Towards sustainable energy future

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- **EU energy strategy** – towards 2050
- **RePowerEU plan** – phase out dependency on Russian fossil fuels
- **Development of optimization algorithms** – advance simulation tools
- **Long term scenarios** – from carbon economy to hydrogen economy

EU energy strategy

towards 2050

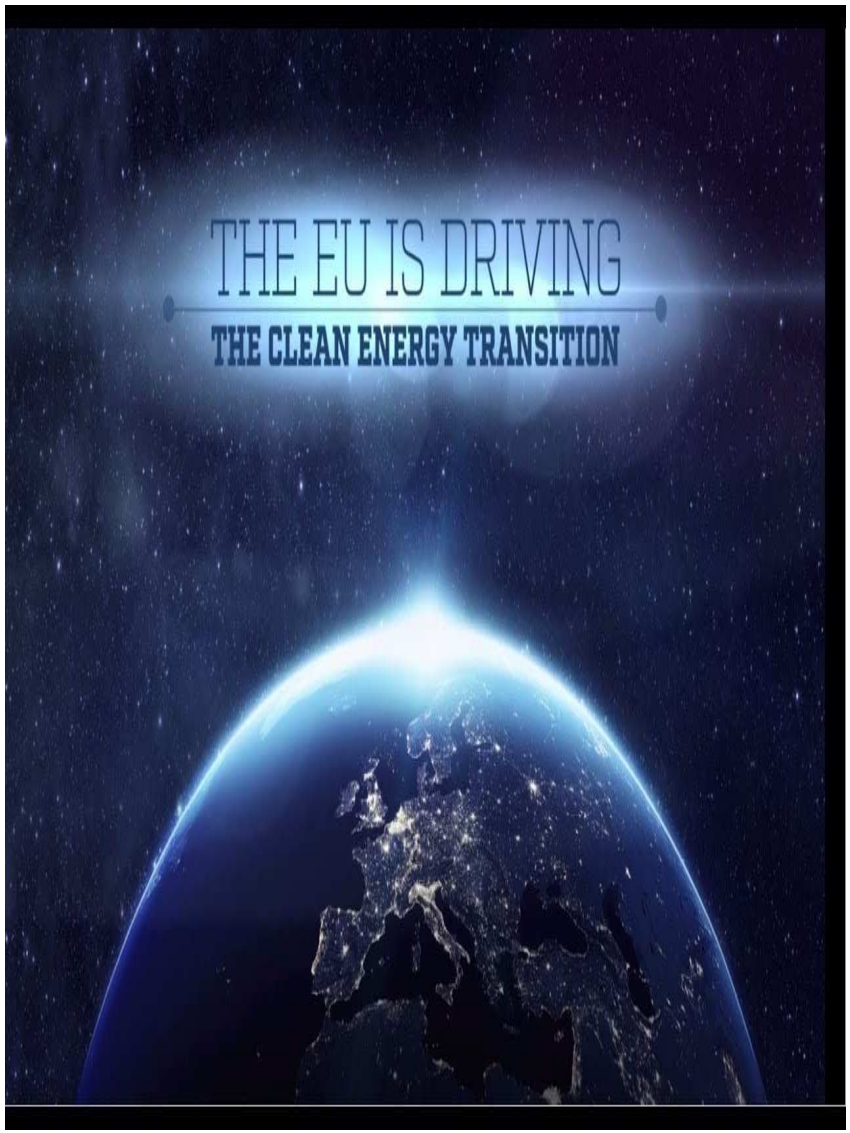
Energy transition

- **greenhouse gas reduction**
  - **EU: climate neutral by 2050**
- **sustainable production and consumption**
- **competition in electricity and natural gas markets**
- **security of supply**

Energy transition*

Need to:

- Reduce cost of security of supply
- Achieve market integration
- Increase socio-economic welfare benefits



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

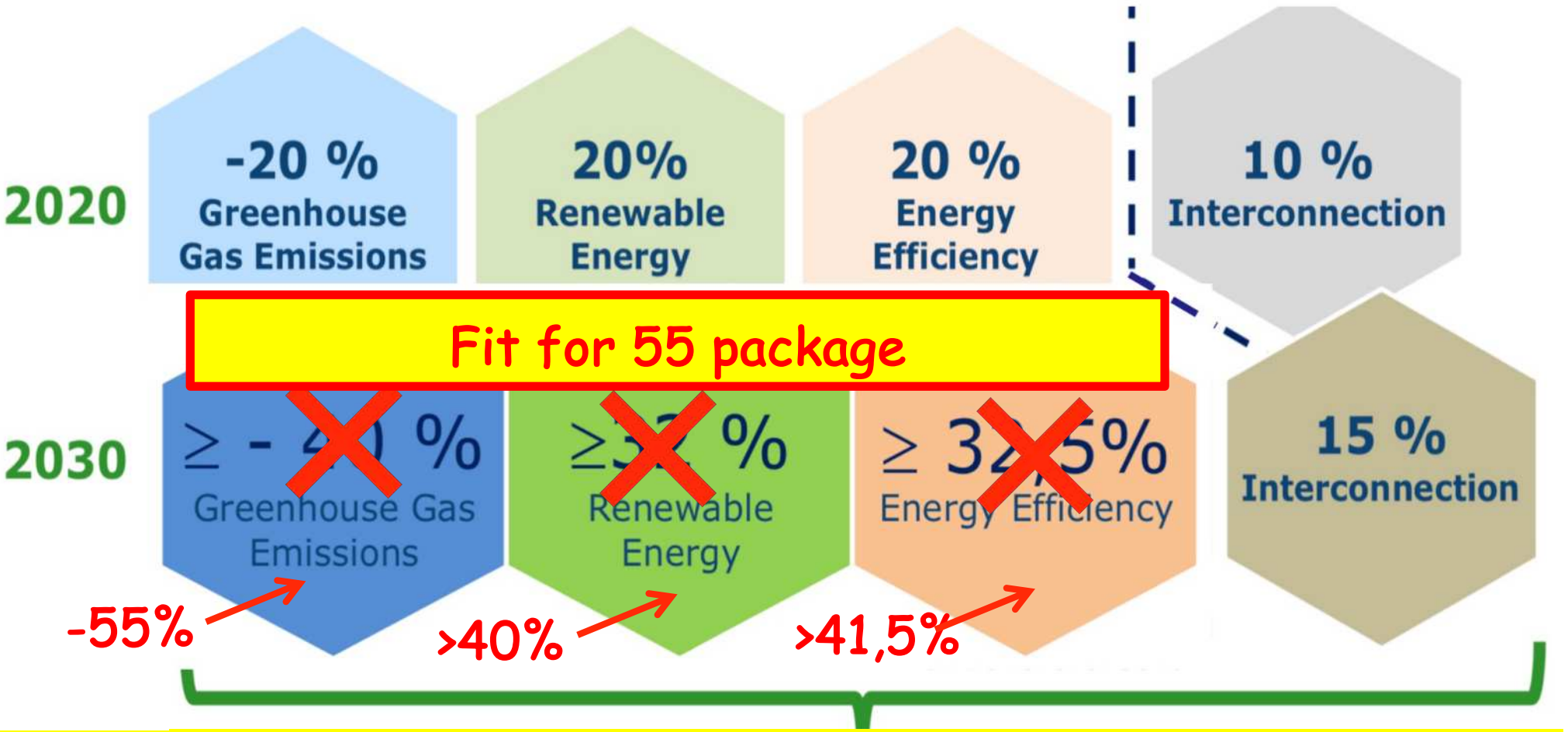
The EU Green Deal and Fit-for-55

…to reach our targets in a:

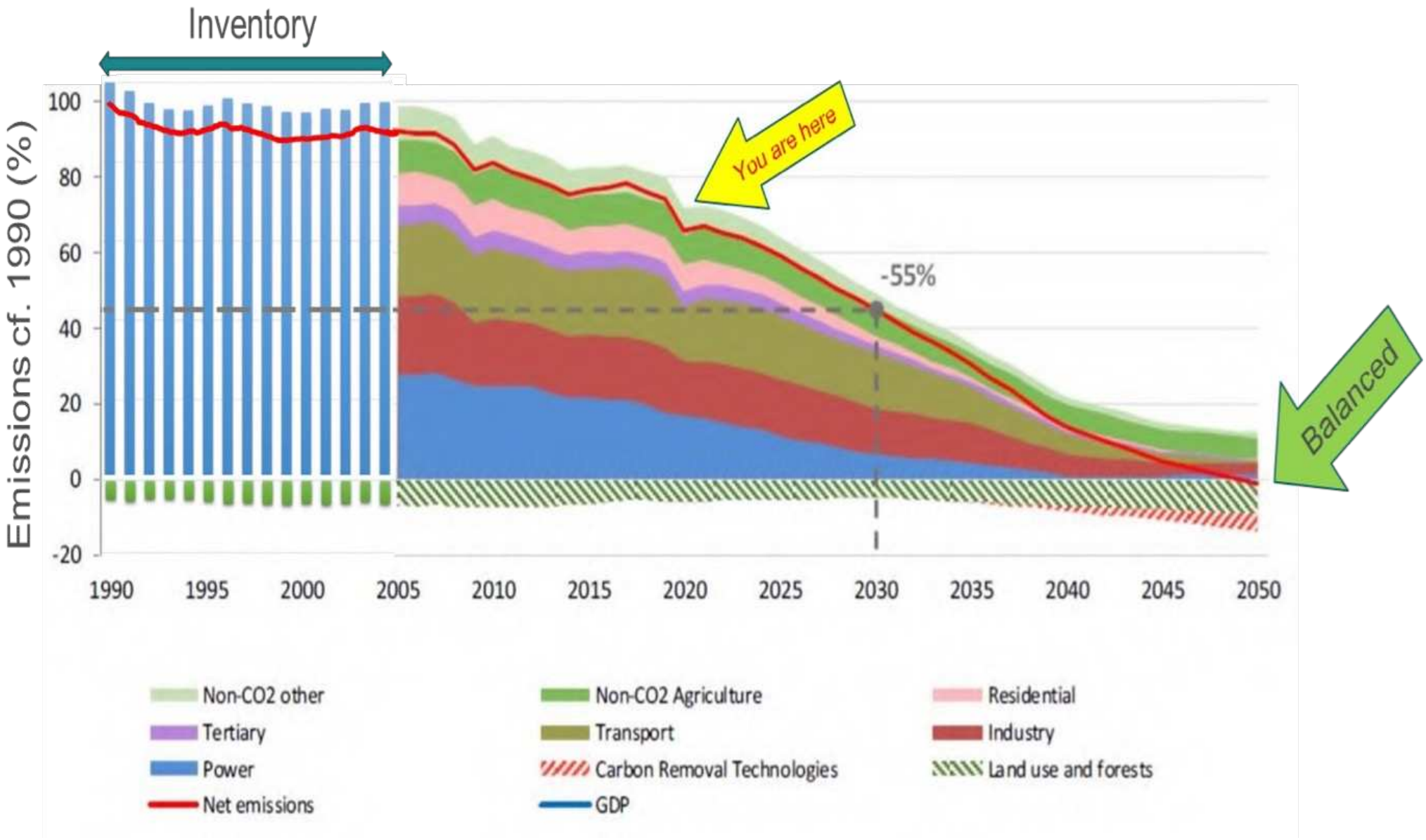
- **socially fair**
- **cost-efficient**
- **competitive**

way…

EU medium and long term targets



Fit-for-55 strategy

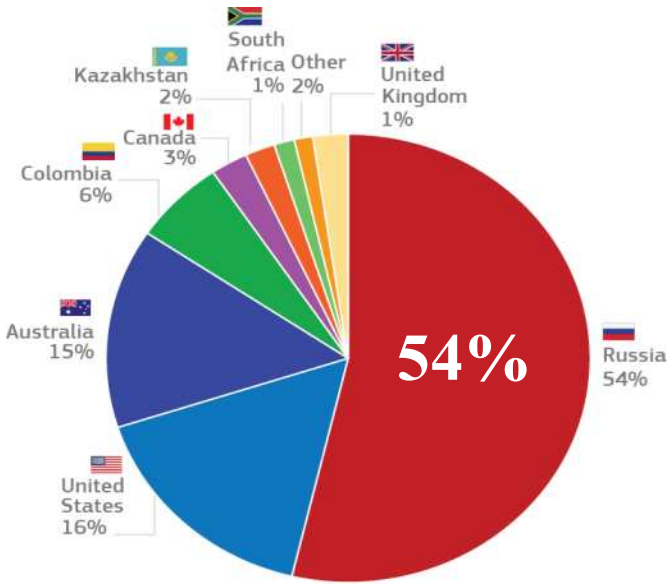


RePowerEU plan

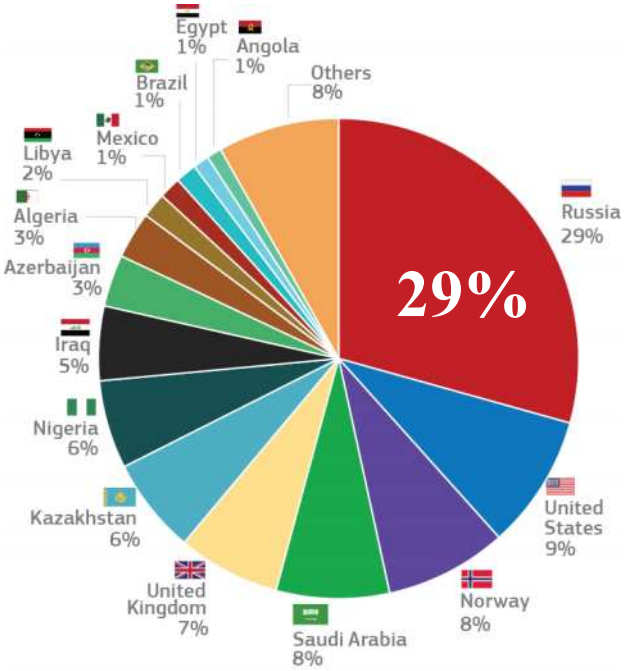
phase out dependency on Russian fossil fuels

EU energy import dependency on Russia (year 2021)

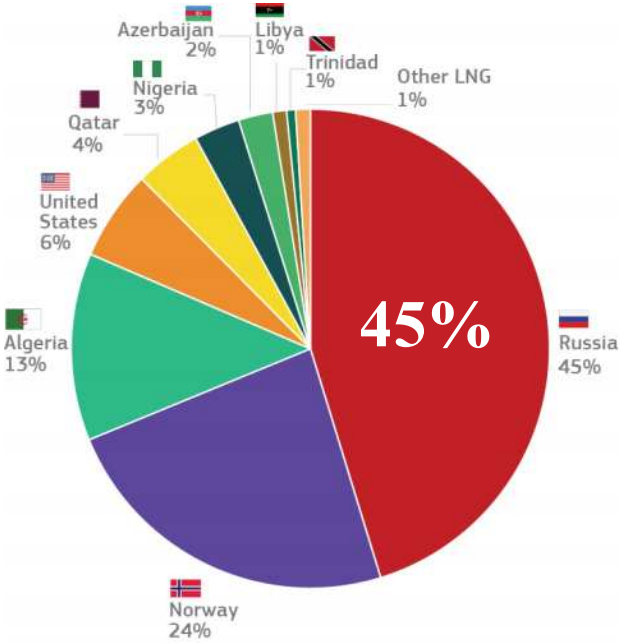
Coal



Oil

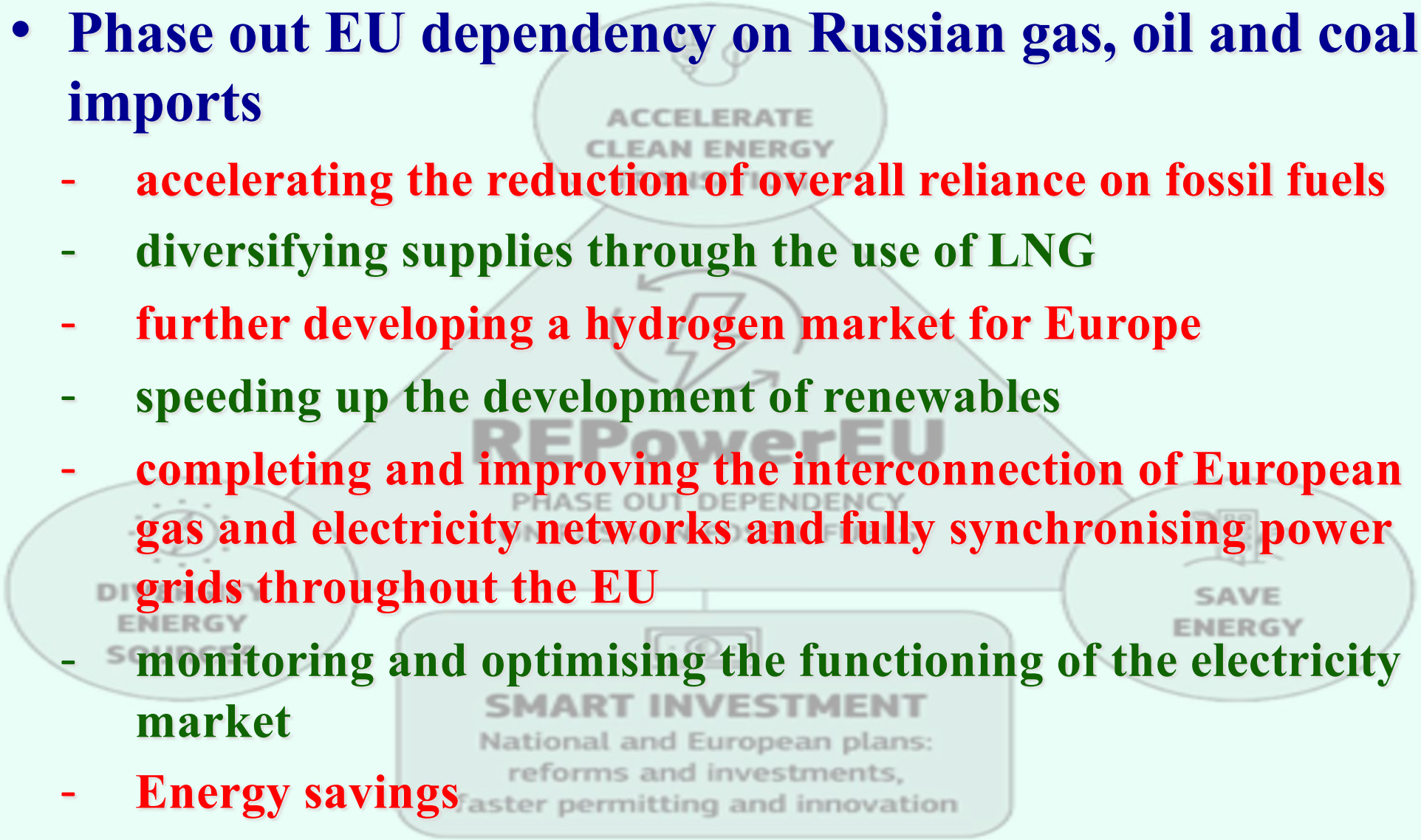


Natural gas (pipe and LNG)



RePowerEU plan*

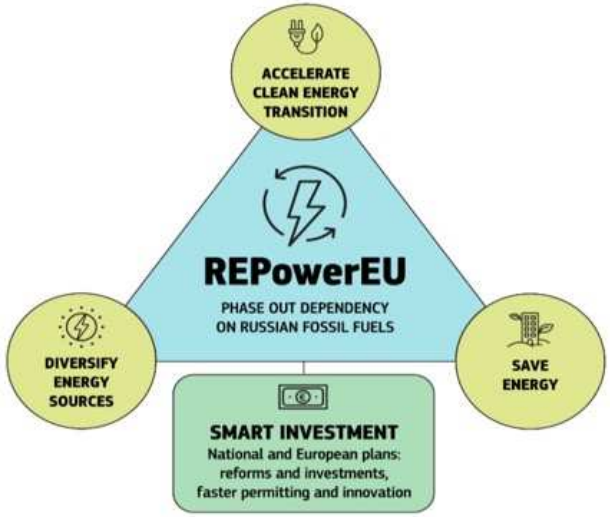
- **Phase out EU dependency on Russian gas, oil and coal imports**
  - accelerating the reduction of overall reliance on fossil fuels
  - diversifying supplies through the use of LNG
  - further developing a hydrogen market for Europe
  - speeding up the development of renewables
  - completing and improving the interconnection of European gas and electricity networks and fully synchronising power grids throughout the EU
  - monitoring and optimising the functioning of the electricity market
  - Energy savings



* RePowerEU Plan, EU, 2022

REPowerEU: from goals to actions

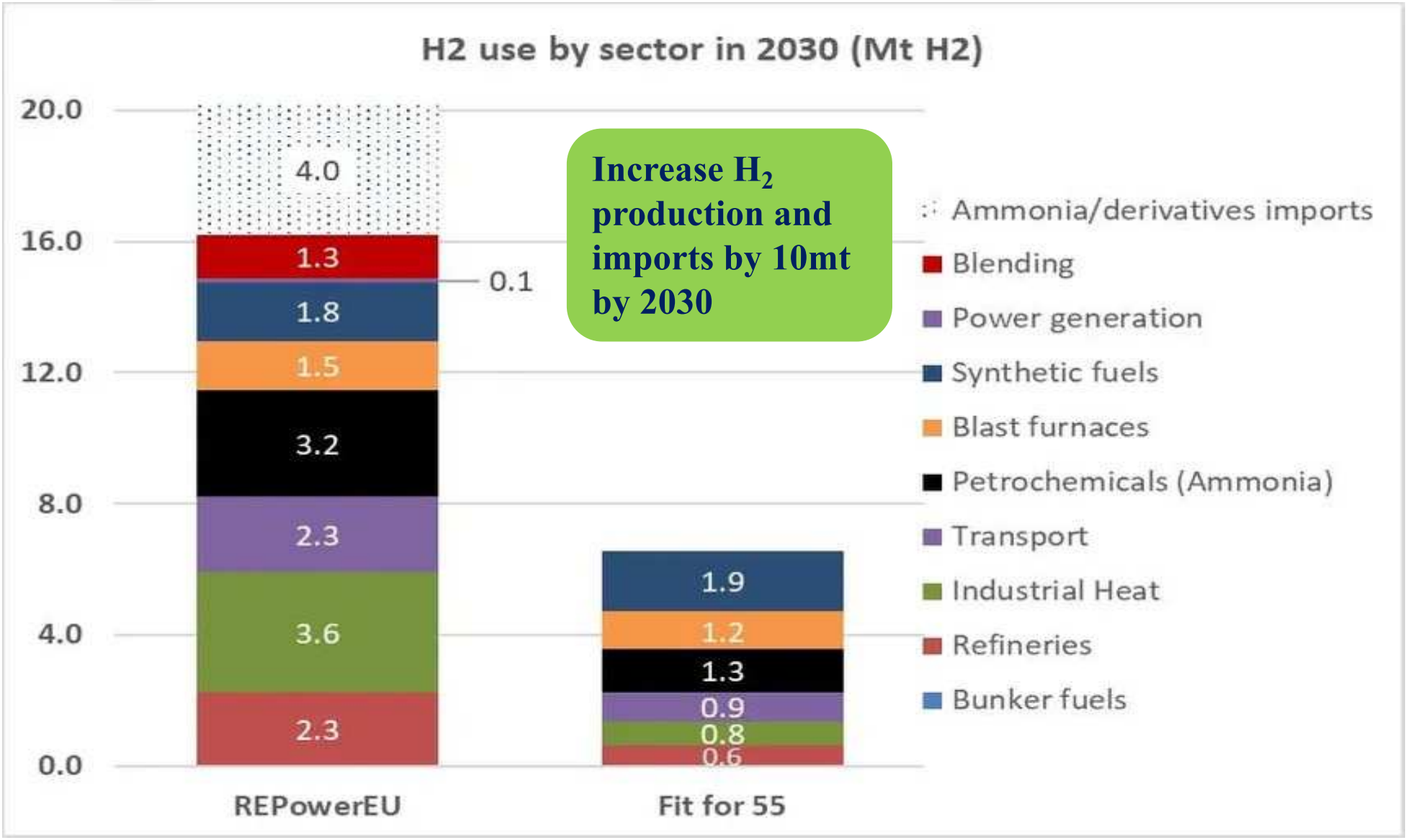
- Independence from Russian fossil fuels by 2027
- Increase imports of LNG by 50 bcm
- Increase pipeline natural gas imports by 10 bcm
- Increase biomethane production by 3.5 bcm
- EU-wide energy saving to cut gas demand by 14 bcm
- Rooftop solar to reduce gas demand by 2.5 bcm
- Heat pumps to reduce gas demand by 1.5 bcm
- Reduce gas demand in the power sector by 20 bcm by deployment of wind and solar



Increase the target of renewable energy from 40% to 45% by 2030

Increase the target of energy savings from 9% to 13% by 2030

H_2 accelerator*



Increase H_2 production and imports by 10mt by 2030

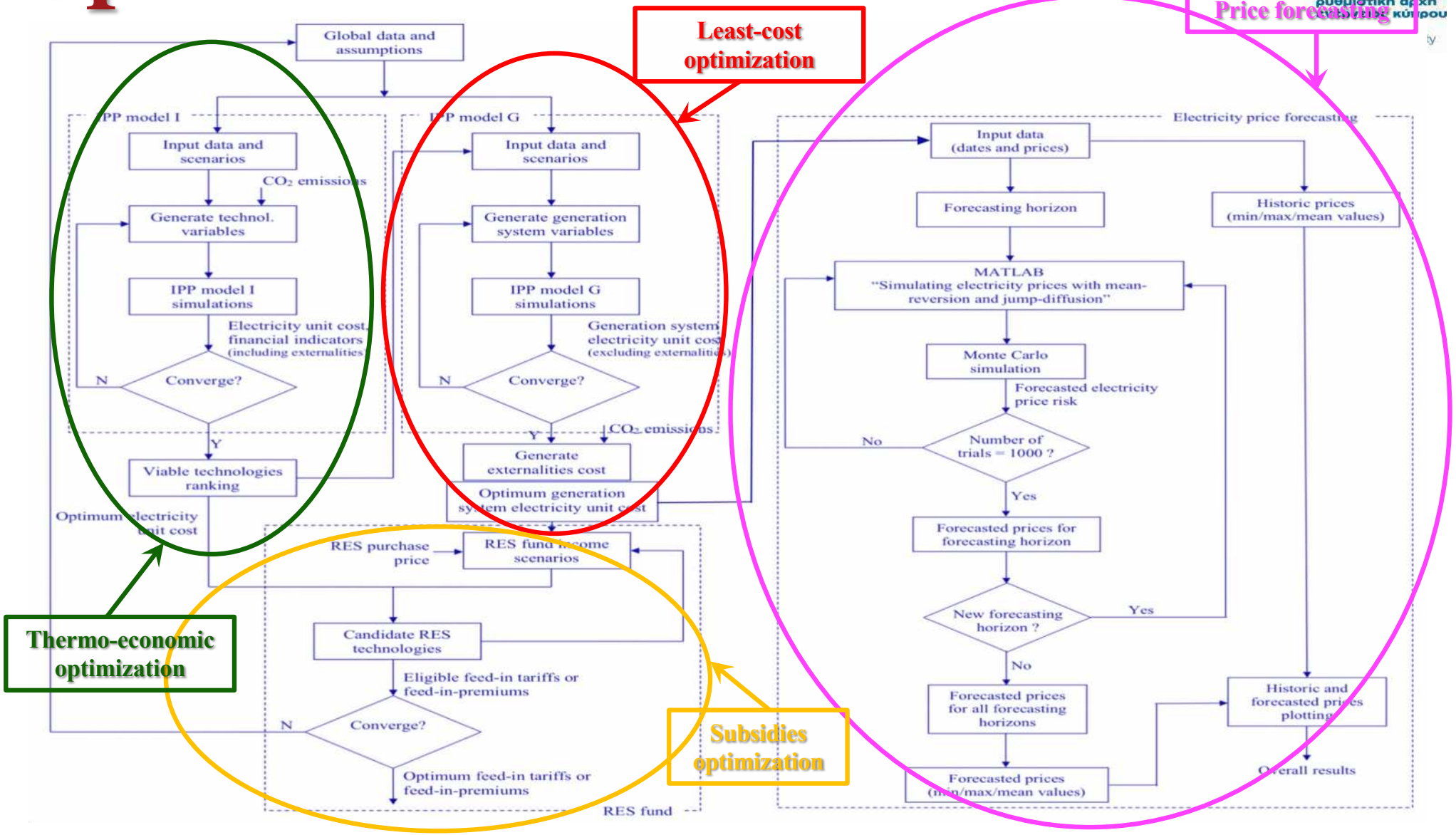
* RePowerEU Plan, EU, 2022

Repowering Europe, how to achieve EU energy independence through new emerging markets and green transition, EDS Summer University, Nicosia, 28 July 2022

Development of optimization algorithms

advanced simulation tools for large scale integration of sustainable technologies including storage

Optimization model*



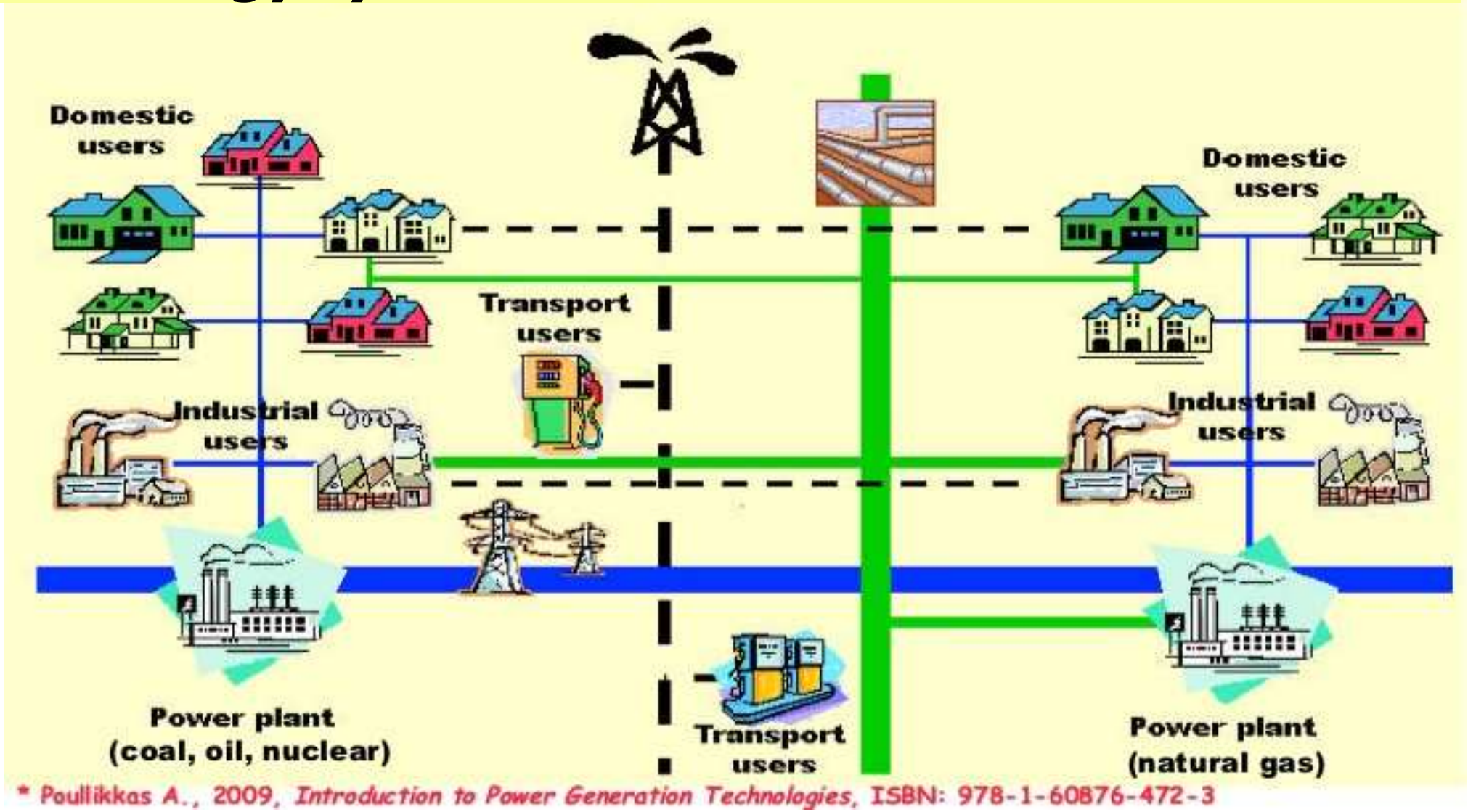
* Poullikkas A., 2018, "An adaptive longterm electricity price risk modelling using Monte Carlo simulation", *Journal of Power Technologies*

Long term scenarios

from carbon economy to hydrogen economy

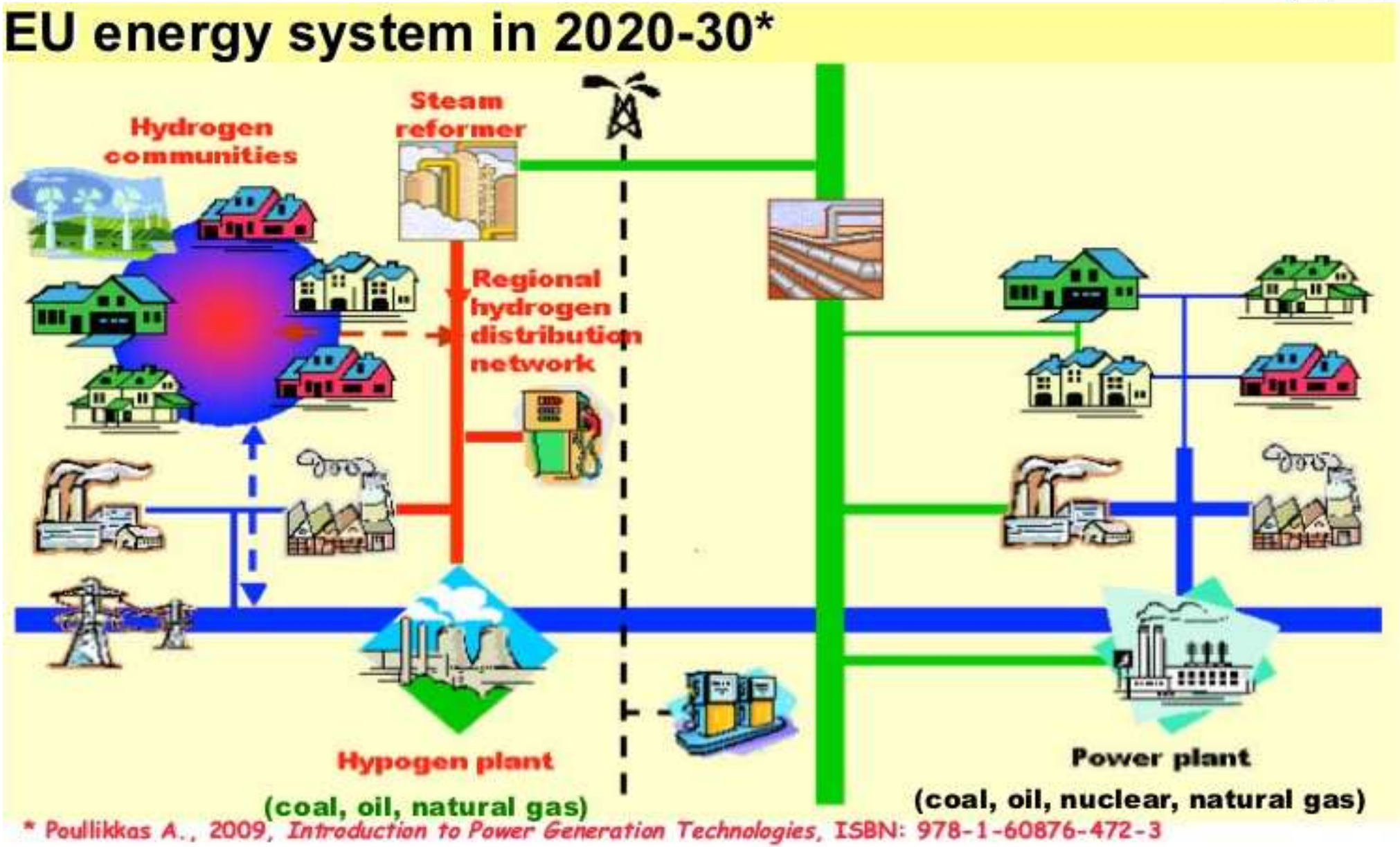
Energy system in 2010

EU energy system in 2010*



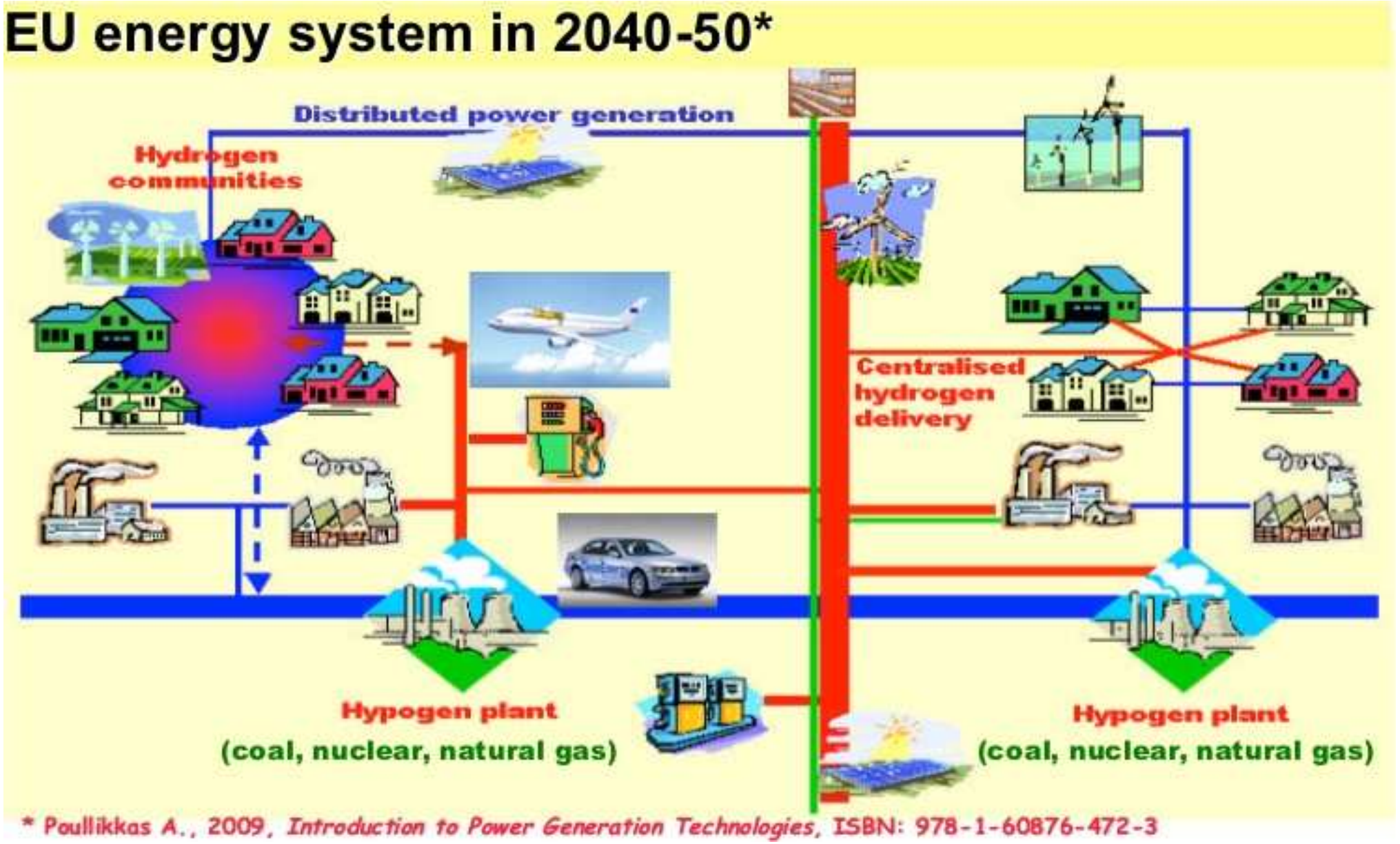
* Poullikkas A., 2009, *Introduction to Power Generation Technologies*, ISBN: 978-1-60876-472-3

Future energy systems (optimistic scenario)

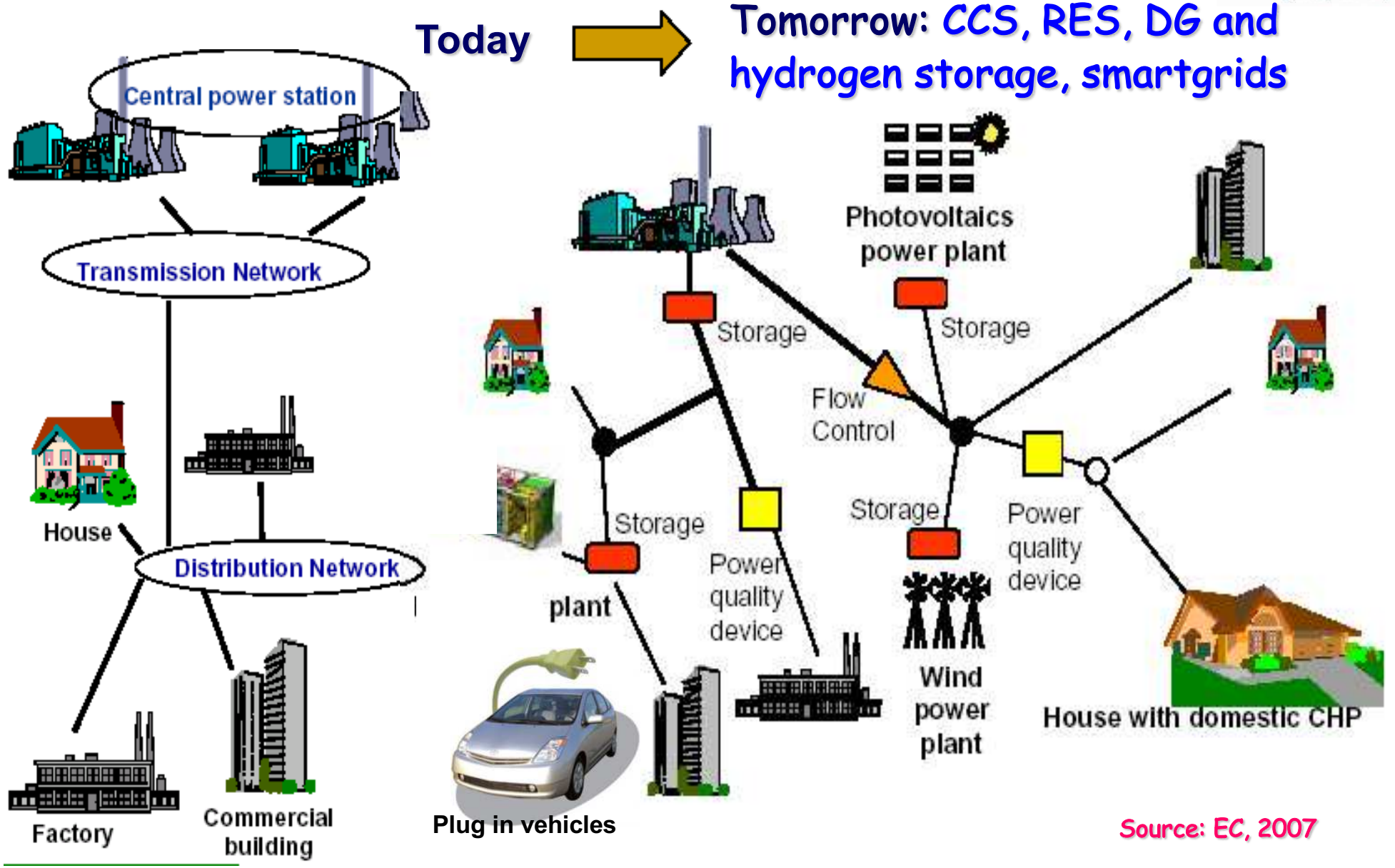


Future energy systems (optimistic scenario)

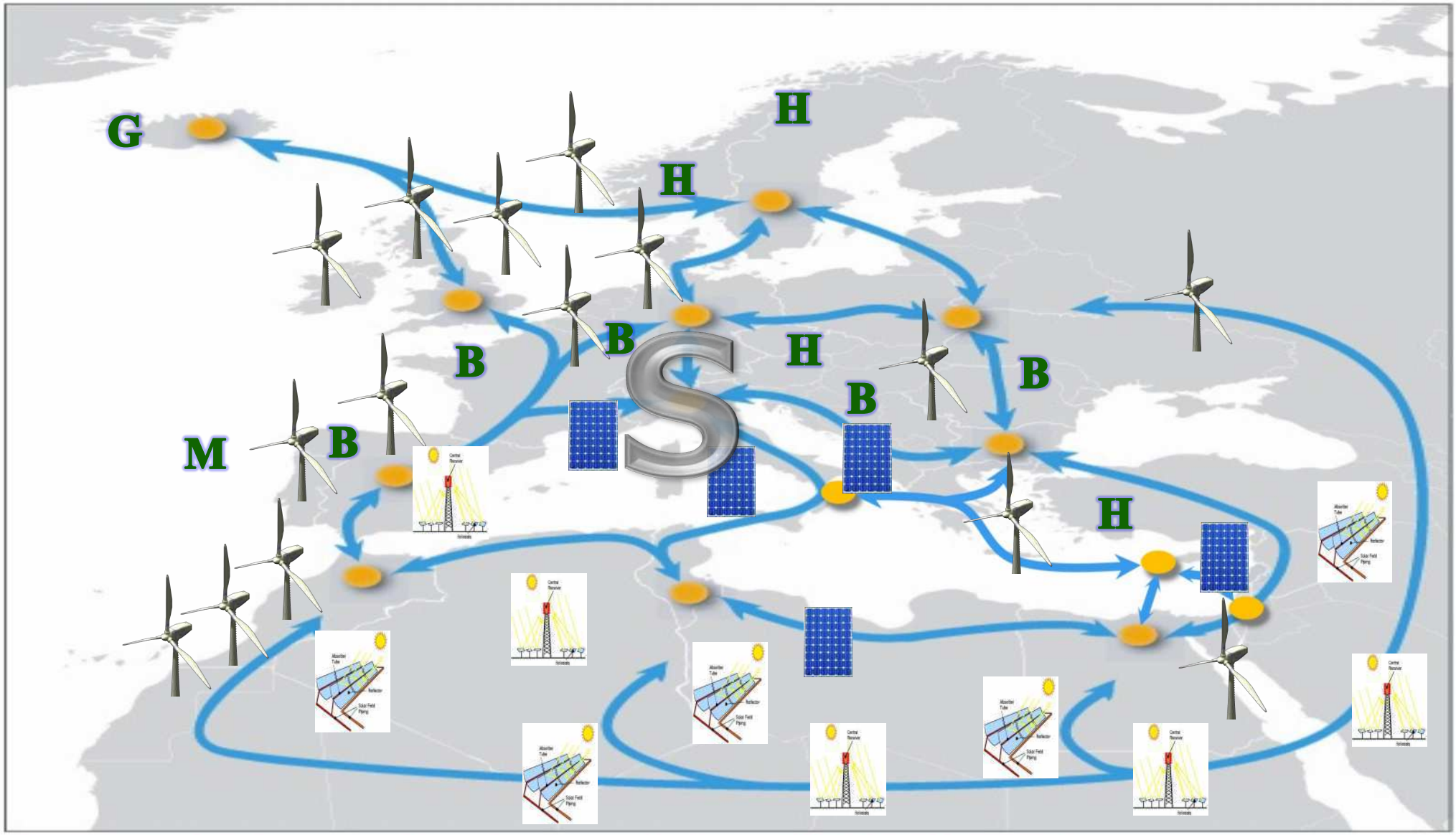
ρυθμιστική αρχή ενέργειας κύπρου
cyprus energy regulatory authority



Future power systems



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

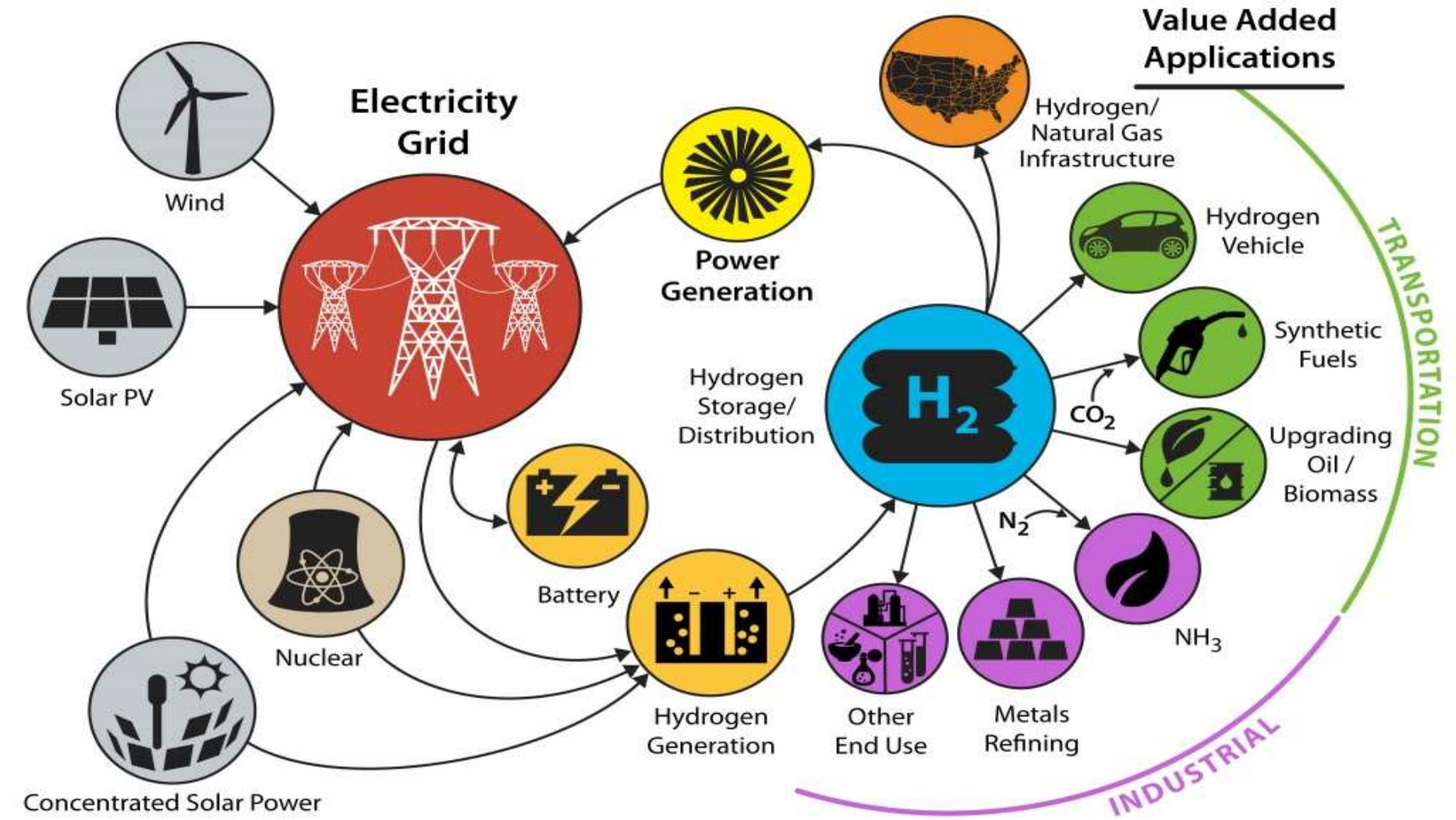


* Poullikkas A., 2013, *Sustainable Energy Development for Cyprus*, ISBN: 978-9963-7355-3-2

Repowering Europe, how to achieve EU energy independence through new emerging markets and green transition, EDS Summer University, Nicosia, 28 July 2022

Long term scenarios in Europe

Moving from Carbon economy to Hydrogen economy

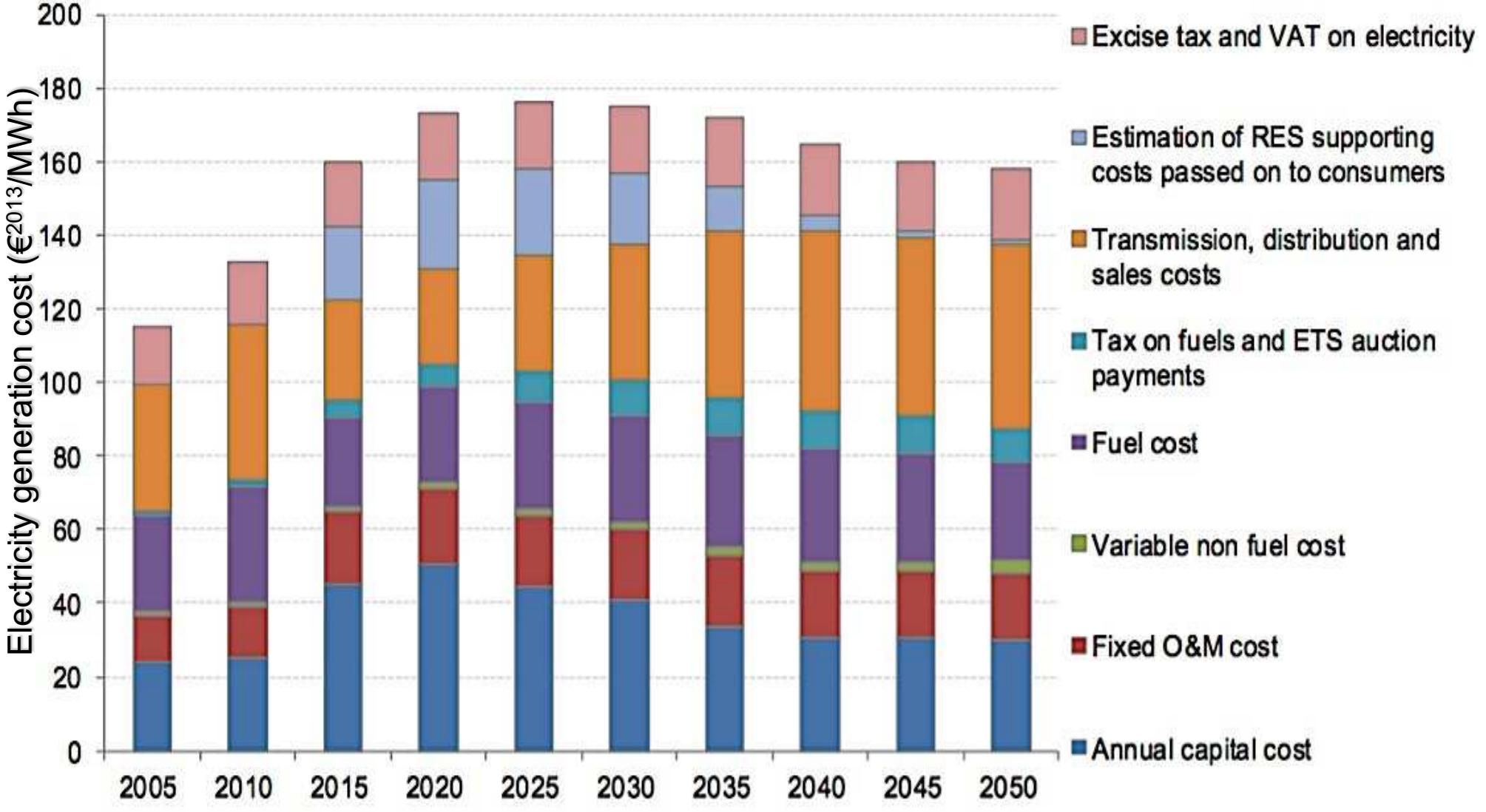


Additional Slides

The energy transition cost

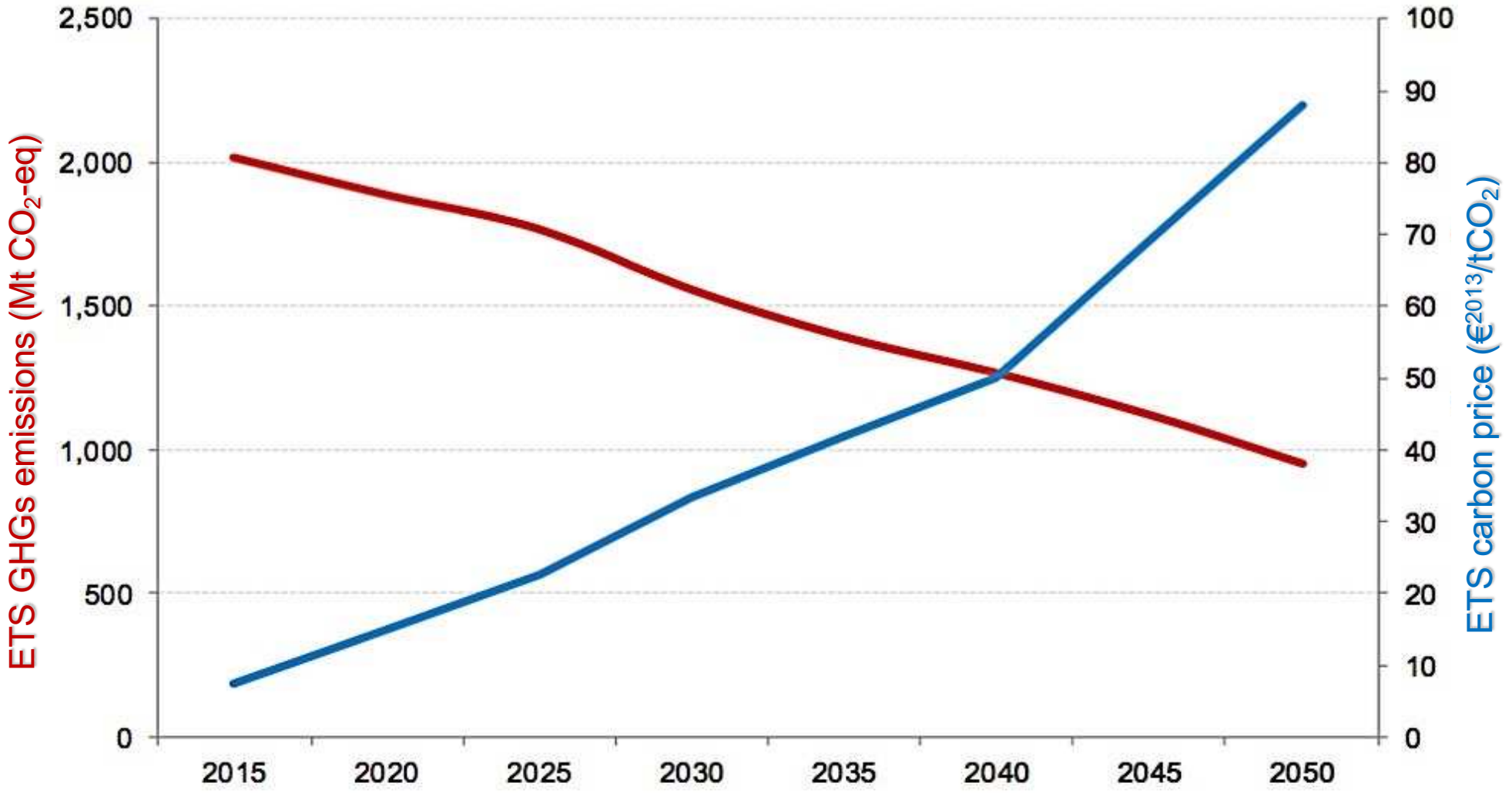
Towards 2050

EU reference scenario 2016



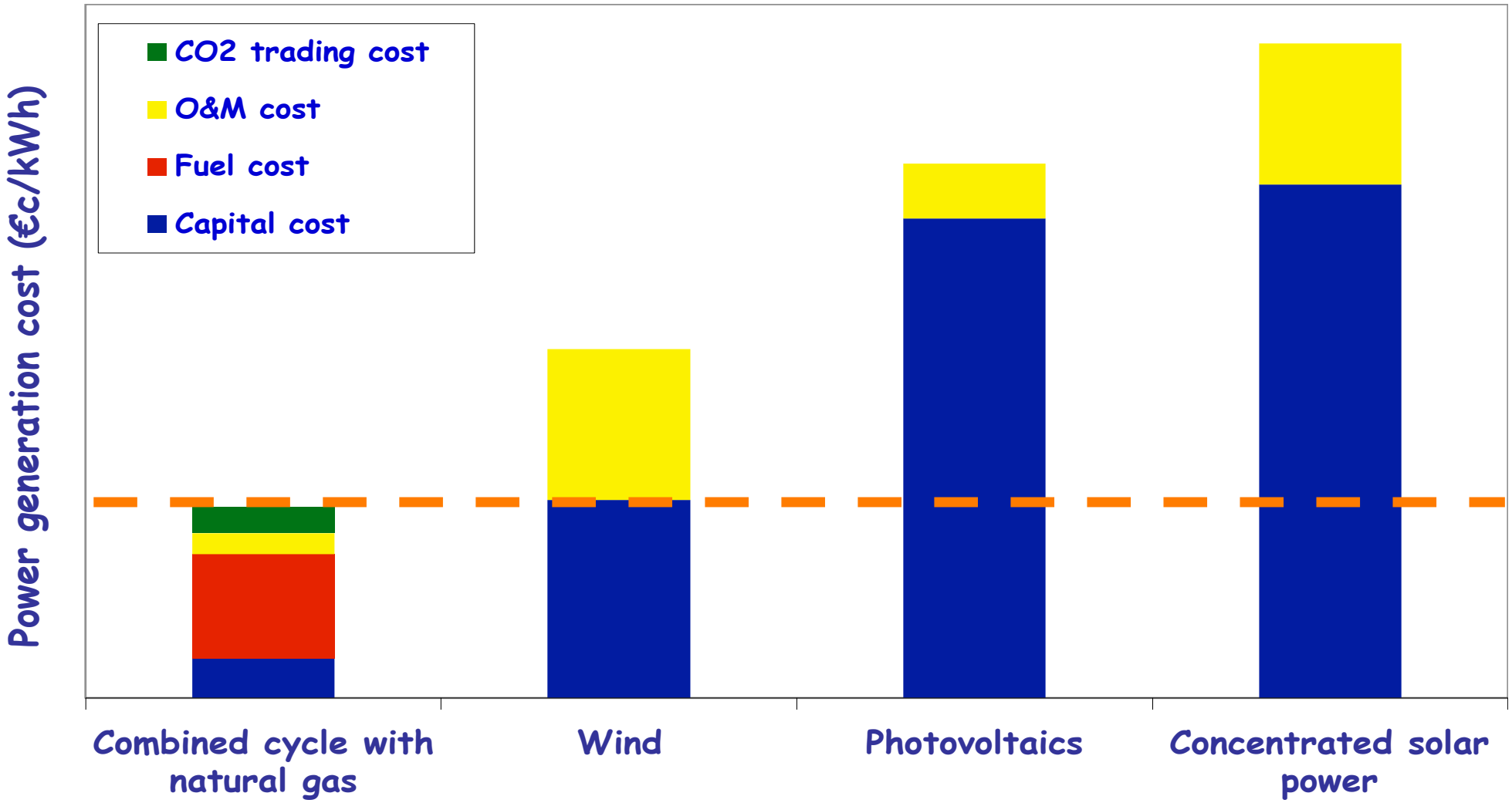
Source: PRIMES

EU reference scenario 2016



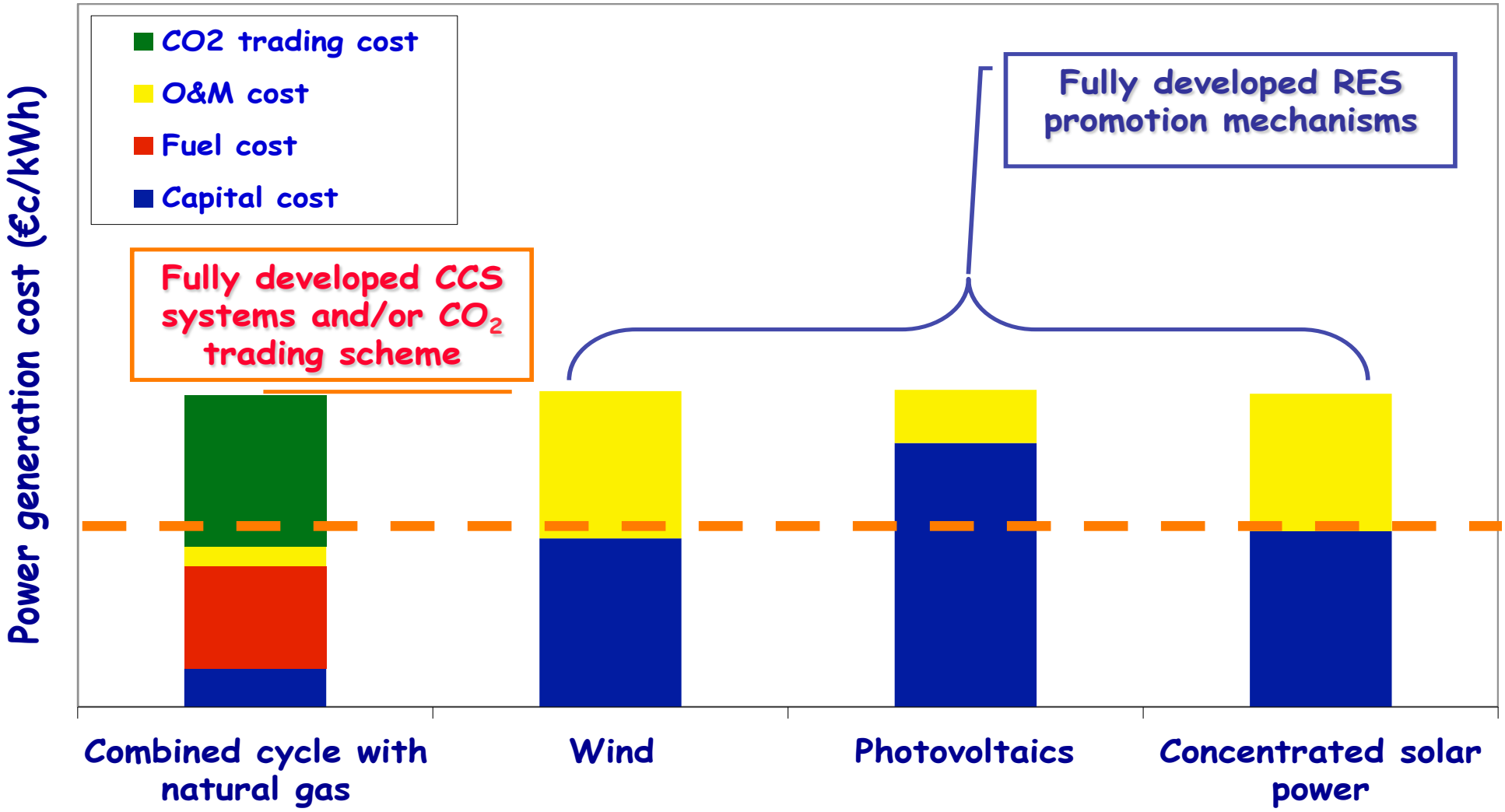
Source: PRIMES, GAINS

Power generation cost (year 2010)*



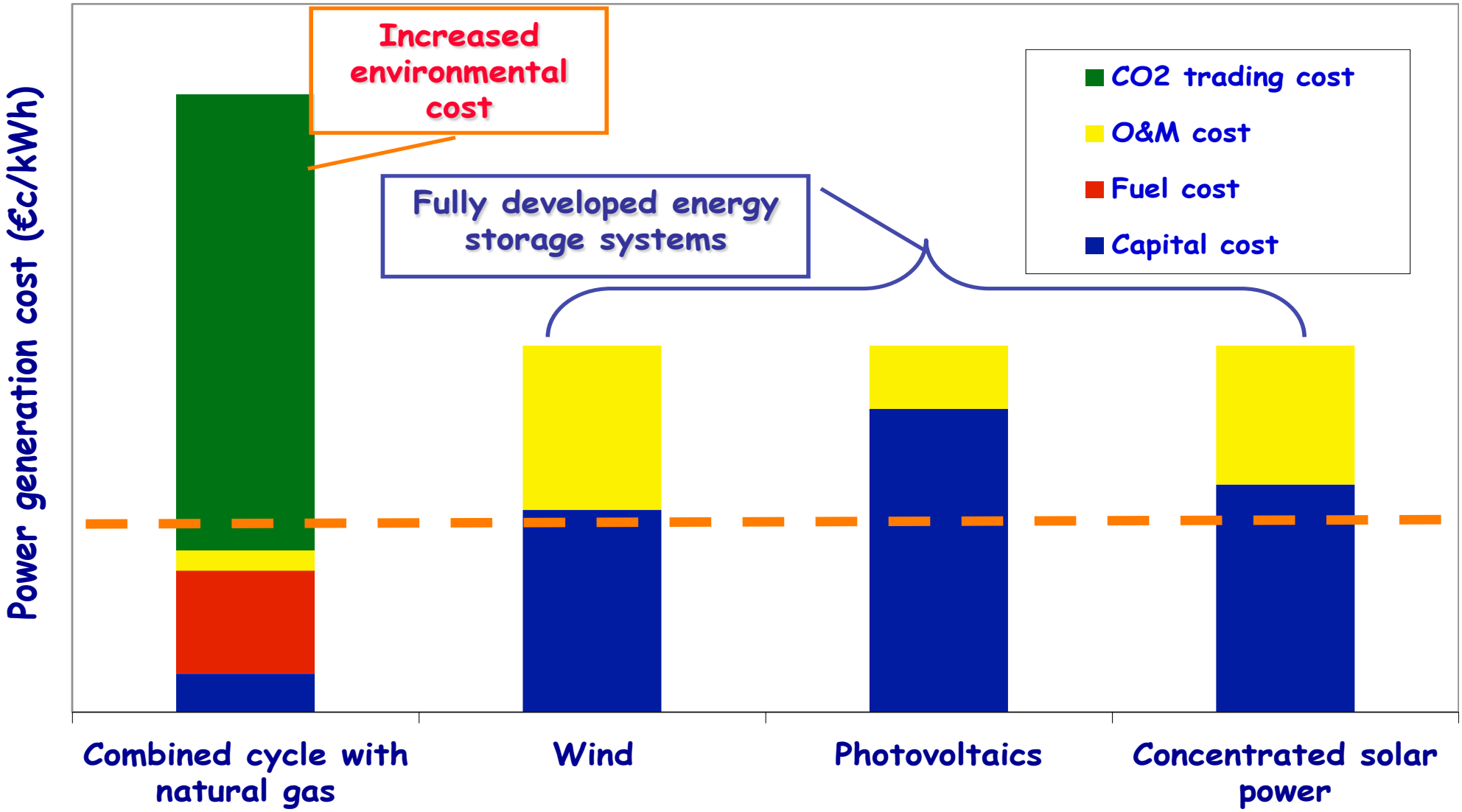
*** Poullikkas A., 2010, "The cost of integration of renewable energy sources", *Accountancy***

Power generation cost (year 2020-30)*



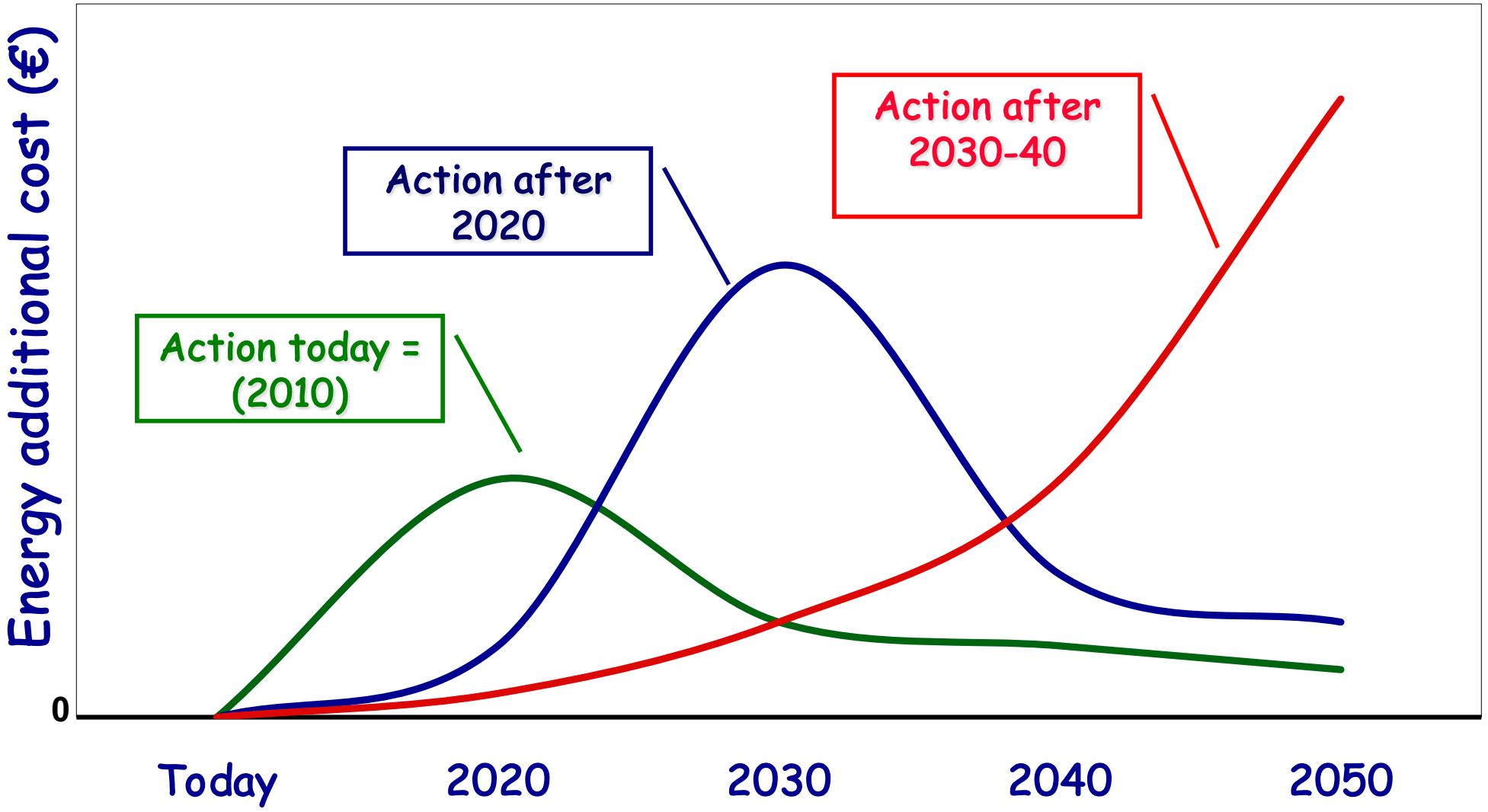
* Poullikkas A., 2010, "The cost of integration of renewable energy sources", *Accountancy*

Power generation cost (year 2040-50)*



* Poullikkas A., 2010, "The cost of integration of renewable energy sources", *Accountancy*

Future energy cost* (for EU only)



* Poullikkas A., 2010, "The cost of integration of renewable energy sources", *Accountancy*