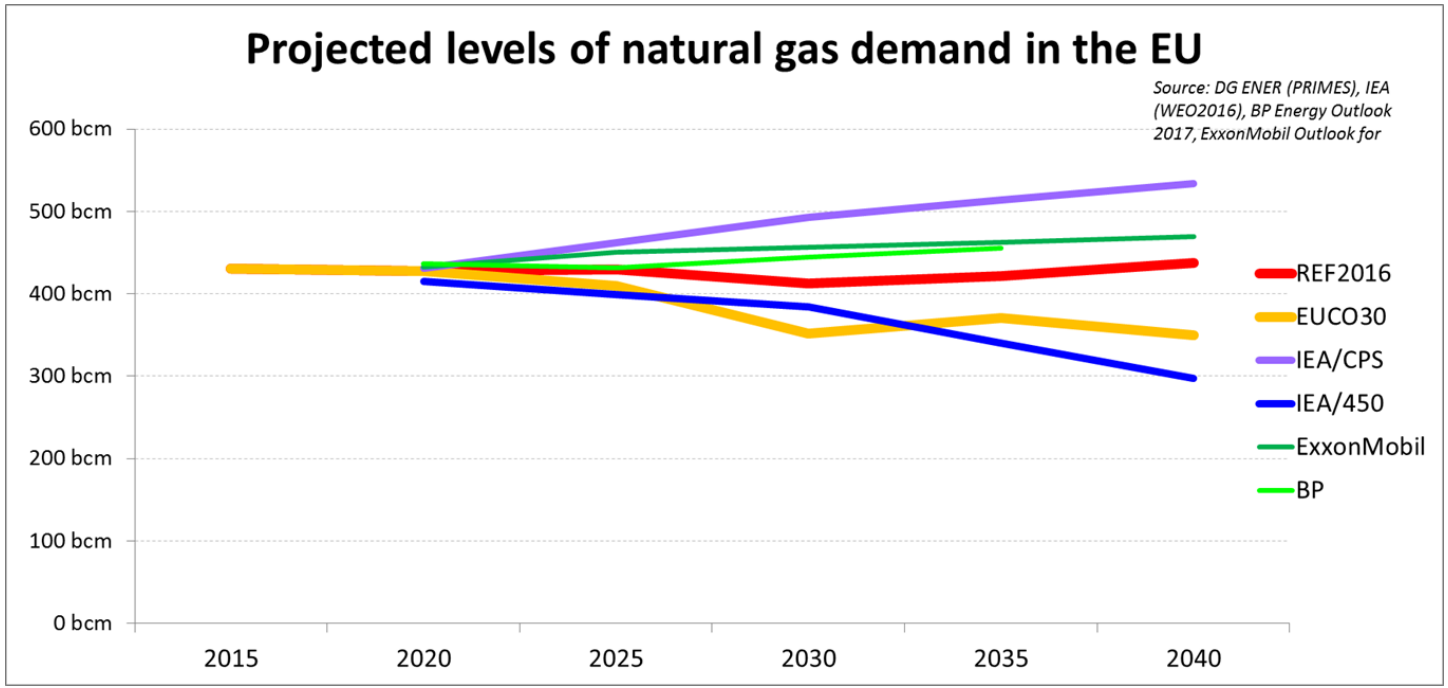
National climate and energy action plans

Member State	2020 res Target	2107 RES level achieved	2030 Res target proposed by Member State in draft NECP	2030 'Fair Share' according to Annex II of the Governance Regulation,	2030 Renewable Electricity Target proposed by Member State	2030 Energy Efficiency Target proposed by Member State
Austria	34%	32.6%	45-50%	46%	100%	25-30%
Belgium	13%	9.1%	25%	25%	Federal: 40.4% Flanders: x Wallonia: 23.5%	Federal: (12%-17%) - (22%-26%) Flanders: x Wallonia: 23%
Denmark	30%	35.8%	55%	46%	Expected above 100%	x
France	23%	16.3%	32%	33%	40%	16.1%
Germany	18%	15.5%	30%	30%	65%	32.2%
Hungary	13%	13.3%	20%	23%	19.1%	8-10%
Italy	17%	18.3%	30%	29%	55.4%	-43% consumption of primary energy as compared to 2007 PRIMES scenario
Netherlands	14%	6.6%	27-35%	26%	~ 66%	28%
Poland	15%	10.9%	21%	25%	29.5%	23%
Portugal	31%	28.1%	47%	42%	80%	35%
Spain	20%	17.5%	42%	32%	74%	39.6%
Sweden	49%	54.5%	65%	64%	85%	x

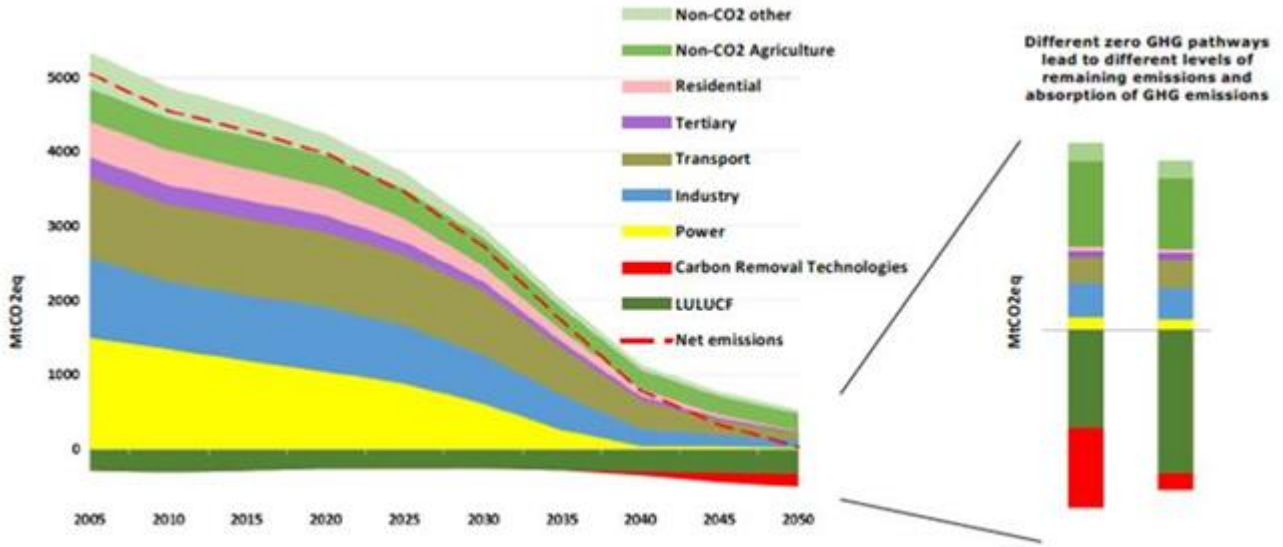
European commission assessment NECPs regarding RES commitments, 18 June 2019



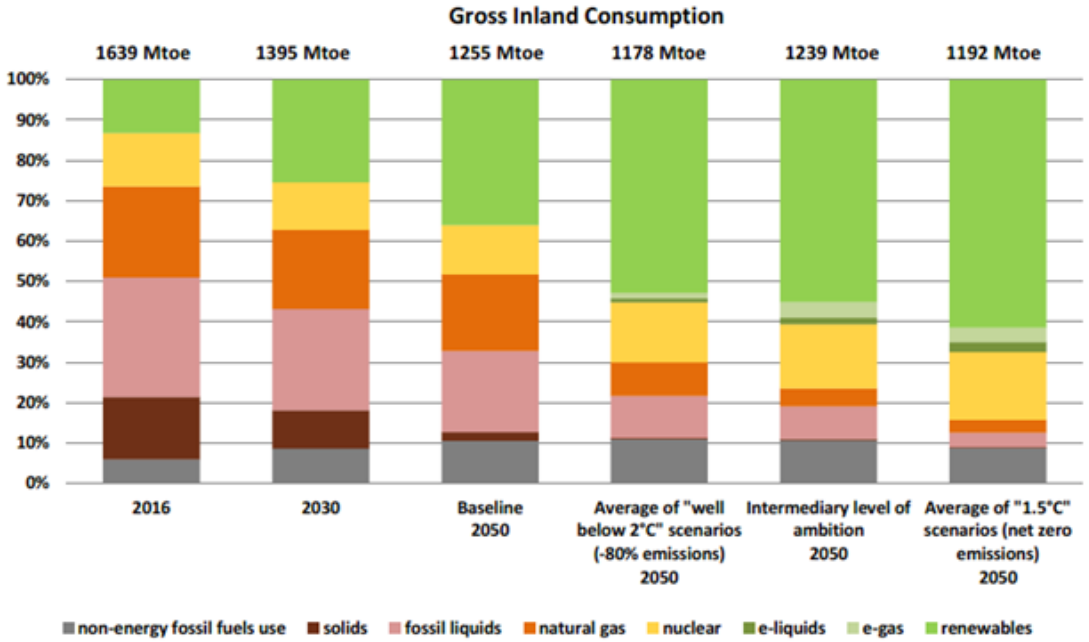
Scenarios for EU gas demand



2050 vision paper; 1.5 degree Paris scenario



2050 vision paper; energy sources, alternative scenarios



Selected member states' positions on natural gas demand contained in draft national energy and climate plans

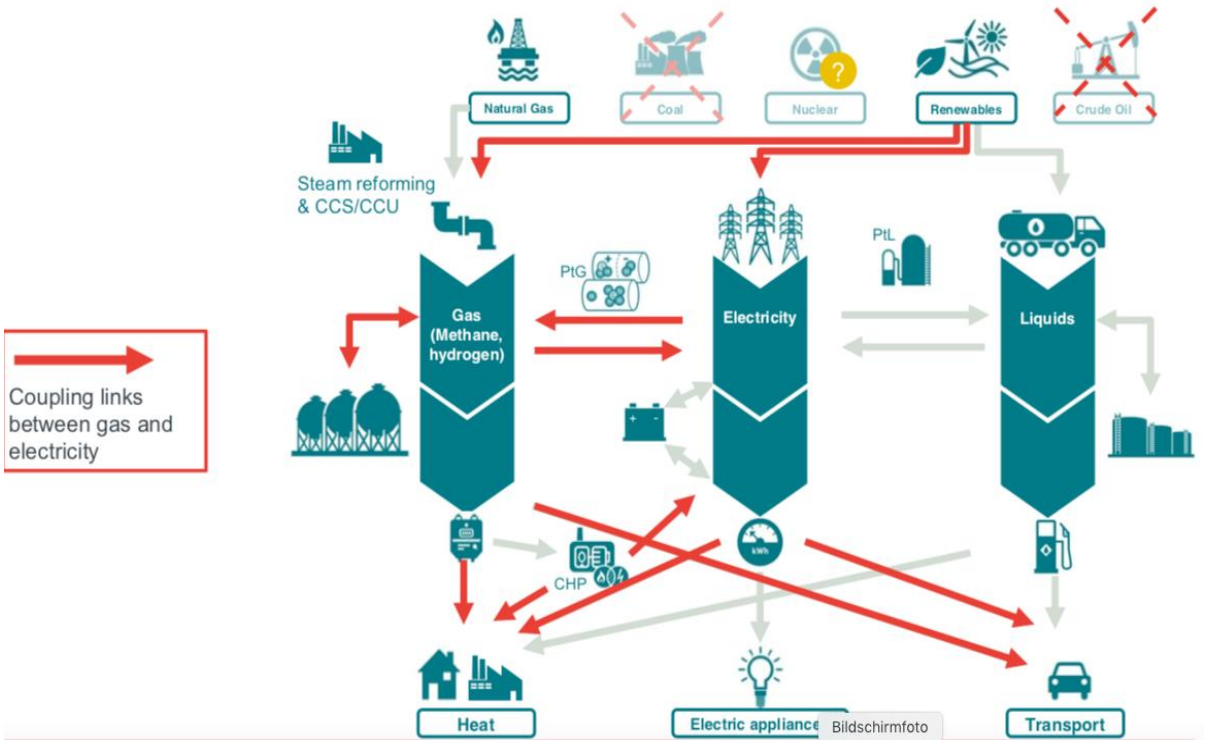
- France envisions that demand for gas will be reduced by 5.5% by 2023 and by 17% by 2028, due largely to improvements in energy efficiency in buildings (yet, it expects the use of gas in electricity production to be reduced by only 5% by 2030);
- Given the nuclear phase out it has planned, Germany expects the share of gas in electricity production to increase to 13.2% by 2030 and to 20.5% by 2040;
- Belgium has a very positive outlook regarding the future use of gas as it withdraws from nuclear, expecting that gas will supply 23.5% of its energy requirements by 2020 and 35.9% by 2030;
- Hungary also expects gas demand to remain robust, and whilst it has only carried out limited analyses, further expects demand to increase slightly by 2030;
- Poland has a limited RES ambition and appears to recognise that coal will need to be (very slowly) phased out. These factors, combined with the fact that it intends to replace solid fuel boilers by heating with gas, leads Poland to consider that gas demand will increase by 40% compared to 2015;

Italy is positive regarding the future role of gas, but expects that it will decrease to 54.4 bcm by 2030 (with Italian demand in 2016 was at 70.88).

Joining forces to achieve decarbonisation

- Sector coupling implies a hybrid 'high electricity/low-carbon gas' model.
  - Building on the strengths of both systems.
- Decarbonisation of the gas networks is possible.
- To minimise cost of decarbonisation a flexible but inter-related approach to allow cooperation is needed.
  - Different approaches, however, may exist at the same time.
- Approaches may evolve and change over time.
  - It has to be possible to become smarter!
- In general the energy mix is a national decision.
  - Based on preferences as well as opportunities and challenges, as e.g., geological formation, biomethane potentials, access to the sea, etc.
- The achievements and benefits of the Internal Energy Market should be retained.
  - New TSO services, as physical gas quality services, could ensure a common gas market.

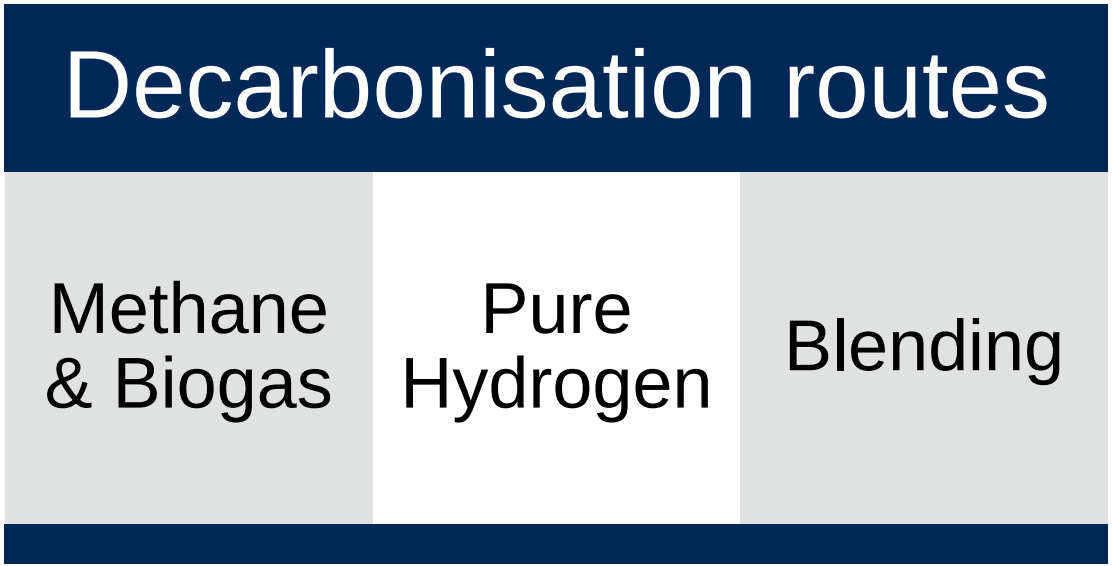
Hybrid renewable electricity/clean gas model



Source: Frontier Economics 2019, presented at 32. Madrid Forum, https://ec.europa.eu/info/sites/info/files/frontier_-_potentials_of_sector_coupling_for_decarbonisation.pdf

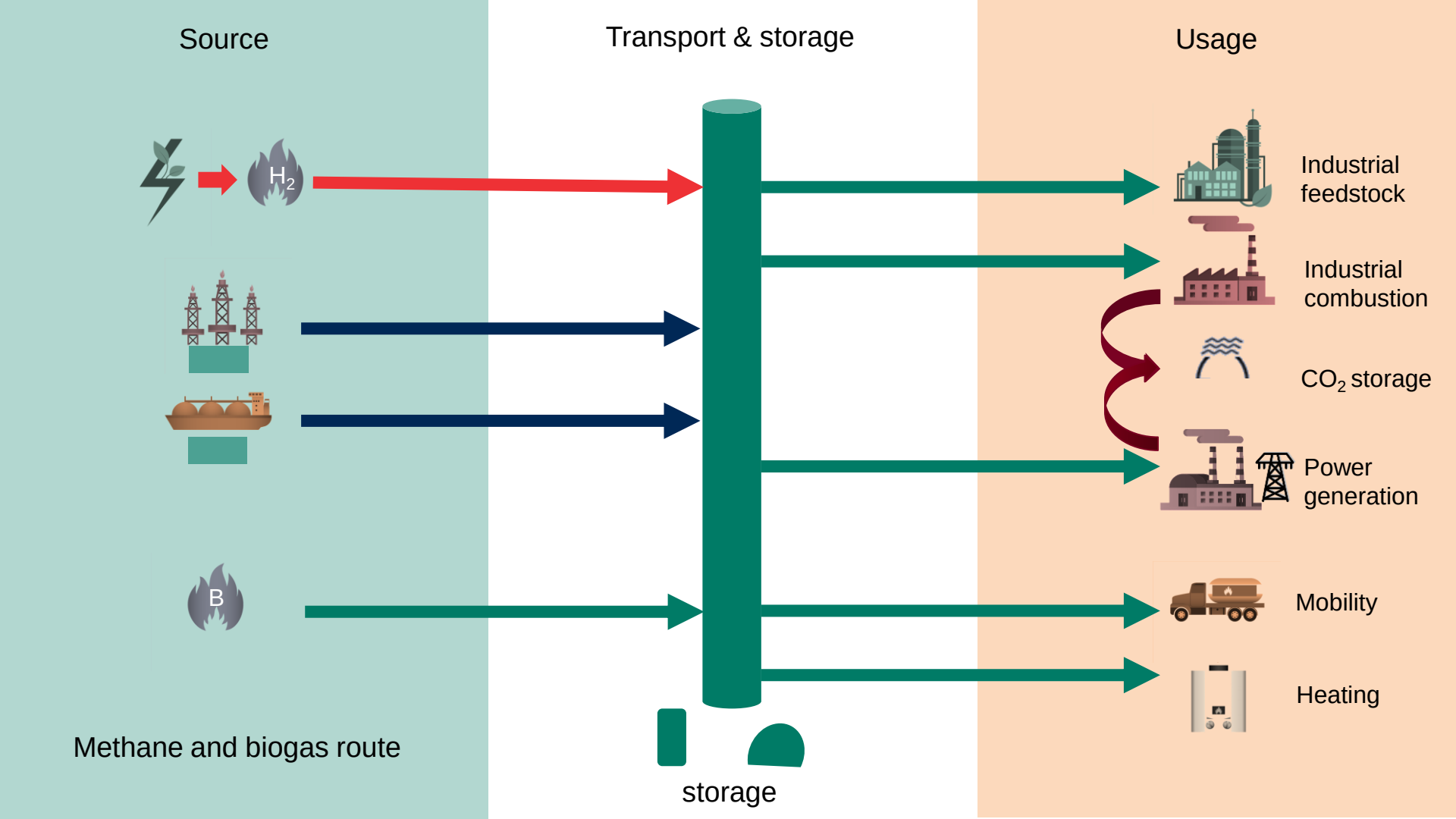
The three different possible routes to a decarbonised economy

- Decarbonisation needs to take place in all three routes.



Methane and biogas route (1/3)

- Based on the usage of natural gas (plus CCS) and a growing share of biogas displacing natural gas.
- Decarbonisation would be reached by
  1. Injecting (more) biogas into the network,
  2. Adding synthetic methane from renewable electricity
  3. Carbon capture and storage at the (largest) points of combustion.
- New Renewable Energy Directive obligations would be fulfilled.
- This is probably the easiest route.
  - least changes in existing market structures and gas infrastructure required.
  - In general, the chemical composition of methane would stay the same as today.
  - No system risks and no need to change existing end consumer installations and appliances.
- Binding targets or a European-wide certificate scheme to increase biogas generation appropriate.
  - A Guarantee of Origin scheme would need to be at least EU-wide recognised and trustworthy.

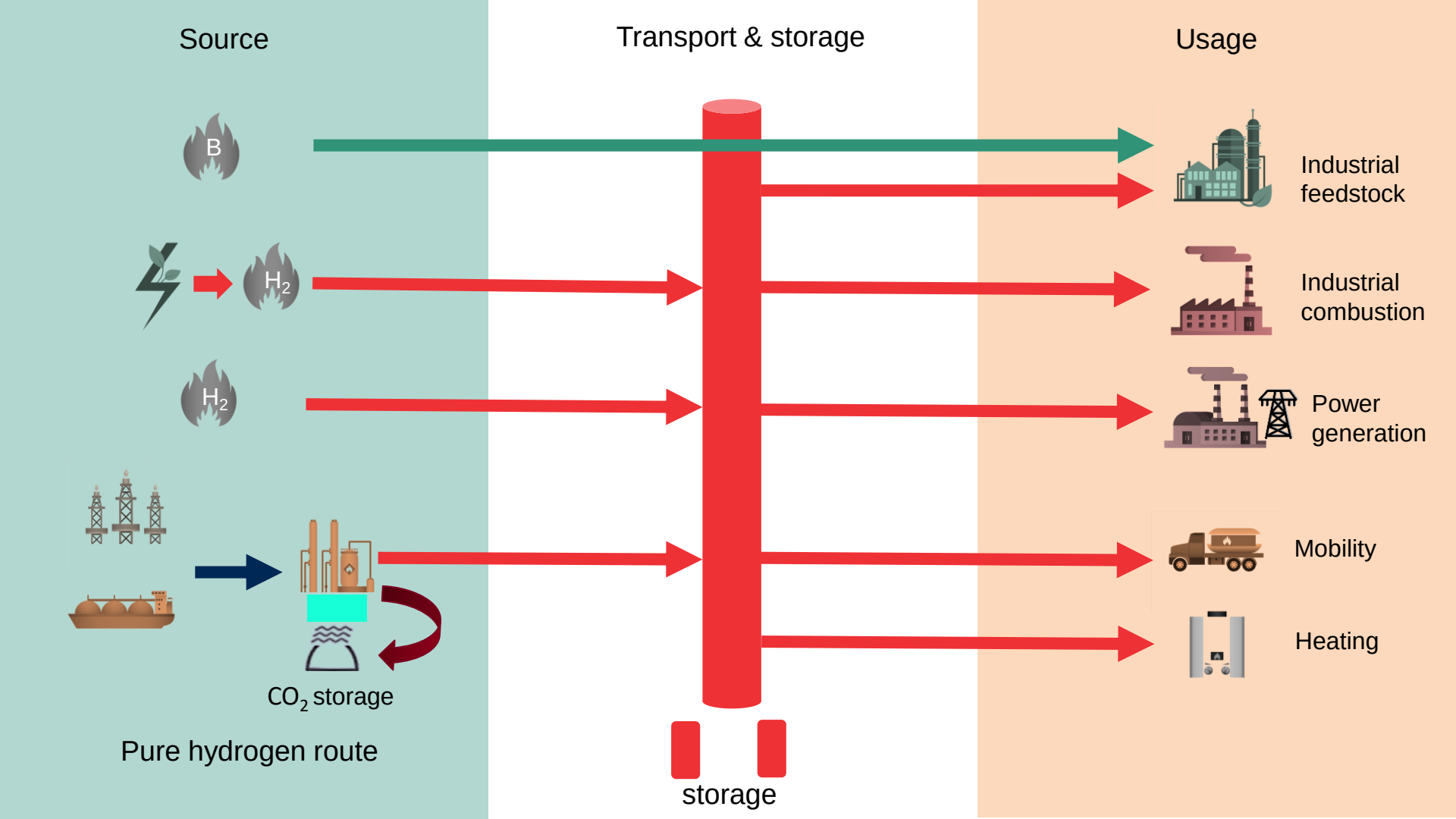

Source
Transport & storage
Usage
H_2
B
Industrial feedstock
Industrial combustion
CO_2 storage
Power generation
Mobility
Heating
storage
Methane and biogas route

Methane and biogas route (3/3)

- Biogas should be traded on the Internal Energy Market across borders in general.
- Cost sharing mechanisms as well as financial support schemes would be needed.
- The use of biomethane for electricity production in CCGT or OCGT facilities, together with CCS technologies, can even count as negative emissions.
  - This allows for balancing of e.g., household level emissions by negative emissions at industrial or generation level with at point of combustion CCS.
  - To improve the public perception it will be necessary to establish a European and fully transparent carbon (and probably also methane) emission monitoring, management and accounting system.
- Public perception of CCS would need to improve.
  - A European and fully transparent carbon (and probably also methane) emission monitoring, management and accounting system needed.

Pure hydrogen route (1/3)

- Hydrogen islands would be established, which could eventually be connected in case of sufficient market interest and cost reduction.
- The existing gas networks would step by step be repurposed to transport 100% hydrogen.
- Sufficient end-user technologies capable of 100% hydrogen are required.
  - In quantities, i.e., for household customers.
- The hydrogen will be produced through a diverse range of sources, routes as well as centralised and decentralised, including:
  - from natural gas or LNG using pyrolysis and/or steam reforming with CCS;
  - within EU borders or in gas producing countries
  - from renewable electricity using electrolysis (Power-to-Gas); or imported hydrogen.

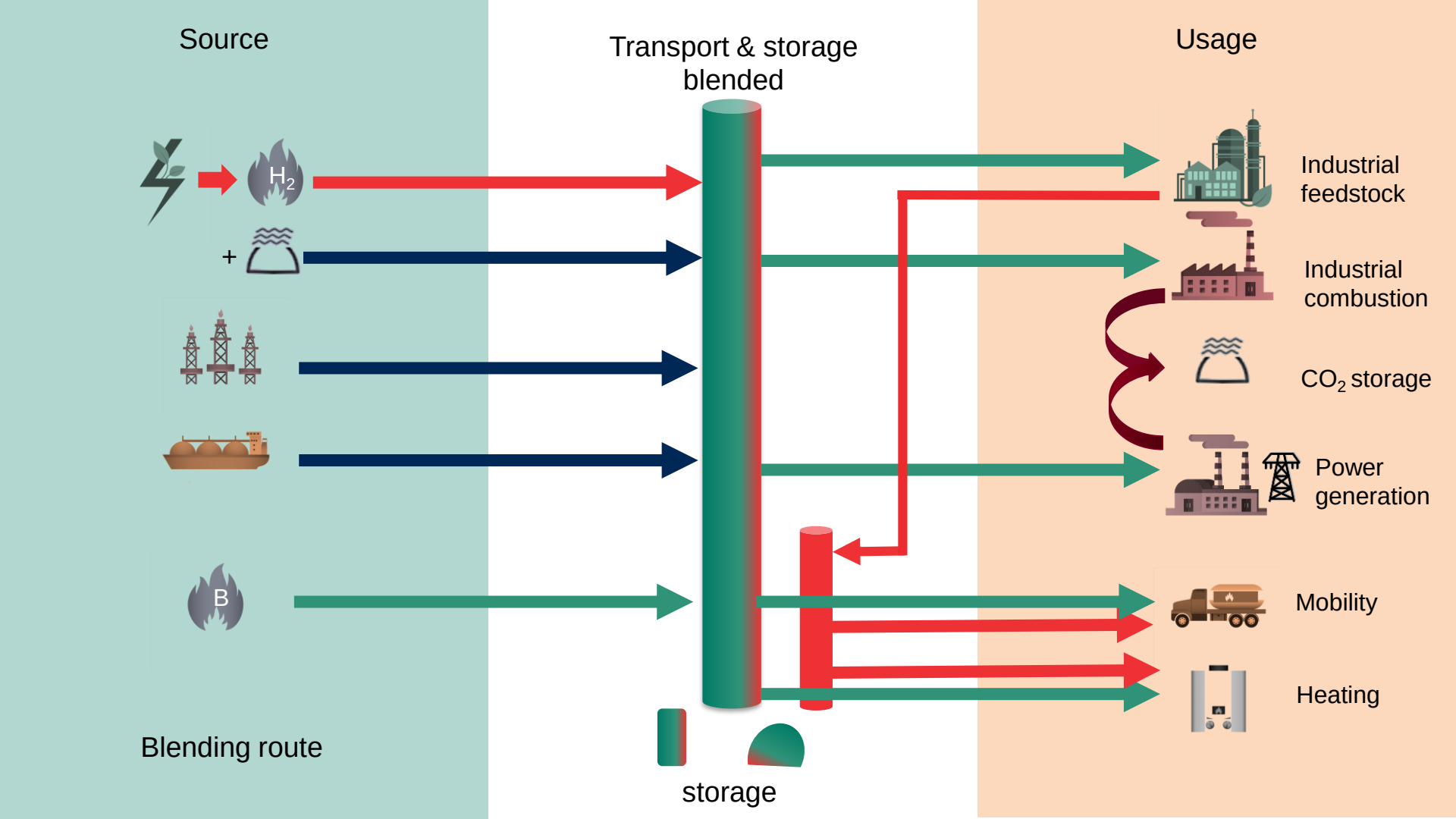

Source
Transport & storage
Usage
B
H_2
H_2
CO_2 storage
Pure hydrogen route
storage
Industrial feedstock
Industrial combustion
Power generation
Mobility
Heating

Pure hydrogen route (3/3)

- System operator perspective:
  - Fuel switch implies significant efforts during a (short) transition period.
  - However, minor changes in daily operation.
  - Further research regarding safety measures and technological challenges needed.
- Regulatory perspective:
  - The transport of hydrogen in dedicated networks forms an essential service which needs to be regulated.
  - Non-discriminatory third-party access to support and further develop the Internal European Energy Market will be necessary.
  - A regulatory framework either by including in the natural gas regulatory framework, or a dedicated regulatory framework in close alignment to natural gas regulation needed.
  - (Gases) Sector coupling rules needed.
- Consumer perspective:
  - The costs and risks on the consumer side are significant due to need for changes in appliances.
  - Hydrogen is currently and is expected to be in the foreseeable future, significantly more expensive than natural gas.
- Decarbonisation perspective:
  - Zero carbon emissions on the consumer side simplifies carbon accounting significantly.

Blending of methane, biogas and hydrogen route (1/3)

- Different gas sources possible:
  - Biogas, regionally produced or imported,
  - renewable gas from renewable electricity (P2G),
  - decarbonised natural gas (in combination with CCS), as well as
  - hydrogen.
- System operators take care of gas quality management of the different injected sources/qualities.
- A continuous further decarbonisation with decreasing shares of untreated natural gas (or gas without CCS) would lead to further decarbonisation.
- From a strategic point of view, blending seems to be the most appealing due to the highest level of flexibility regarding
  - the source of energy in the network and its shares,
  - availability of user appliances and
  - builds on already available technologies.


Source
Transport & storage
blended
Usage
H_2
+
B
Industrial
feedstock
Industrial
combustion
CO_2 storage
Power
generation
Mobility
Heating
Blending route
storage

Blending of methane, biogas and hydrogen route (3/3)

- However, different hydrogen thresholds of end-use applications may create operational challenges for system operators.
  - Sensitive industrial customers may be unable to tolerate higher concentrations of hydrogen today.
- Pure hydrogen would be predominately used for industrial appliances, in the form of hydrogen islands.
- Biogas for the end consumer appliances.
- A combination with CCS and a carbon management system would support this approach.
- This route implies trading energy content in a virtual/blended energy product in kWh.
- To retain Internal Energy Market the management of different gases would cost money.
  - Processes as well as cost sharing rules needed.

Decarbonising EU gas market is possible

- Decarbonisation of the economy is the greatest energy challenge up to 2050.
  - The good news are that gas can contribute significantly.
- The new EU Commission will push for even more ambitious goals.
  - Energy demand is forecast to increase at the same time.
  - Demand for natural gas is expected to be robust for at least another 20 years.
  - And will remain important for decades in case of hydrogen or other decarbonised gases.
- Overall efficiency, cost efficiency as well as energy conversion efficiency improvements will materialise, if we establish/achieve
  - Technology neutrality,
  - further R&D work,
  - improved network development planning,
  - (cross-border) knowledge sharing, and due to
  - the economics of scale principle.

The future sustainable gas sector

- Unclear how exactly a decarbonised energy system will look like in 2050.
- Policy and regulatory framework which allows decarbonisation to happen needed.
- Recent developments and announcements at EU level further underline the strong push towards decarbonisation of the EU energy sector.
- Klaus-Dieter Borchardt, Deputy Director-General for Energy European Commission, emphasized that "there is no alternative to natural gas in the coming 10, 15 years (…) and in the long run "green gas" and green hydrogen will play an important role" furthermore, he has argued that electrification alone cannot achieve the climate targets.
- The future should be based on an efficient multi-gas system, both flexible and affordable, to enable a meaningful and significant role for gas in a decarbonised economy and retain the value of the gas transmission and distribution system for the end customer.

Decarbonised gases will be part of the future energy system

- To satisfy the energy appetite (molecules and electrons) of the economy and society;
- To offer the needed flexibility for periods where there is not enough wind or sun available (storage of RES energy);
- To transport the needed quantities of energy to where it is needed (even over long distances);
- To ensure the security of supply of energy;
- To minimise the cost of decarbonisation as far as possible;
- To avoid significant stranded assets from gas infrastructure as well as major disruptions on labour markets.

Employing advantages of existing assets

- The existing gas infrastructure offers major advantages as significant capacities connecting already today
  - industrial and other business areas as well as
  - neighbourhoods.
- The gas infrastructure can easily be repurposed to transport other gases than today, namely fully decarbonised gases as e.g., hydrogen.
- It is possible to store energy in gas infrastructure not only for minutes but also for months, i.e., seasonal storage of energy.
- The gas infrastructure offers flexibility for the whole energy system.
- However, to have the infrastructure available in 2050 it is necessary to keep the infrastructure up and running today,
  - i.e., to continue maintenance work and sustainable development.

Technology neutrality is key to a sustainable and efficient decarbonisation

- Therefore, the future energy market design:
  - should be the enabler of a path towards decarbonising gas and must at least not hinder or slow down the implementation of processes and targets decided by policymakers and legislators.
  - must support all possible decarbonisation pathways, especially the different implementation speeds chosen by the individual Member States.
  - needs to be flexible enough so it can be adapted to alternative or adjusted pathways if needed, as it can be expected that there might be different priorities.
  - must be able to allow different technological solutions as it is impossible to predict with certainty which technologies for decarbonization will be most cost-effective
  - must assure that the existing gas infrastructure is retained and expanded to meet the new demands, and, above all
  - must ensure the progressive development of a market-based system that ensures that RES electricity and decarbonised gas can compete on an level playing field.

Thank you!