ρυθμιστική αρχή ενέργειας κύπρου
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Energy Regulatory Challenges Towards 2050

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EU energy strategy

2020, 2030, 2050

Future energy systems

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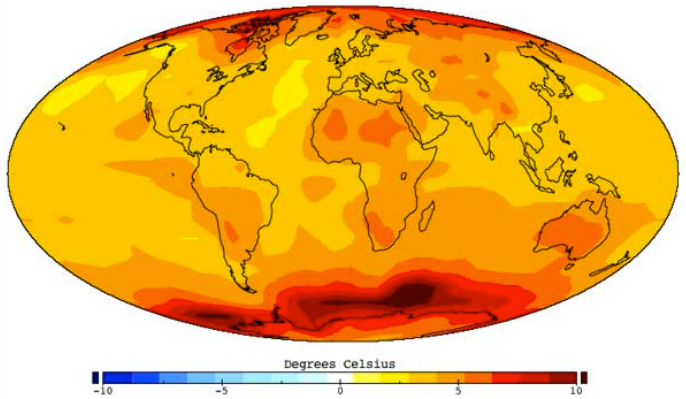
- **Climate change**

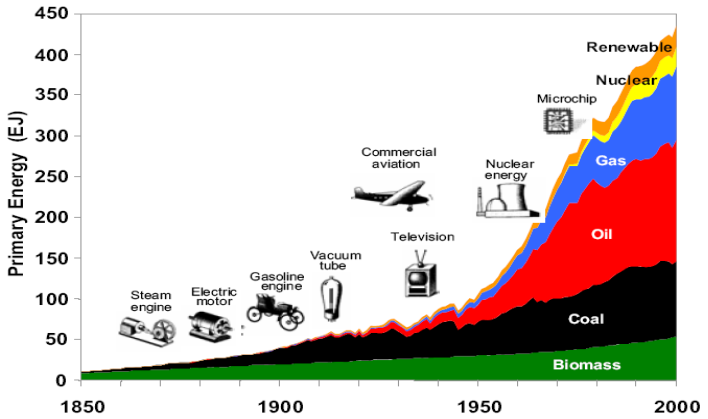


- **Third energy revolution**

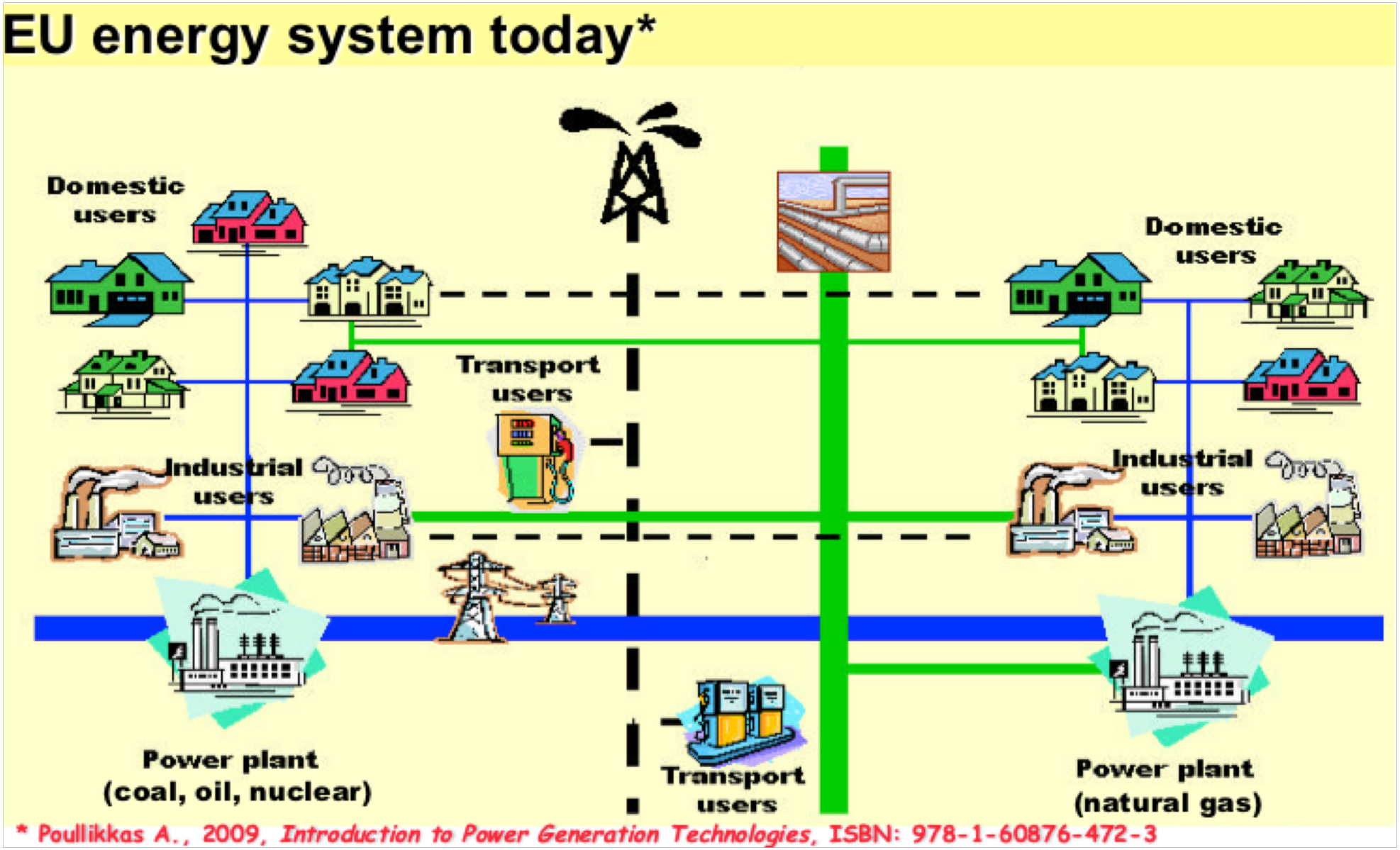
- **Future energy economics**

EU energy objectives

- greenhouse gas reduction
- sustainable production and consumption
- competition in electricity and natural gas markets
- security of supply



Current energy system



Future energy systems (optimistic scenario)

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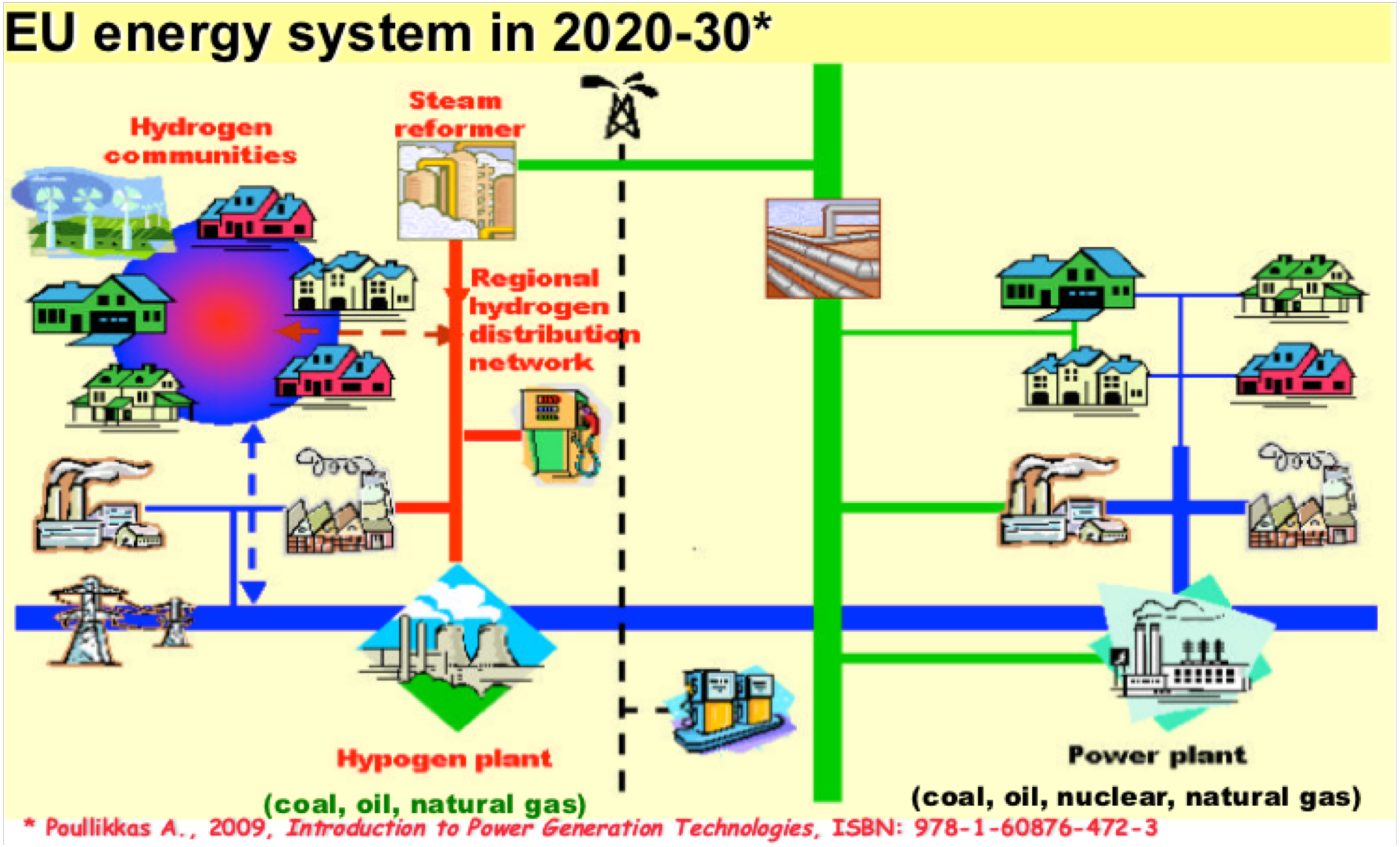

Future energy systems (optimistic scenario)

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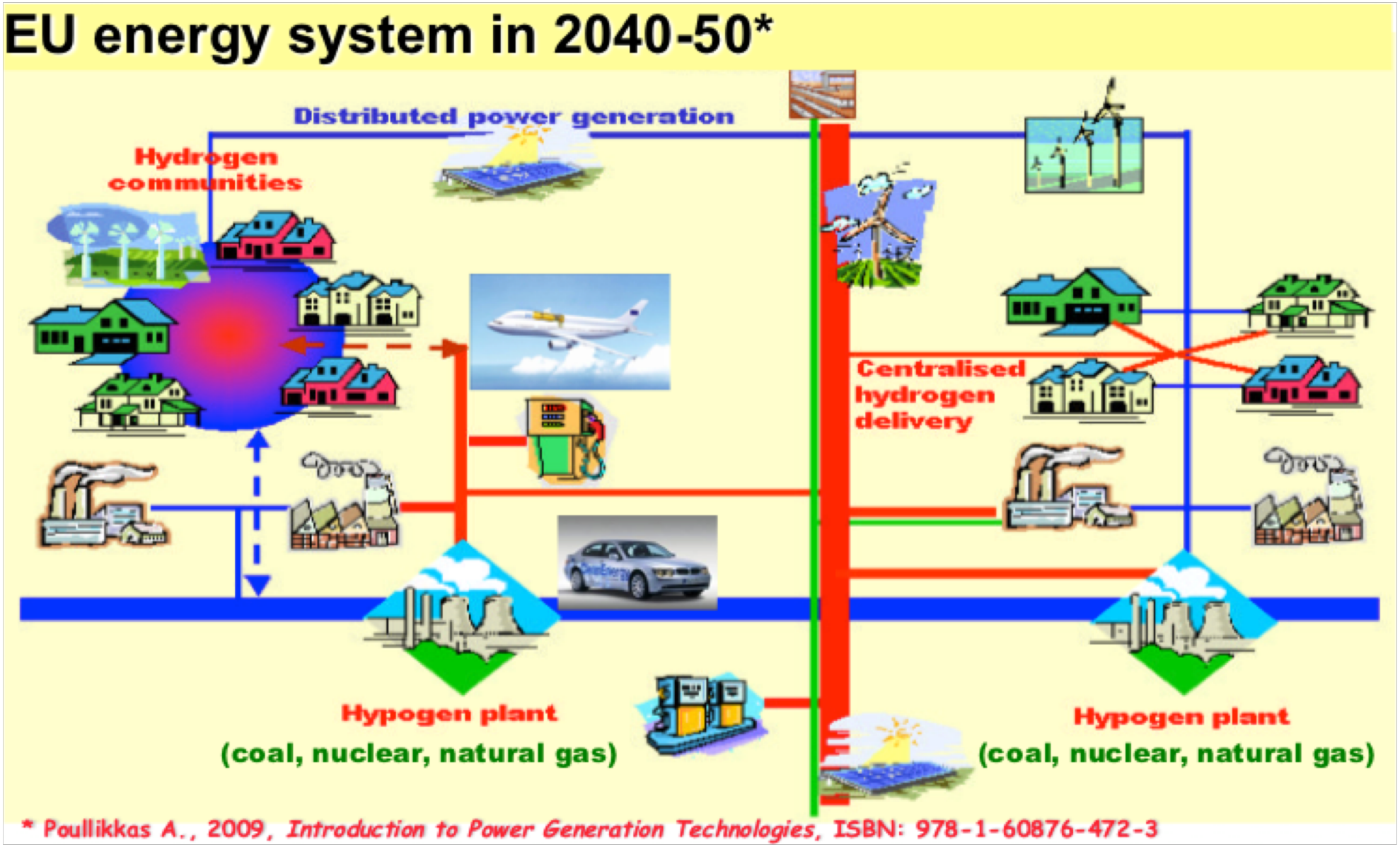
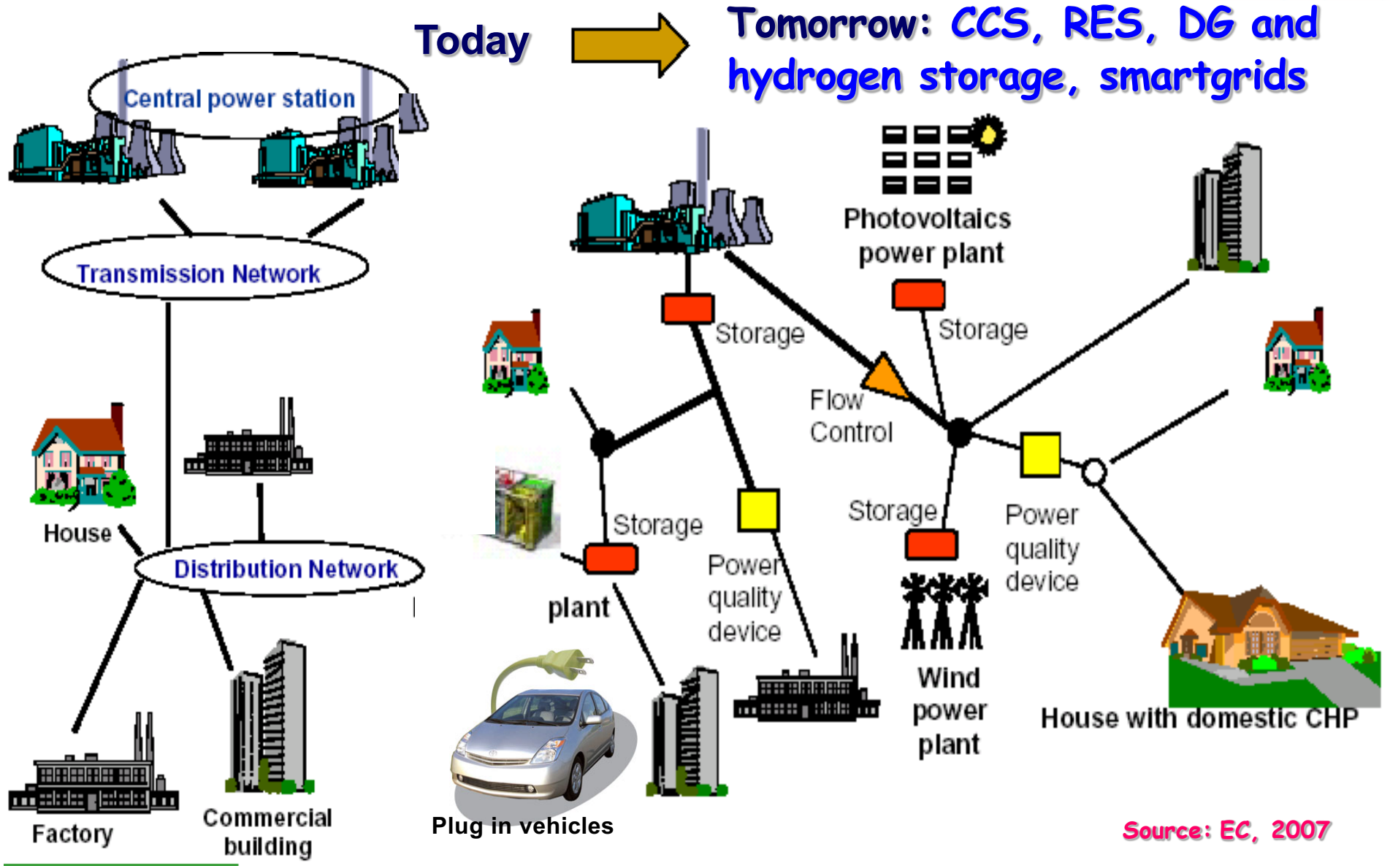


Future power systems



End goal – the smart future

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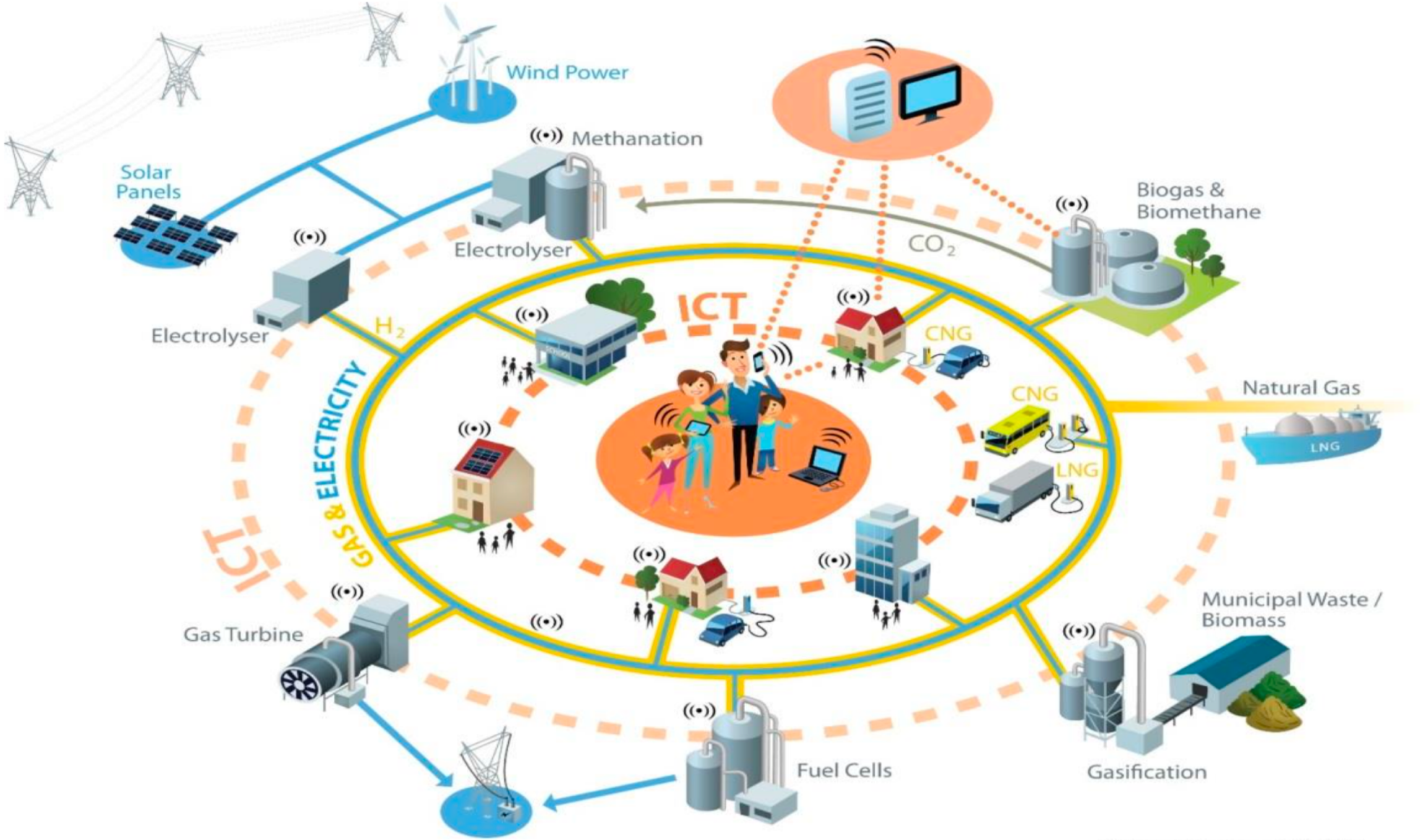

The Super Smart Grid after 2050*
(may allow for 100% RES)

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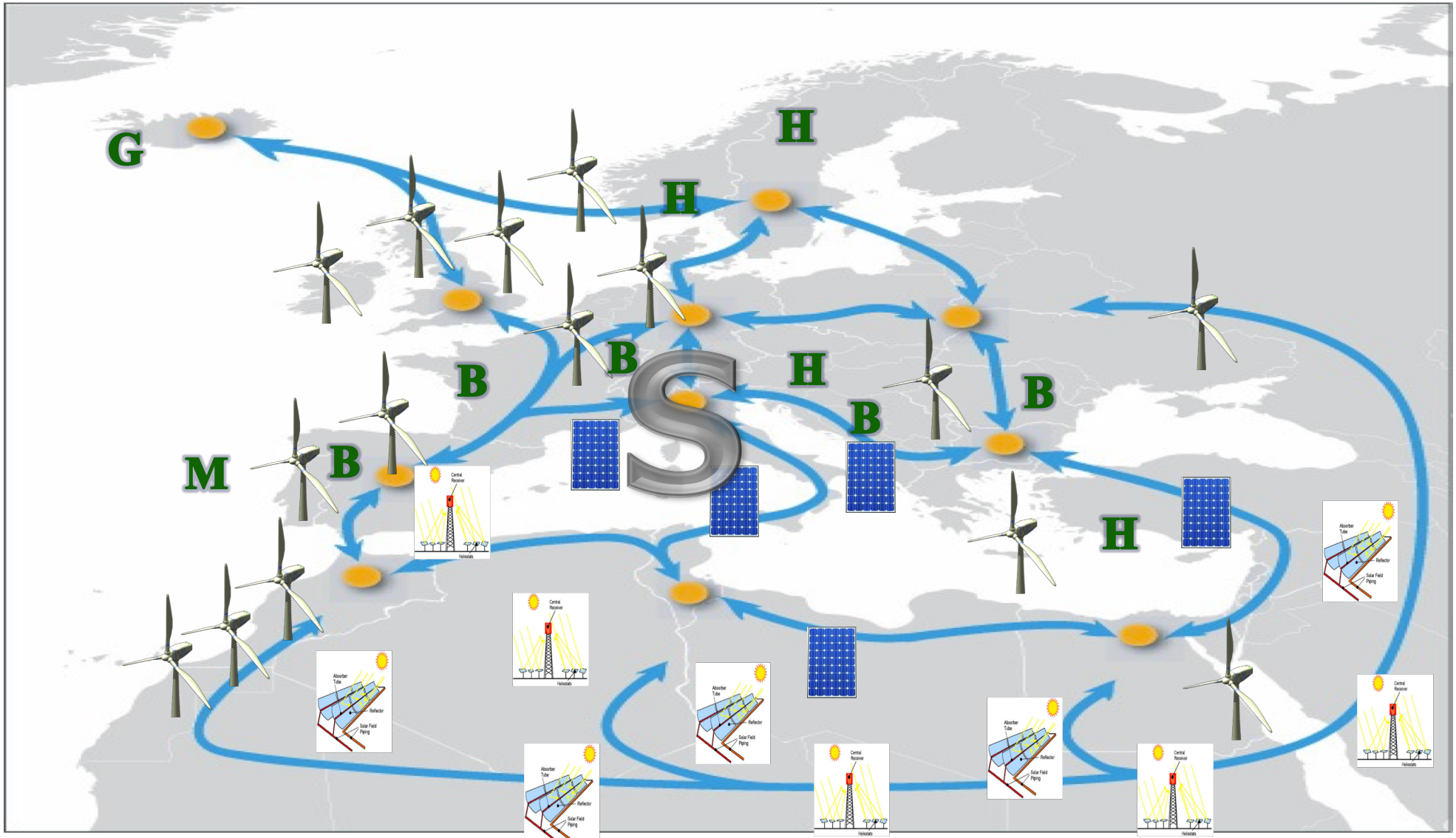
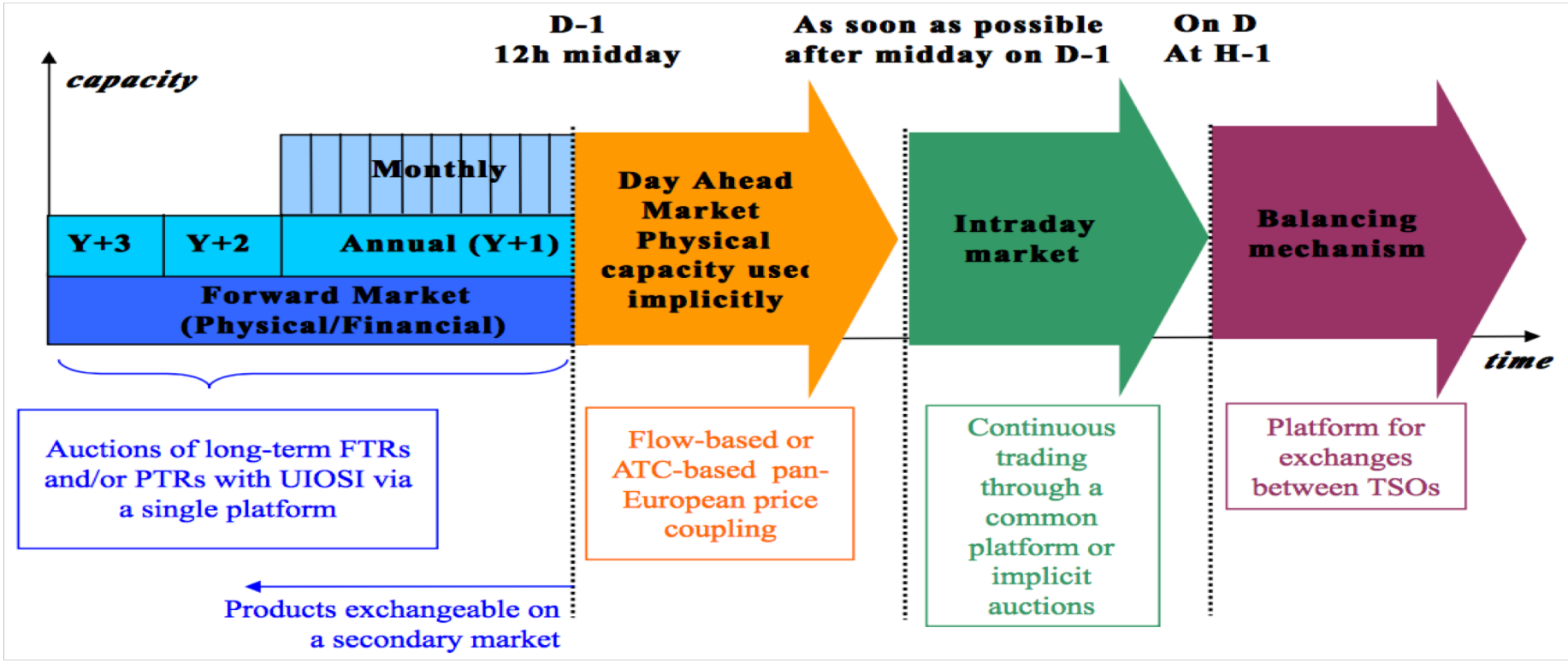


* Poullikkas A., 2013, *Sustainable Energy Development for Cyprus*, ISBN: 978-9963-7355-3-2

Challenges in electricity markets

RES integration and storage

EU electricity market target model



Integration of RES: LCOE *vs* Reliability

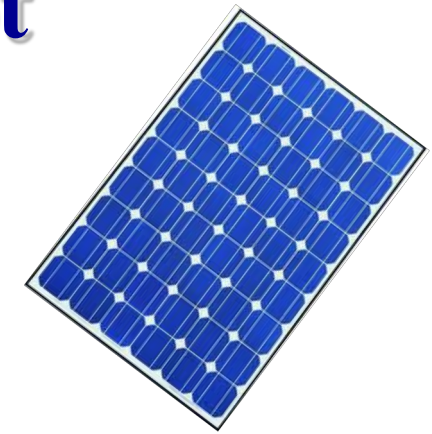
Power system reliability*

- **adequacy**, PS ability to satisfy customers needs both in power and electrical energy
- **security**, PS ability to remain in operation after sudden disturbances

* Poullikkas A., 2016, *Fundamentals of Energy Regulation*, ISBN: 978-9963-7355-8-7

Intermittent energy source*

- Any source of energy that is not continuously available
- May be quite predictable
- Cannot be dispatched to meet the demand of a power system
- For dispatching need storage



* Poullikkas A., 2013, *Renewable Energy: Economics, Emerging Technologies and Global Practices*, ISBN: 978-1-62618-231-8

Storage is the missing link

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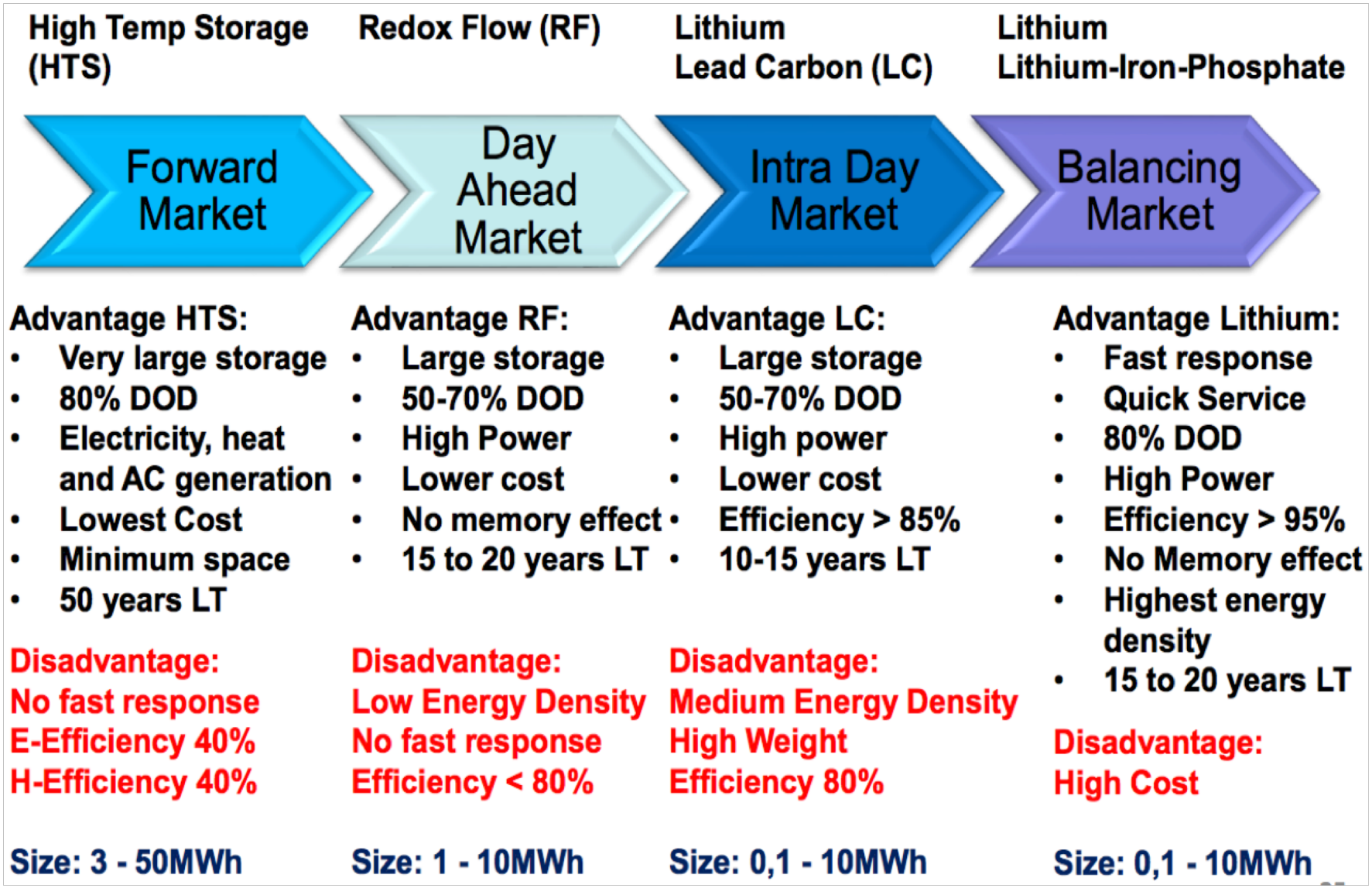
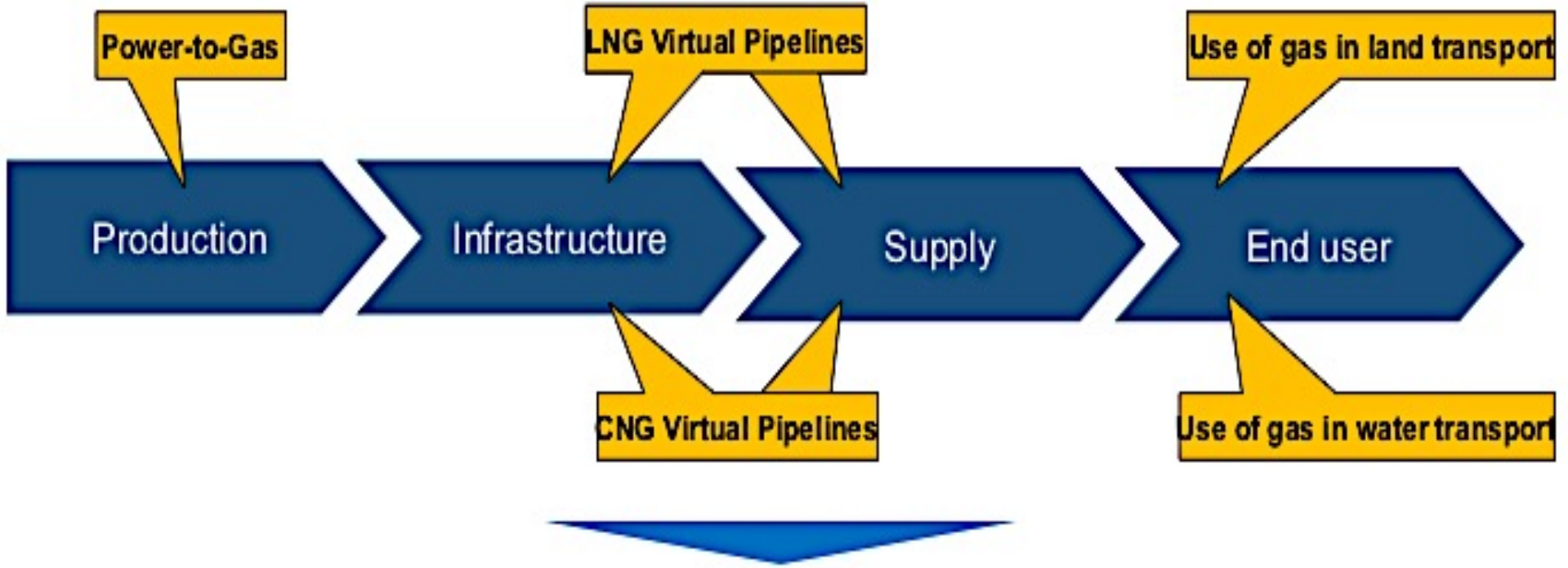


Challenges in natural gas markets

Towards sustainable energy systems

EU gas market target model

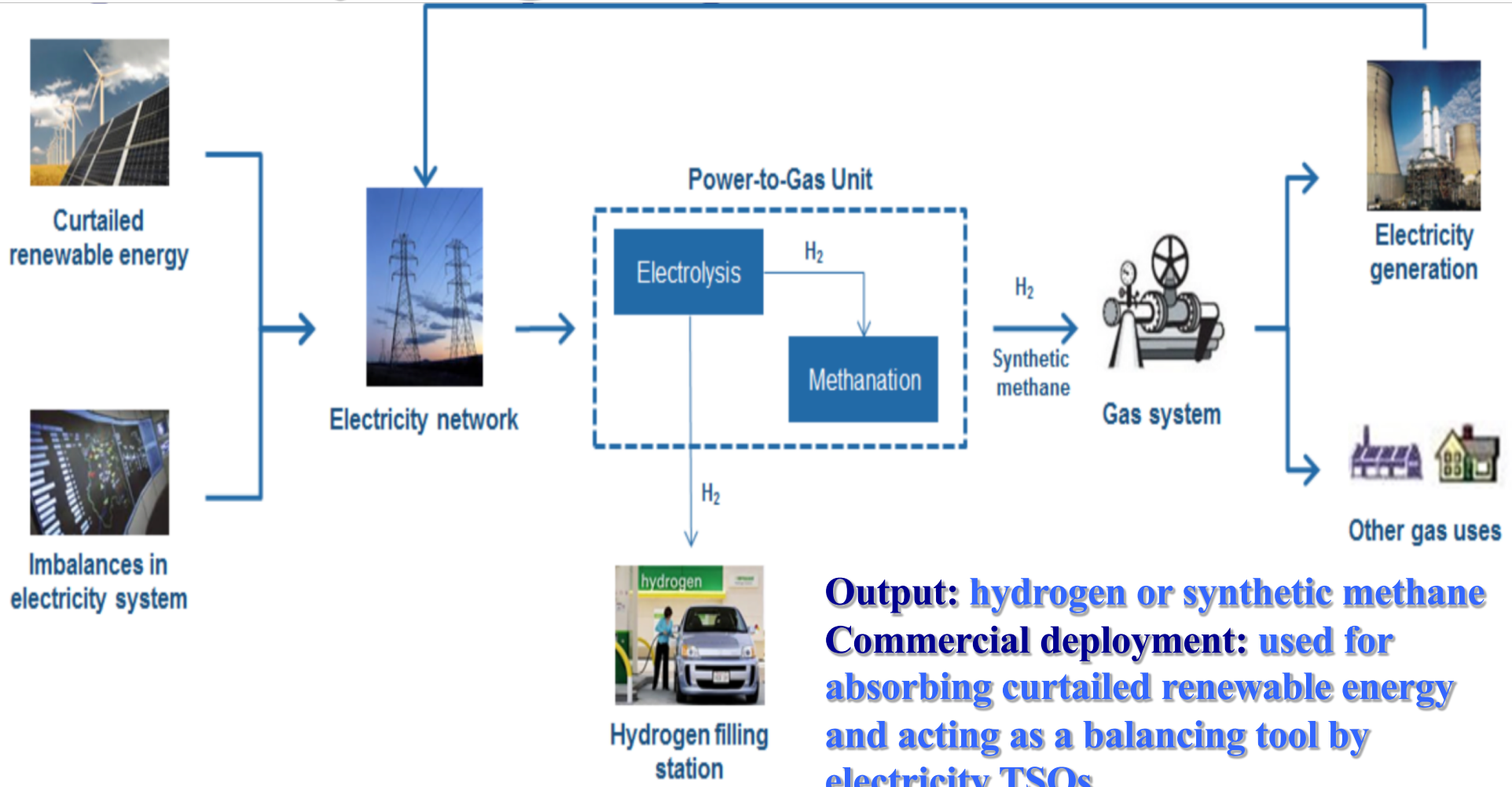
- **The new uses for gas have different roles across the gas supply chain**



Virtual pipelines are closely related to the development of the use of gas in the transport sector, particularly in the case of LNG

Power-to-Gas (P2G)

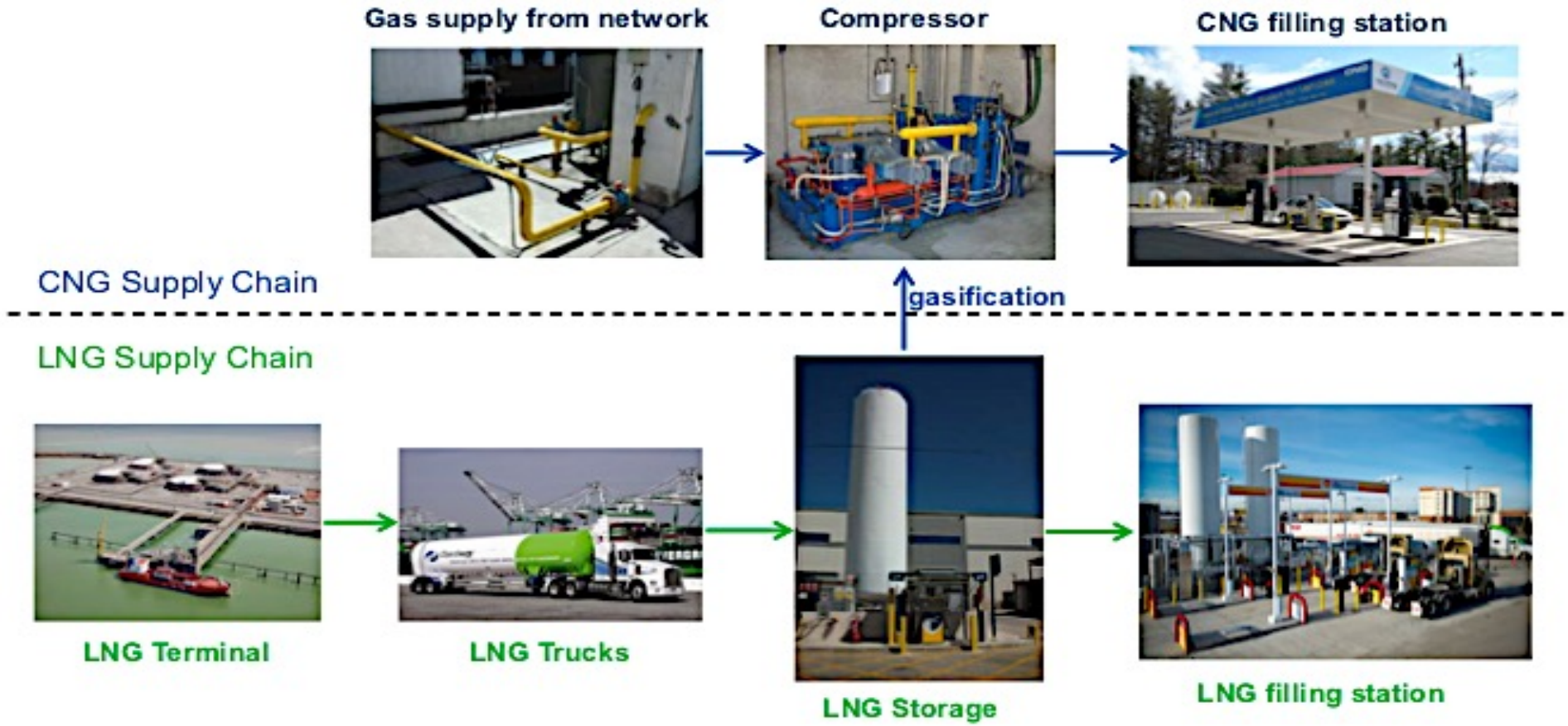
- **energy storage technology linking the electricity and gas infrastructure**



Output: hydrogen or synthetic methane
Commercial deployment: used for absorbing curtailed renewable energy and acting as a balancing tool by electricity TSOs

Virtual pipelines

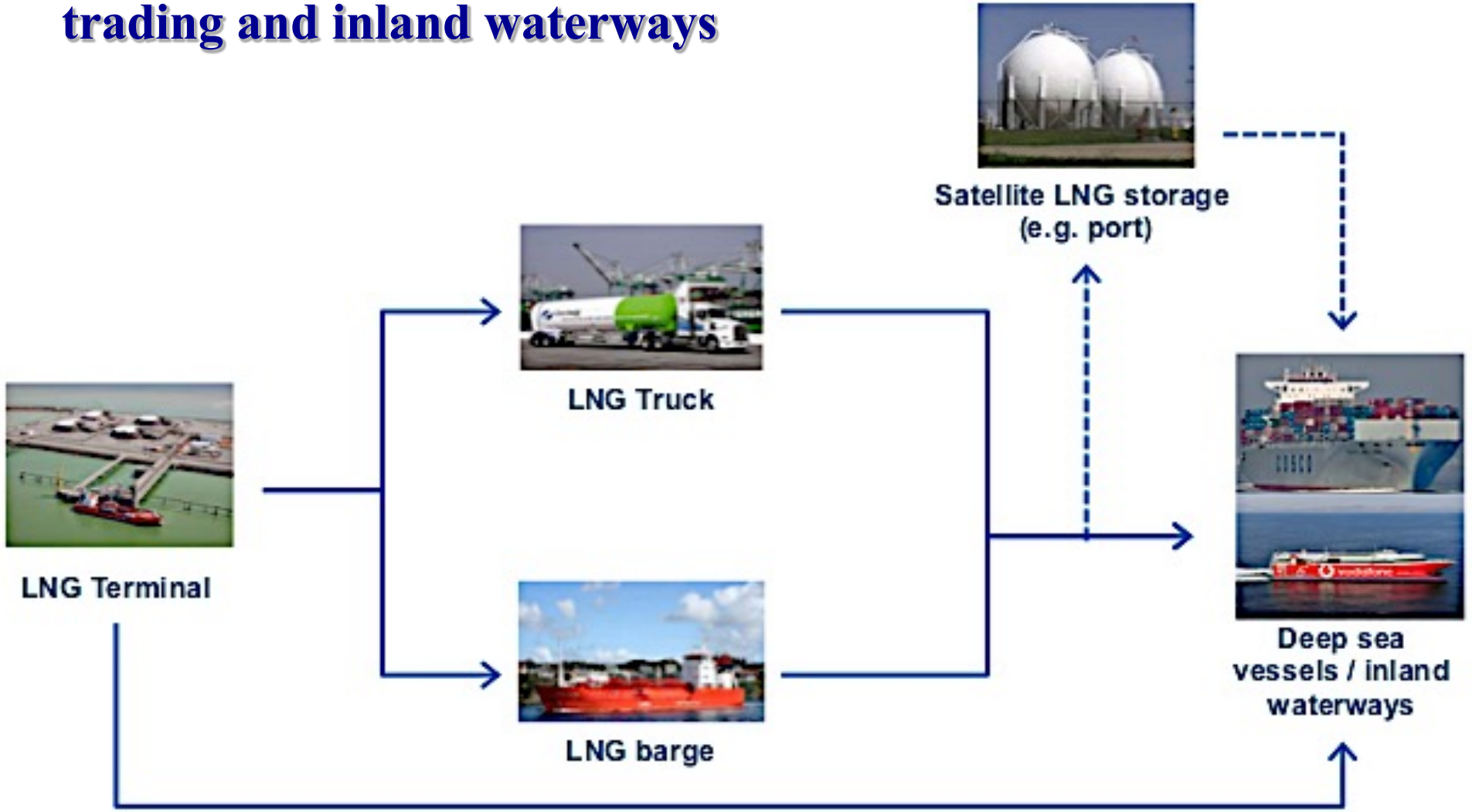
- **LNG stations are supplied through trucks**
- **CNG stations are supplied either from the network or with LNG (L- CNG)**



Virtual pipeline: the supply chain transporting natural gas to final consumers in the form of CNG or LNG, using road and sea means of transportation, such as trucks, vessels and rail

LNG bunkering

- **Supply chain is the same for applications in deep-sea trading and inland waterways**



LNG bunkering options: Ship-to-Ship (STS), Truck-to-Ship (TTS), Terminal-to-Ship (TPS)