Europe 2030, energy security, climate change mitigation and regional integration

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EU TOWARDS 2030…. AND BEYOND

Increasingly ambitious commitments for 2030 and aspirational goals for 2050, a clear indication that Europe has embarked on a clean energy transition based on energy efficiency and progressive decarbonisation of energy supply:

- *October 2014*: adoption by the European Council of the 2030 climate/energy framework which calls for 40% reduction in GHG emissions by 2030 (as committed under Paris Agreement and included in EU NDC), 27% share of renewable energy (RE) and 27% improvement in energy efficiency
- *February 2015*: the Energy Union strategy to align energy and climate policy. Five pillars (see next slide). Clean Energy Package (CE4ALL), proposed by EC in November 2016 and fully adopted in June 2019, to implement Energy Union. Targets for RE and EE increased respectively to 32% and 32.5%
- *November 2018*: in response to IPCC warning, EC Communication "A Clean Planet for All"– a vision for a climate-neutral Europe by 2050 and the analytical foundation for the long-term energy/climate strategy
- *Expected 11 December 2019*: EC Communication on the European Green Deal, expected to propose 50-55% GHG emission reduction by 2030

THE ENERGY UNION STRATEGY

AN INTEGRATED FRAMEWORK FOR EUROPEAN ENERGY AND CLIMATE POLICY

- Aims to make the use of energy more **secure**, affordable and **sustainable**
- Aligns and coordinates energy and climate policy (integrated perspective)
- Acknowledges the role of **regional market integration** to minimize the energy transition cost

1. **Security, solidarity and trust:** Diversifying Europe's sources of energy and ensuring energy security through solidarity and **cooperation** between EU countries
2. **Fully integrated internal energy market**: Enabling the free flow of energy through the EU thanks to adequate infrastructure and without technical or regulatory barriers
3. **Energy efficiency:** Improving energy efficiency to reduce dependence on energy imports, lower emissions, and drive jobs and growth
4. **Decarbonising the economy:** Complying with the EU commitment to a quick ratification of the Paris Agreement and to retaining its leadership in the area of renewable energy
5. **Research, innovation and competitiveness:** Supporting breakthroughs in low-carbon and clean energy technologies by prioritizing research and innovation to drive the energy transition and improve competitiveness.

CE4ALL-THE LEGAL/REGULATORY FRAMEWORK FOR EU CLIMATE AND ENERGY POLICY 2021-2030

- 8 legislative documents, covering energy performance in buildings, energy efficiency, renewable energy, electricity market design, security of supply and the governance structure of the Energy Union.
- A Gas Package in preparation? Regulation on Security of Gas Supply issued in 2017
- A single RE target at EU level. Strong emphasis on market integration, regional cooperation and coordination-- to reduce the cost of the energy transition and enhance security of supply– and an increased target for interconnectivity between MS
- Many cooperation mechanisms, between MS but also with third countries

Table 1 Adoption and Publication of the Clean Energy for all Europeans Package (1 July 2019).

	European Commission Proposal	European Parliament Adoption	Council Adoption	Official Journal Publication
Energy Performance in Buildings	30/11/2016	17/04/2018	14/05/2018	19/06/2018 - Directive (EU) 2018/844 https://bit.ly/2TVFS2T
Renewable Energy	30/11/2016	13/11/2018	04/12/2008	21/12/2018 - Directive (EU) 2018/2001 https://bit.ly/2CuqQuz
Energy Efficiency	30/11/2016	13/11/2018	04/12/2018	21/12/2018 - Directive (EU) 2018/2002 https://bit.ly/2QI5HpD
Governance	30/11/2016	13/11/2018	04/12/2018	21/12/2018 - Regulation (EU) 2018/1999 https://bit.ly/2EJDuZb
Electricity Regulation	30/11/2016	26/03/2019	22/05/2019	14/06/2019 – Regulation (EU) 2019/943 https://bit.ly/2LHgs83
Electricity Directive	30/11/2016	26/03/2019	22/05/2019	14/06/2019 – Directive (EU) 2019/944 https://bit.ly/2Lmk3sA
Risk Preparedness	30/11/2016	26/03/2019	22/05/2019	14/06/2019 – Regulation (EU) 2019/941 https://bit.ly/2Xof15o
Acer	30/11/2016	26/03/2019	22/05/2019	14/06/2019 – Regulation (EU) 2019/942 https://bit.ly/2Gcxl12

Source: EC 2019: https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union/clean-energy-all-europeans

More information in report « Clean Energy for All Europeans » Package: Implications and Opportunities for the Mediterranean.

Available on www.cmimarseille.org

COOPERATION MECHANISMS

WHAT IS THE REASON FOR USING COOPERATION MECHANISMS?

Challenge:

- Different support schemes create distortions in the functioning of the internal energy market (investment and dispatch decisions)
- A purely national approach does not allow cost-optimal deployment at EU level – 2030 target may not be reached cost effectively

RED II (Art. 5):

- MS may open part of newly-supported capacity to installations in other MS
- Installations in other MS shall be allowed to participate or be eligible
- Indicative shares 5% opened over 2021-2025, 10% over 2026-2030

Impact:

- Lower system costs of reaching the target
- Lower cost for consumers / taxpayers
- Gradual alignment of support schemes, based on best practices (at discretion of MS)
- Reduced distortions in the internal energy market

WHAT IS ENERGY SECURITY?

- A polyseme (a concept widely used, but no consensus on its meaning or precise definition)
- According to the IEA (which was created in 1974 to address the first serious security concerns following the first Arab oil embargo): the uninterrupted availability of energy sources at an affordable price, irrespective of economic or political instability
- This definition of long-term security of energy supply has increasingly been complemented recently, due to the rapidly increasing RE penetration, with concepts specific to the electricity system: power system reliability and grid stability
- Typical energy security indicators include:
  - Self sufficiency (or the opposite, degree of import dependency)-- overall and by fuel
  - Number of external suppliers, and market share of dominant supplier
  - Primary energy mix
  - Etc……

ENERGY SECURITY AND DECARBONIZATION

FRIENDS OR FOES?

- Paris Agreement and other climate commitments require massive RE scale-up and increased electrification
- RE are usually national energy sources, so increasing the RE share result in a higher level of self-sufficiency (=> good for energy security)
- However, production of Variable Renewable Energy (VRE) is difficult to control, more decentralized and not always available when needed=> threat to power system reliability and to energy security
- To cope with a high RE penetration, power systems need flexibility, and regional electricity market integration is a good way to deliver that flexibility without hurting the other objectives of security and affordability

POWER SYSTEM FLEXIBILITY

THE PROBLEM AND THE SOLUTIONS

Dispatchable power plants

Demand side Response

Energy storage facilities

Interconnection with adjacent markets

Gas-fired power plant

Industrial

residential

Pumped hydro facility

Scandinavian interconnections

Numerous definitions but flexibility can generally be defined as the ability of the power system to cope with sudden and unexpected changes in demand/supply

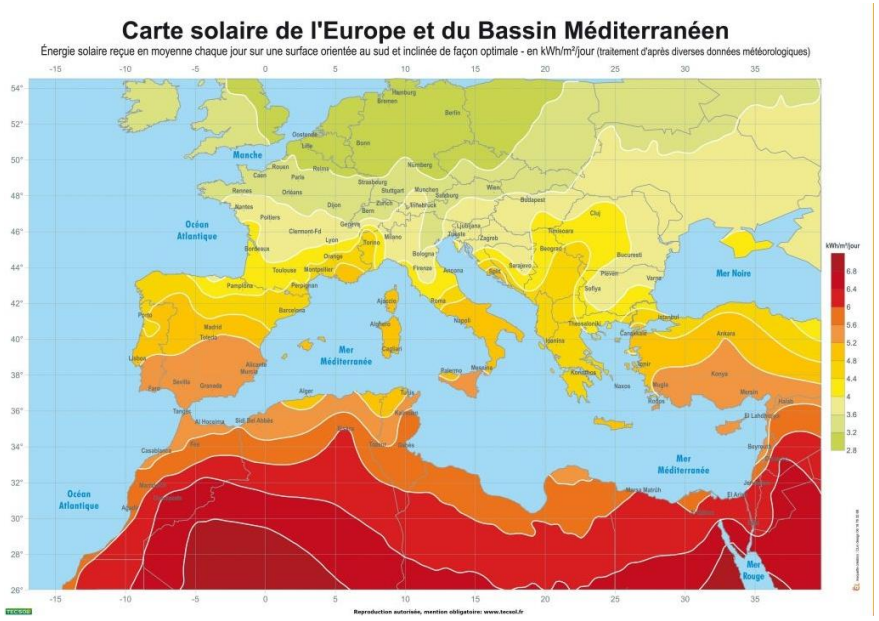
REGIONAL ENERGY MARKET INTEGRATION BENEFITS

INCLUDE ENHANCED ENERGY SECURITY AND RES SCALE-UP SUPPORT

- Enhanced energy security???? (depends on definition)
- Increased power system flexibility and reliability
- Smoothing of load duration curve
- Optimized use of infrastructure and more efficient dispatch of power plants=> lower cost of supply
- Economies-of-scale on generating plants serving multiple markets
- Reduced CO2 emissions

Might be the best solution to reconcile different objectives– for a secure low-carbon energy supply at least cost

BENEFITS PARTICULARLY SIGNIFICANT IN THE MEDITERRANEAN



Solar resources for more hours

Flattening of load curve because of differences in peak times

Diversified energy mix

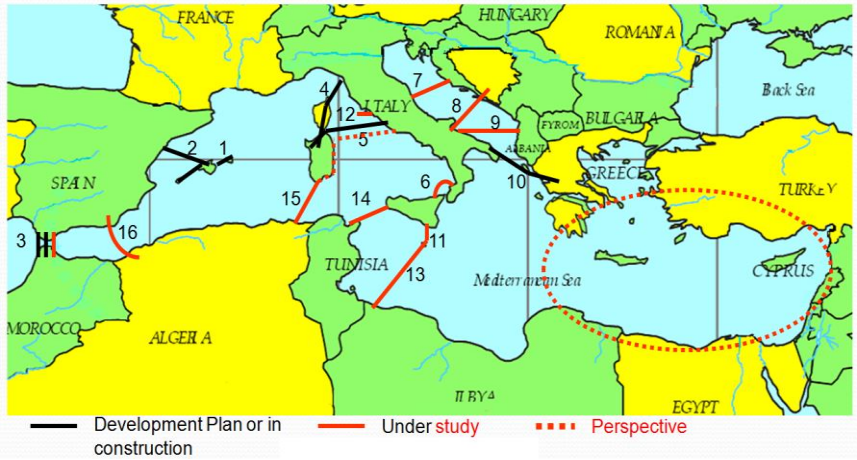
Reserve sharing for VRE back-up

Larger balancing areas

Access to cheaper RES for a rapidly expanding European market for decarbonated electricity

INTEGRATED EURO- MEDITERRANEAN MARKET REQUIRES INFRA AND COORDINATION OF SYSTEM/MARKET OPERATIONS

- Hardware: interconnectors (CEF)
  - Morocco-Spain already connected
  - Turkey connected to Greece and Bulgaria
  - Projects:
    - Tunisia-Italy (ELMED PIC, TuNur)
    - Algeria-Spain and Algeria-Italy
    - Israel-Cyprus-Crete (PIC)
    - Egypt-Cyprus-Crete



- Software (process under way in Balkans)
  - Gradual harmonization of market design
  - Technical cooperation between TSOs
  - Cooperation between National Regulatory Authorities (NRAs
  - Strong institutional arrangements and a regional mindset with trust between parties
  - Some coherence and consistency in pricing systems

Some aspects of CE4ALL to help (see www.cmimarseille.org for more info)

Thank you

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Back-up Slides

RES integration, a challenge for power systems

- Production of Variable Renewable Energy (VRE) is difficult to control, more decentralized and not always available when needed (graph + duck curve)

- VRE technologies have high capital cost and low OPEX=> low SRMC (used for dispatch) and high LRMC (used for investment)
  - Merit order effect=> conventional power plants are unprofitable and may not be available for reserve (graph merit order)
  - Wholesale prices are low (zero or even negative at times), while consumer prices are high (esp. If VRE subsidised)

- VRE induce additional system costs (reserves, frequency control, other network costs, balancing requirements, etc.)

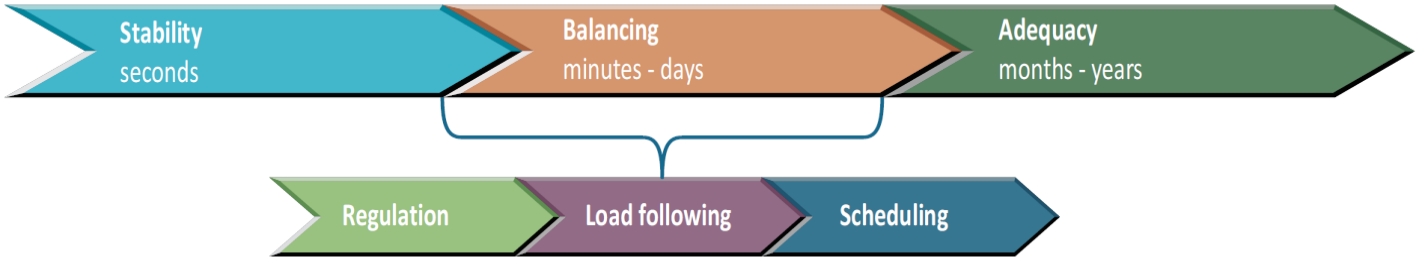
What is power system flexibility

While many definitions exist (see Annex), flexibility can generally be defined as the ability of the power system to cope with sudden and unexpected changes in demand or supply

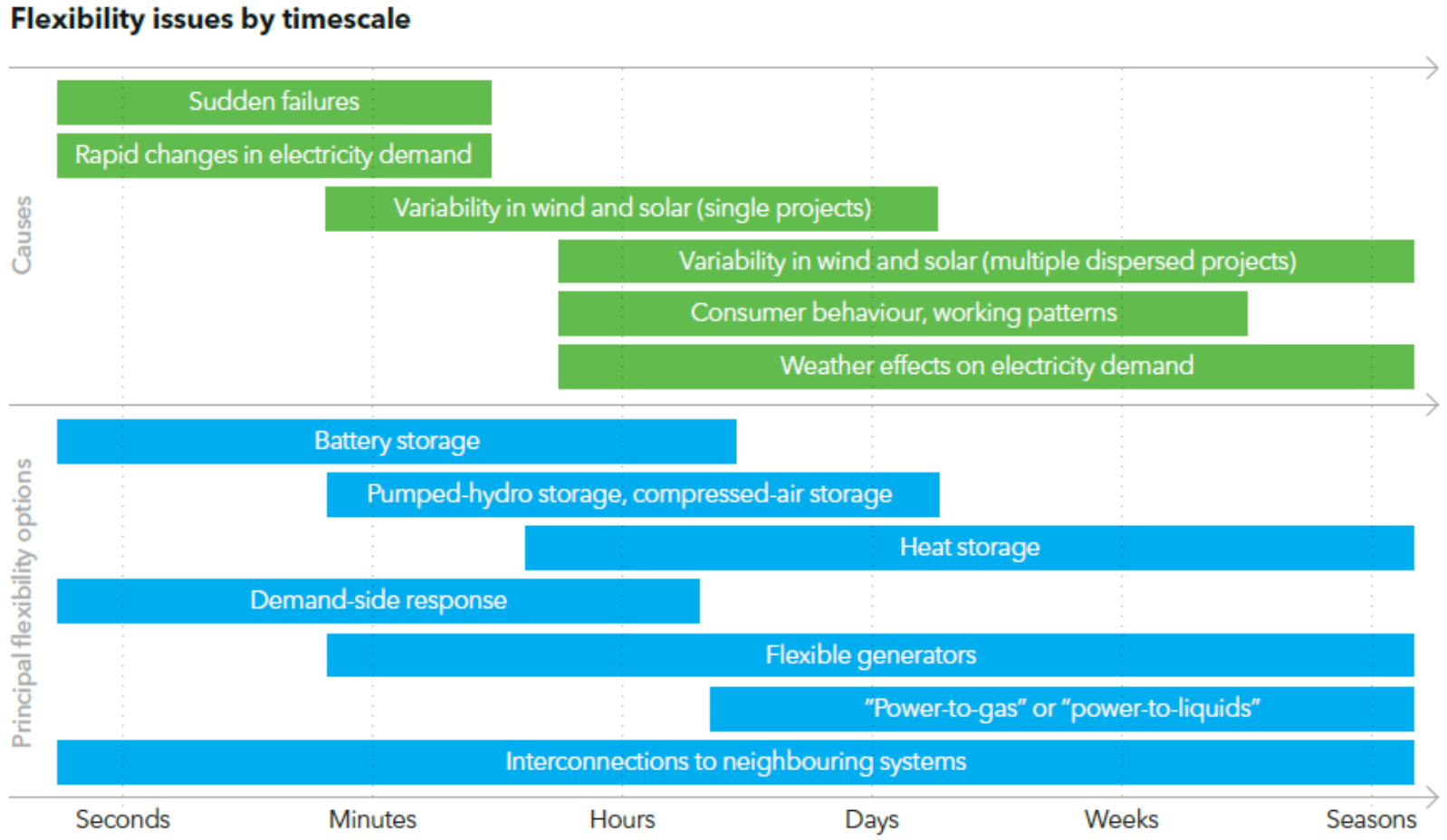
Flexibility needs of the power system:

- Voltage stability, when insufficient reactive power
- Frequency stability, in case of large unforeseen imbalance
- Reactive power control
- Transmission reliability (n-1 criterion)
- Adequacy: ensuring long-term supply/demand equilibrium

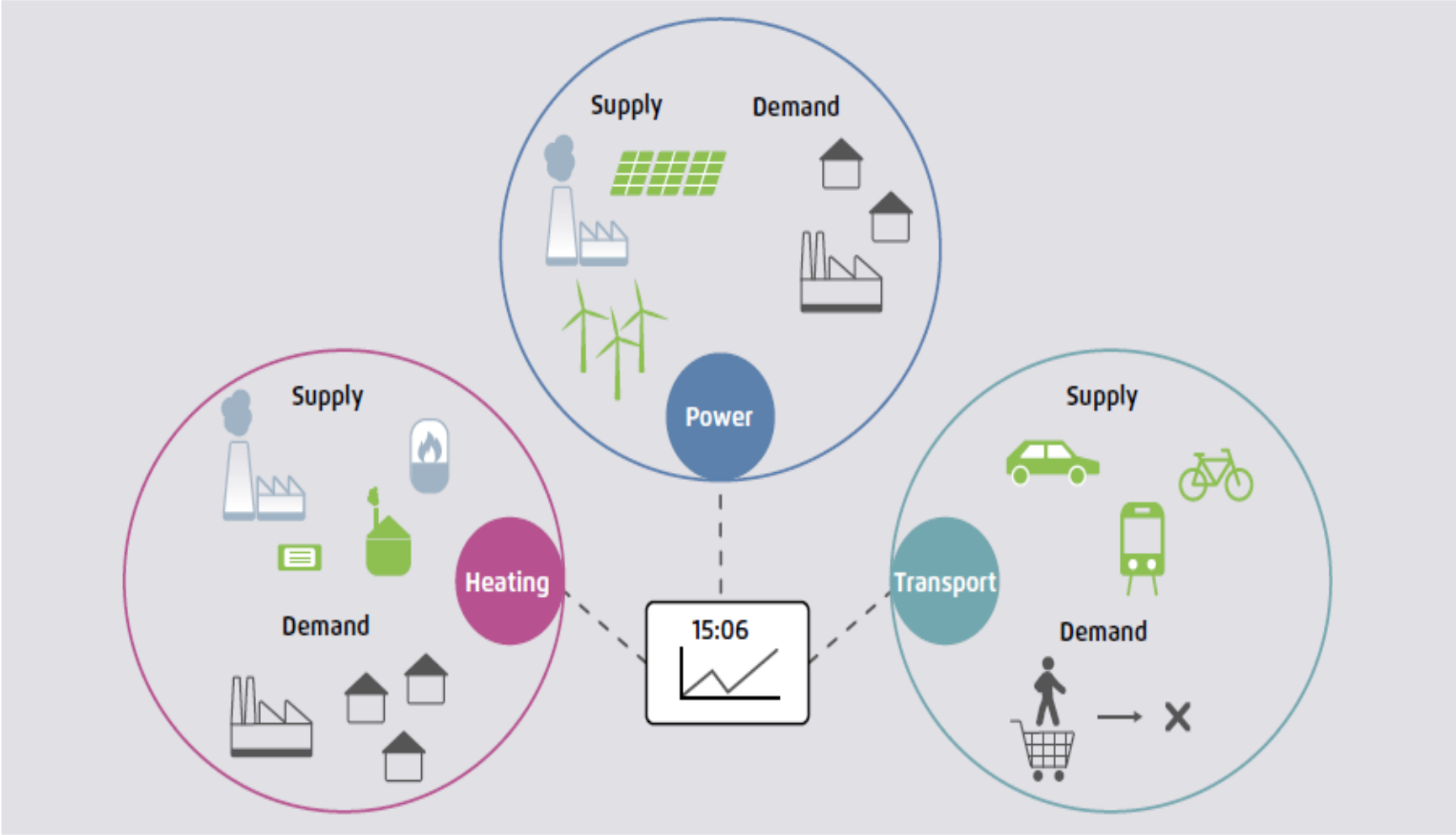
Balancing of the electricity system needs to address several time frames for response (from seconds to a day) and duration (from 10 minutes to 6 hours)



Flexibility solutions differ according to time scale and energy required solutions



Sector coupling



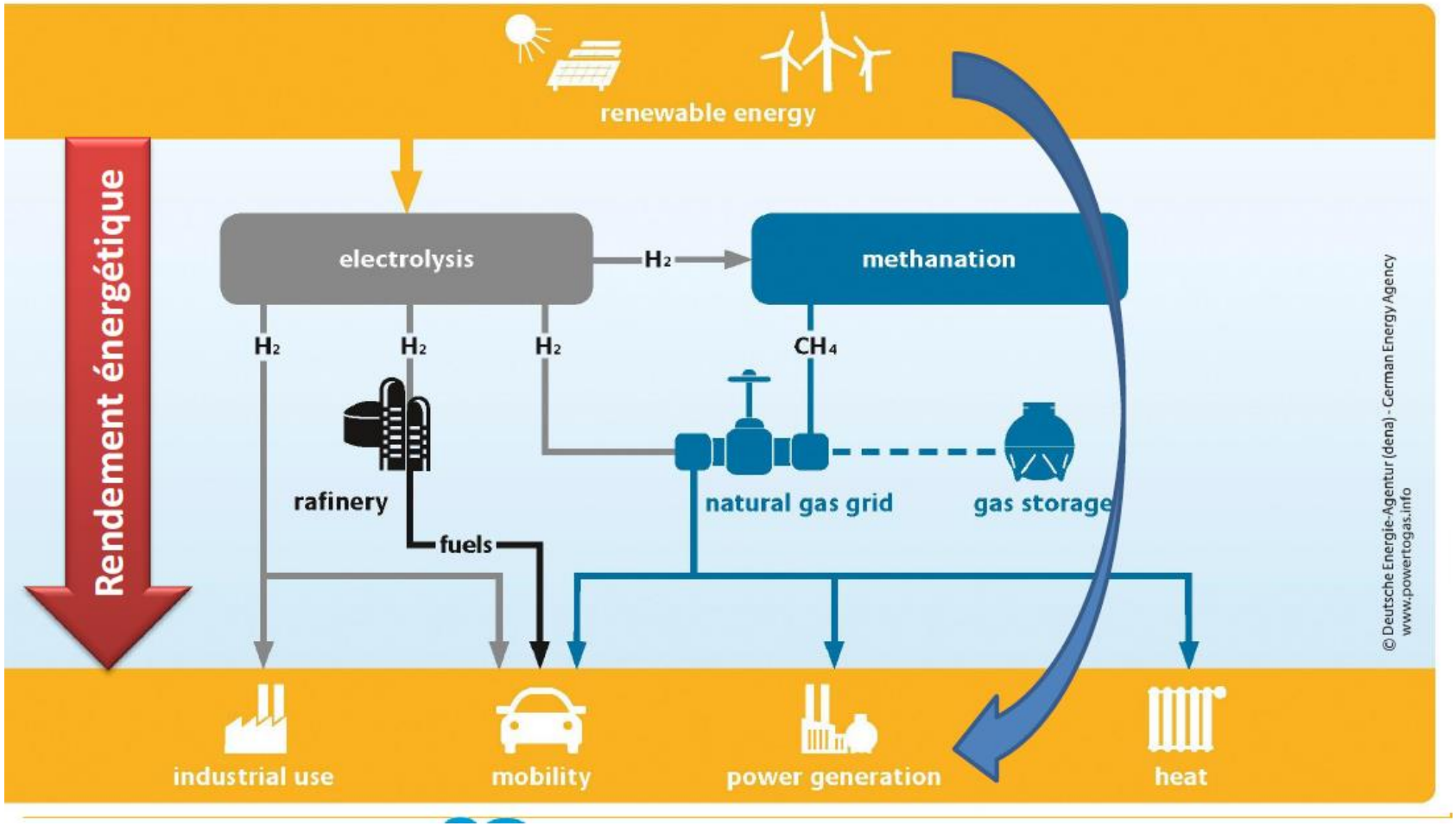
Sector coupling, also a source of flexibility (DSR, storage)

- Concept initiated with the coupling of the transport sector with the power sector: use electric vehicles (EV) as batteries and let power flow from EV to the grid (V2G)– since cars are parked 95% of the time

- Massive electrification of end-use sectors create new loads high in capacity but low in energy, if not properly managed. But if end-use sectors are coupled with each other and with power sector, DSR potential and storage solutions are increased

- Coupling electricity and gas (incl green gas and hydrogen) sectors is also a source of flexibility

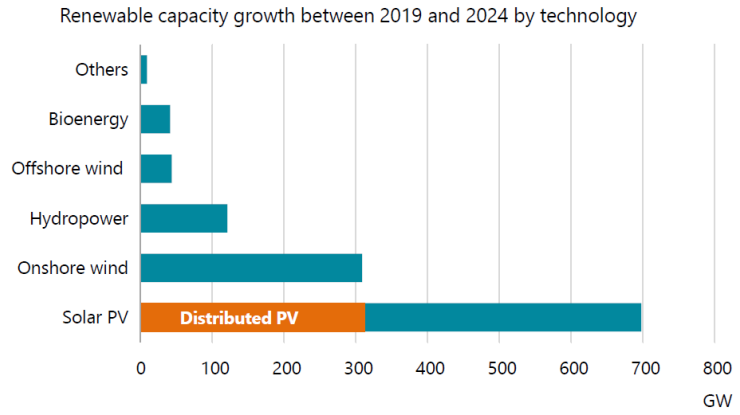
Power-to-Gas – Gas-to-Power



Decentralised vs Centralised: the raging debate

With RES scale-up, DER or « embedded » generation increases

- IEA forecast 1/3 of RES capacity addition do be decentralised over the next 5 years



DER saves costs (less T&D lines)

But creates new challenges:

- Bi-directional power flows (requires grid code changes)
- Power quality, voltage stability, harmonics, reliability
- Loss of revenues for TSOs
- Allocation of grid costs to users

Analysis by Joskow indicates new costs are higher than savings