



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

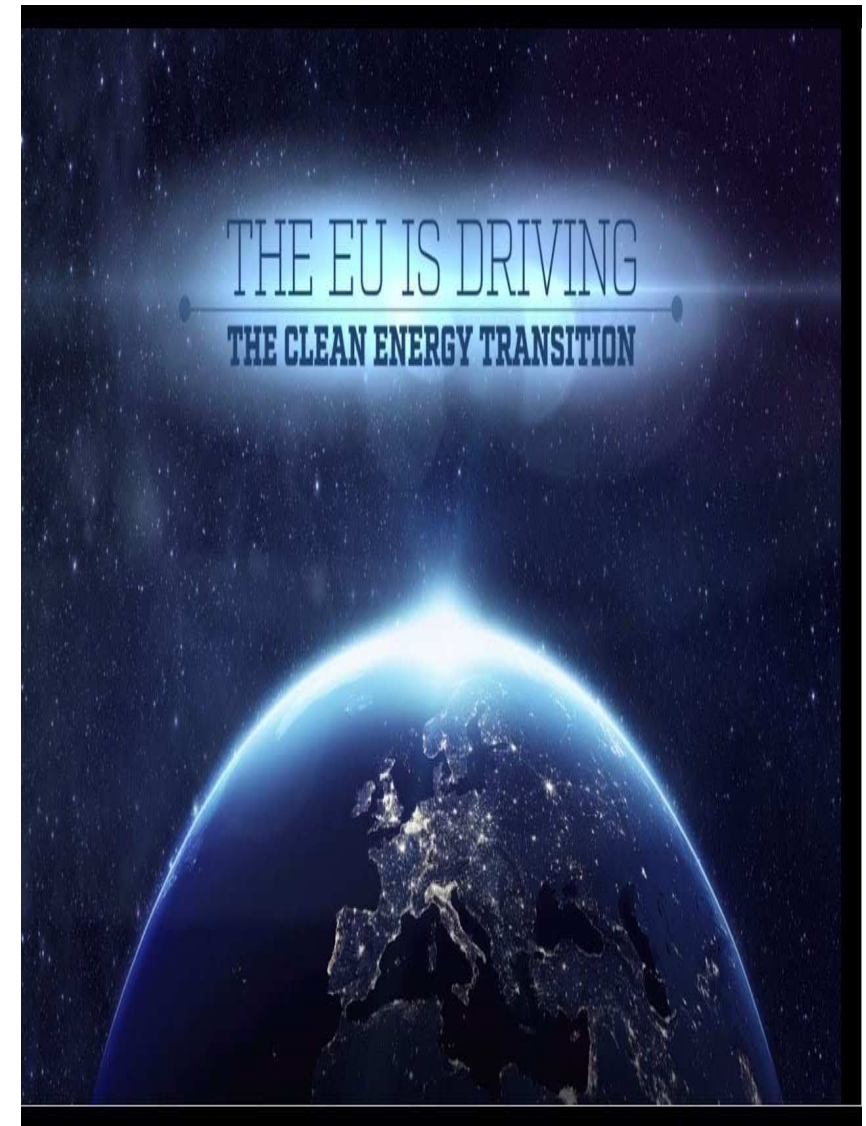
- **greenhouse gas reduction**
 - EU: climate neutral by 2050
- **sustainable production and consumption**
- **competition in electricity and natural gas markets**
- **security of supply**



Energy transition*

Need to:

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

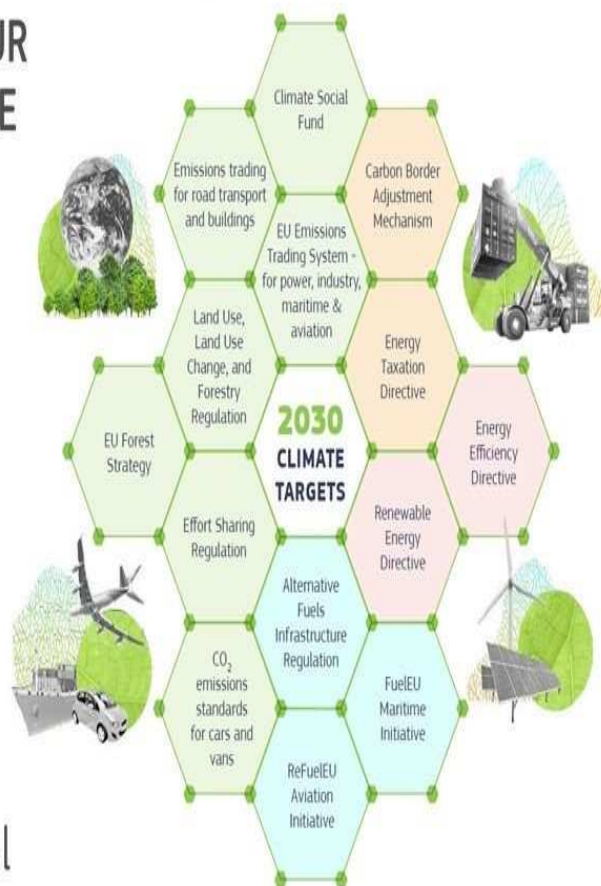


* Poullikkas A., 2013, *Renewable Energy: Economics, Emerging Technologies and Global Practices*, ISBN: 978-1-62618-231-8

The EU Green Deal and Fit-for-55

EUROPEAN GREEN DEAL

REACHING OUR
2030 CLIMATE
TARGETS



#EUGreenDeal

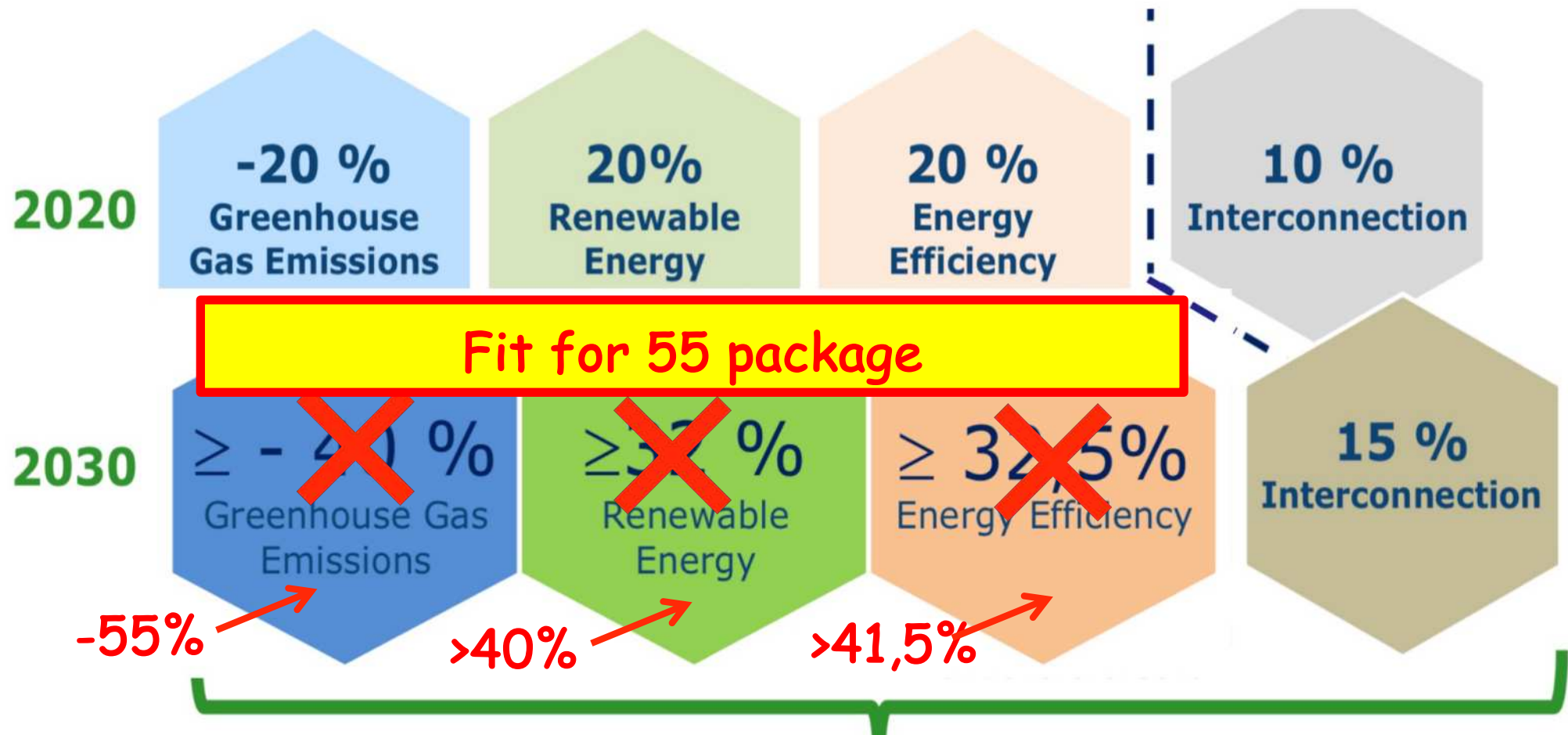


...to reach our
targets in a:

- socially fair
- cost-efficient
- competitive

way...

EU medium and long term targets

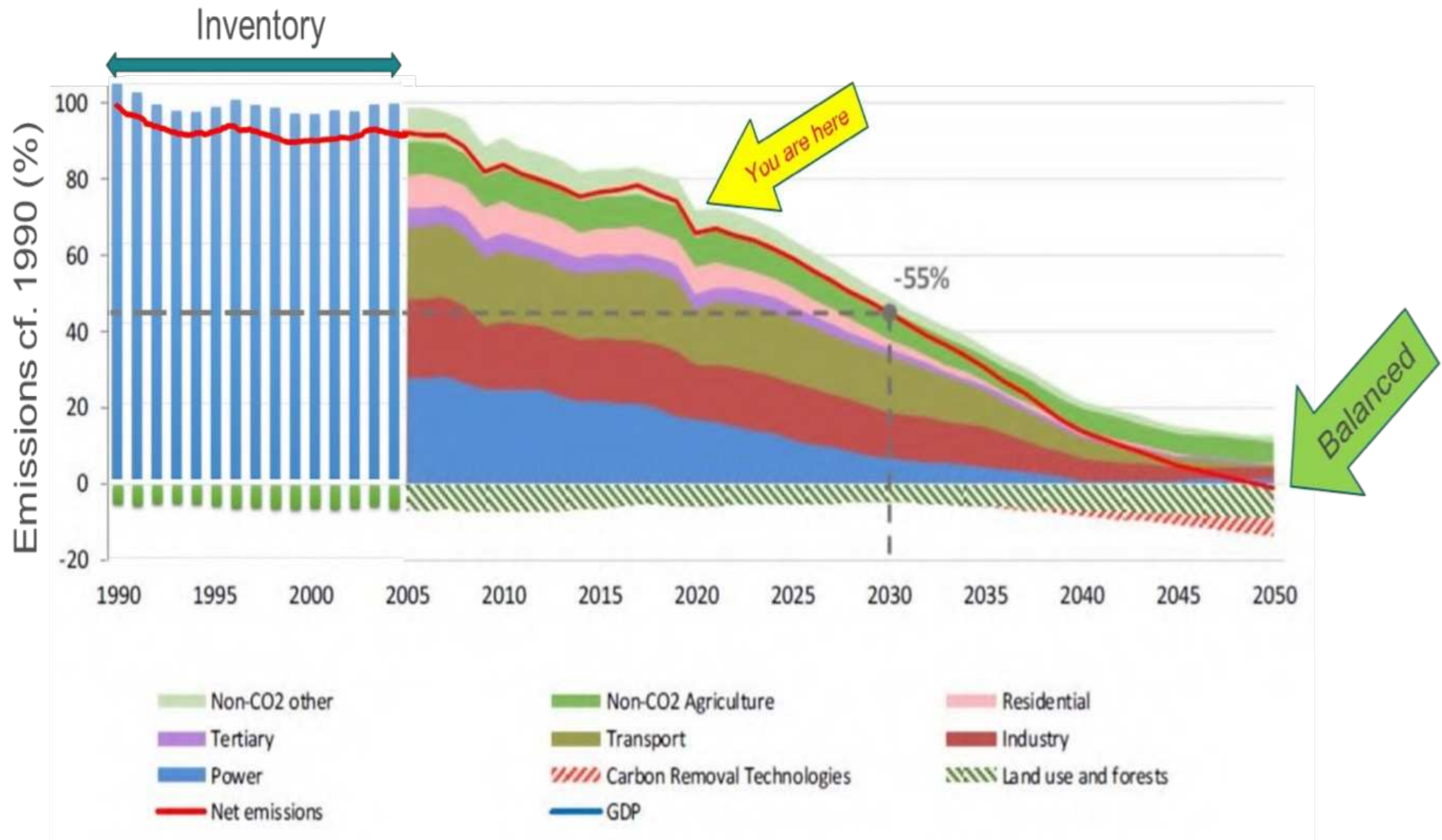


2050

Climate-Neutral

(an economy with net-zero greenhouse gas emissions)

Fit-for-55 strategy

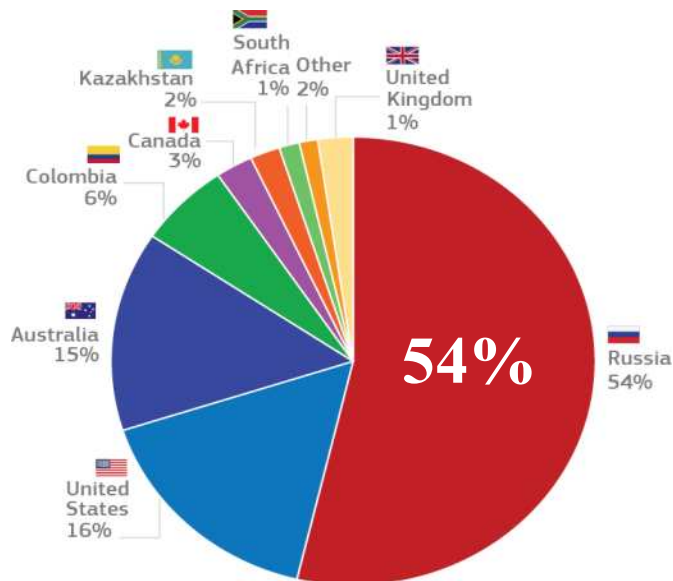


RePowerEU plan

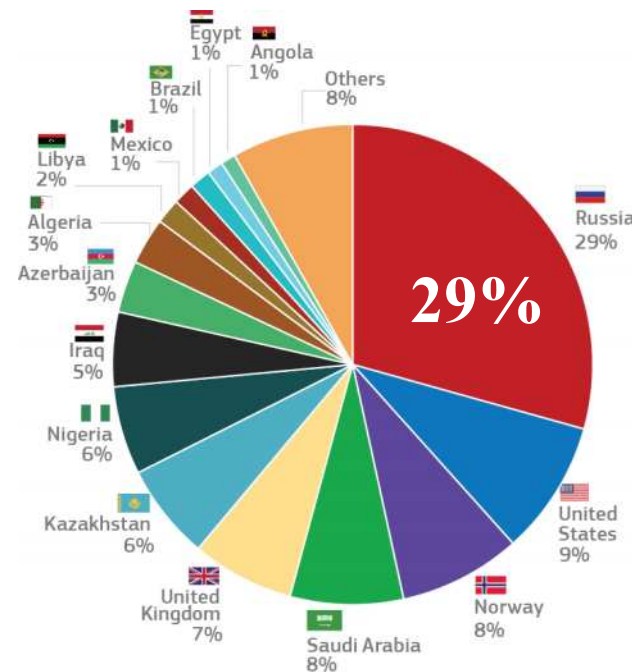
phase out dependency on Russian fossil fuels

EU energy import dependency on Russia (year 2021)

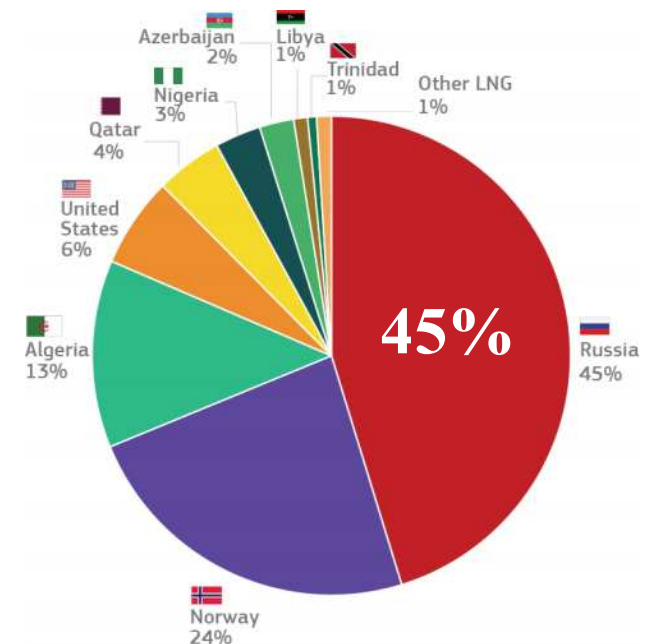
Coal



Oil



Natural gas (pipe and LNG)



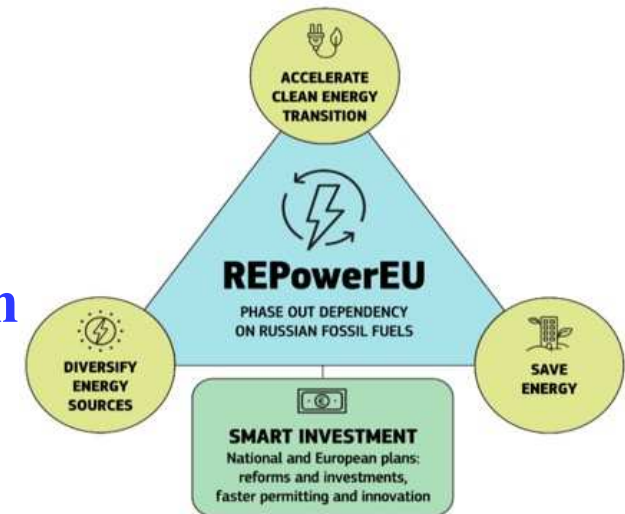
RePowerEU plan*

- 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

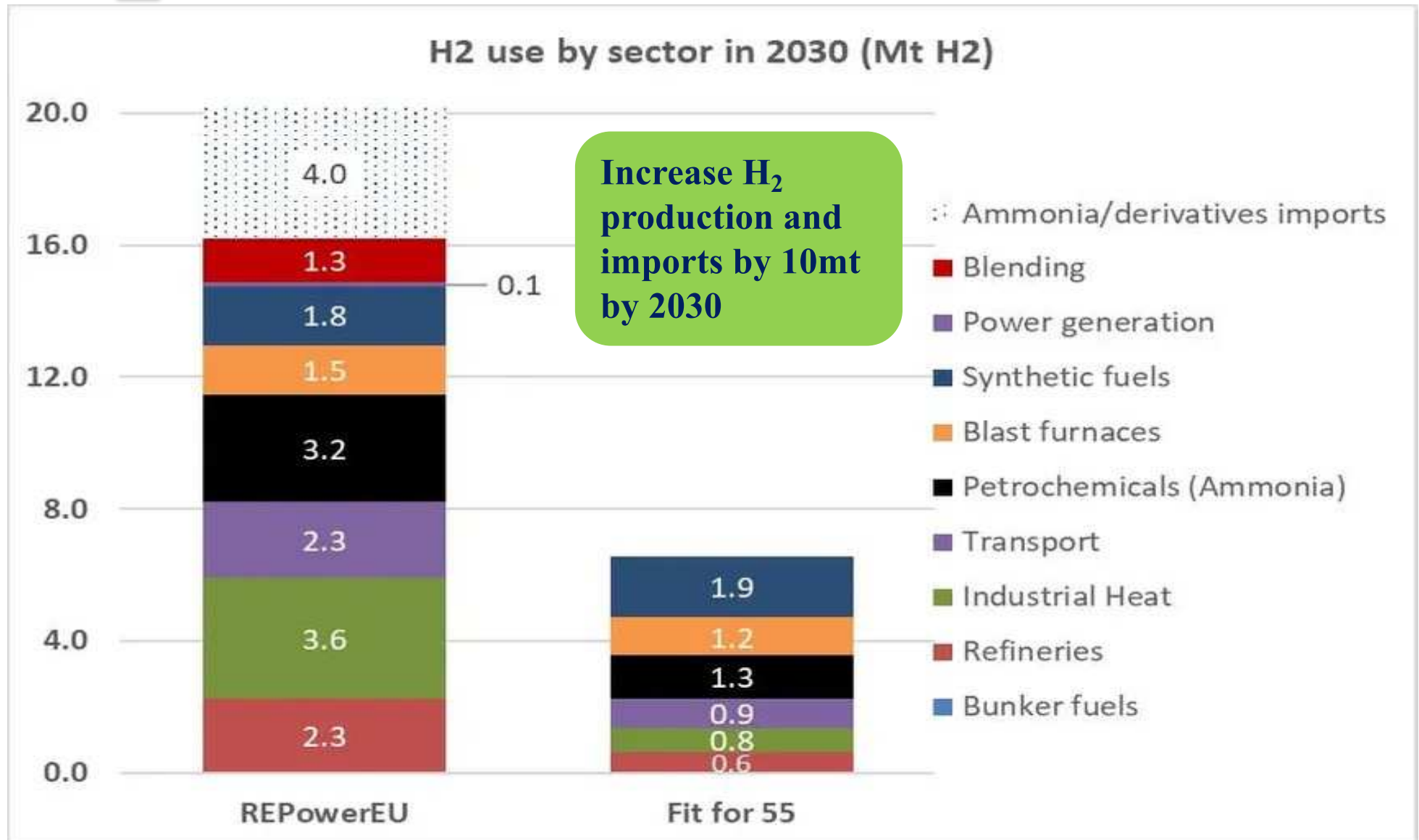
- Independence from Russian fossil fuels by 2027
- Increase imports of LNG by 50 bcm
- Increase pipeline natural gas imports by 10 bcm
- Increase biomethane production by 3.5 bcm
- EU-wide energy saving to cut gas demand by 14 bcm
- Rooftop solar to reduce gas demand by 2.5 bcm
- Heat pumps to reduce 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

H₂ accelerator*



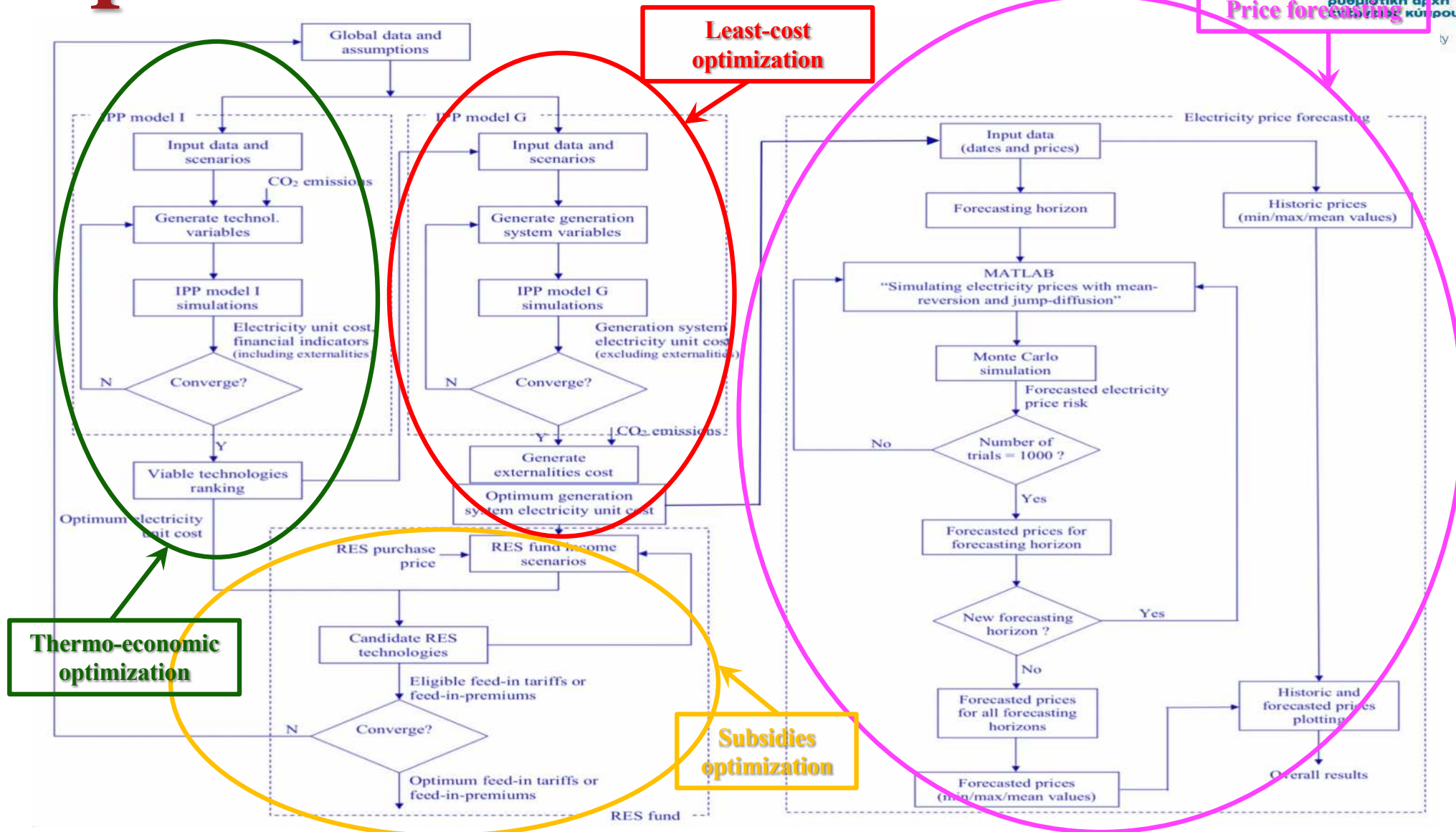
* RePowerEU Plan, EU, 2022

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

Optimization model*



Ευρωπαϊκή ατζέντα
Ευρωπαϊκή κλίμα



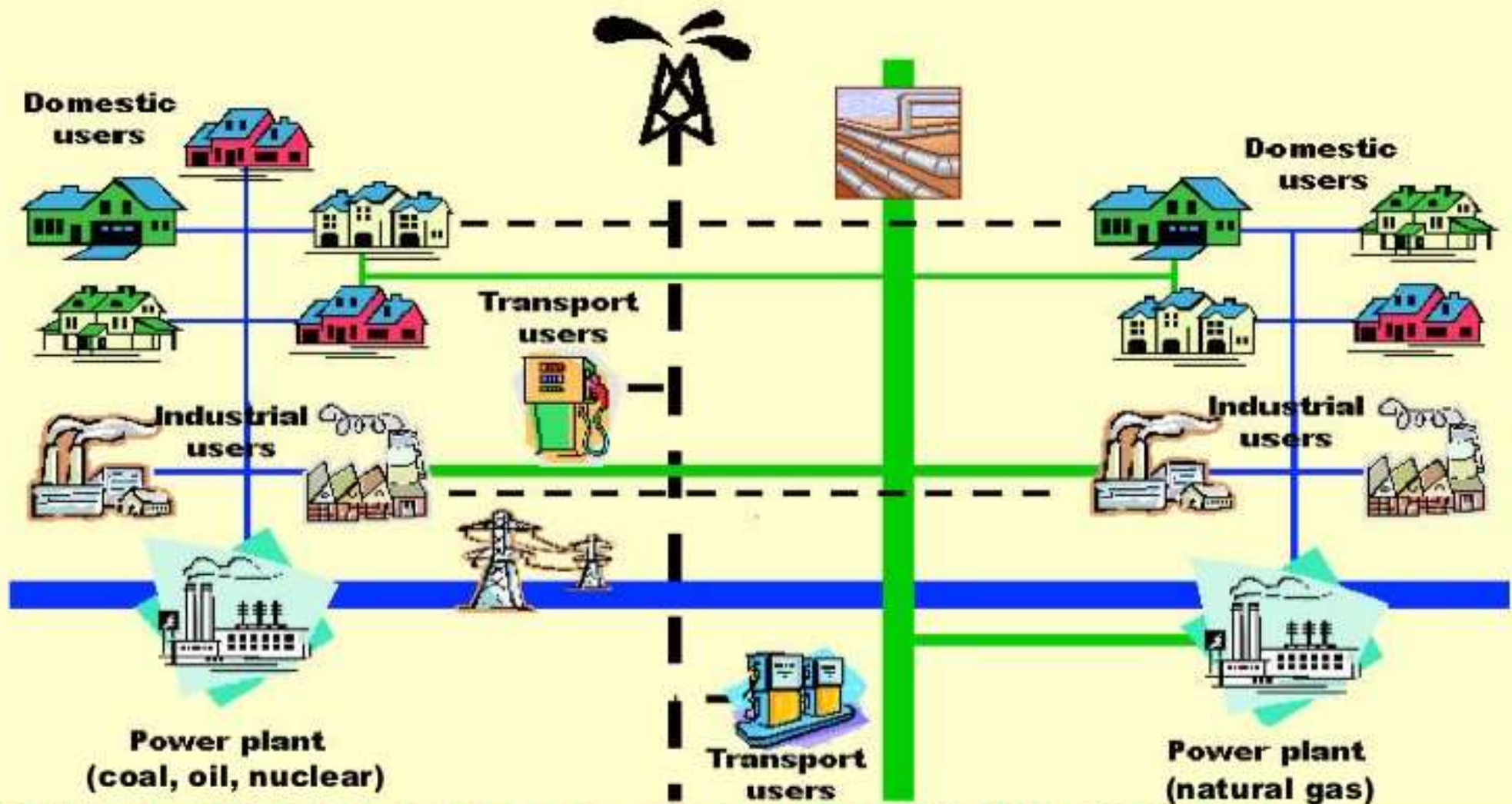
* Poullikkas A., 2018, "An adaptive longterm electricity price risk modelling using Monte Carlo simulation", *Journal of Power Technologies*

Long term scenarios

from carbon economy to hydrogen economy

Energy system in 2010

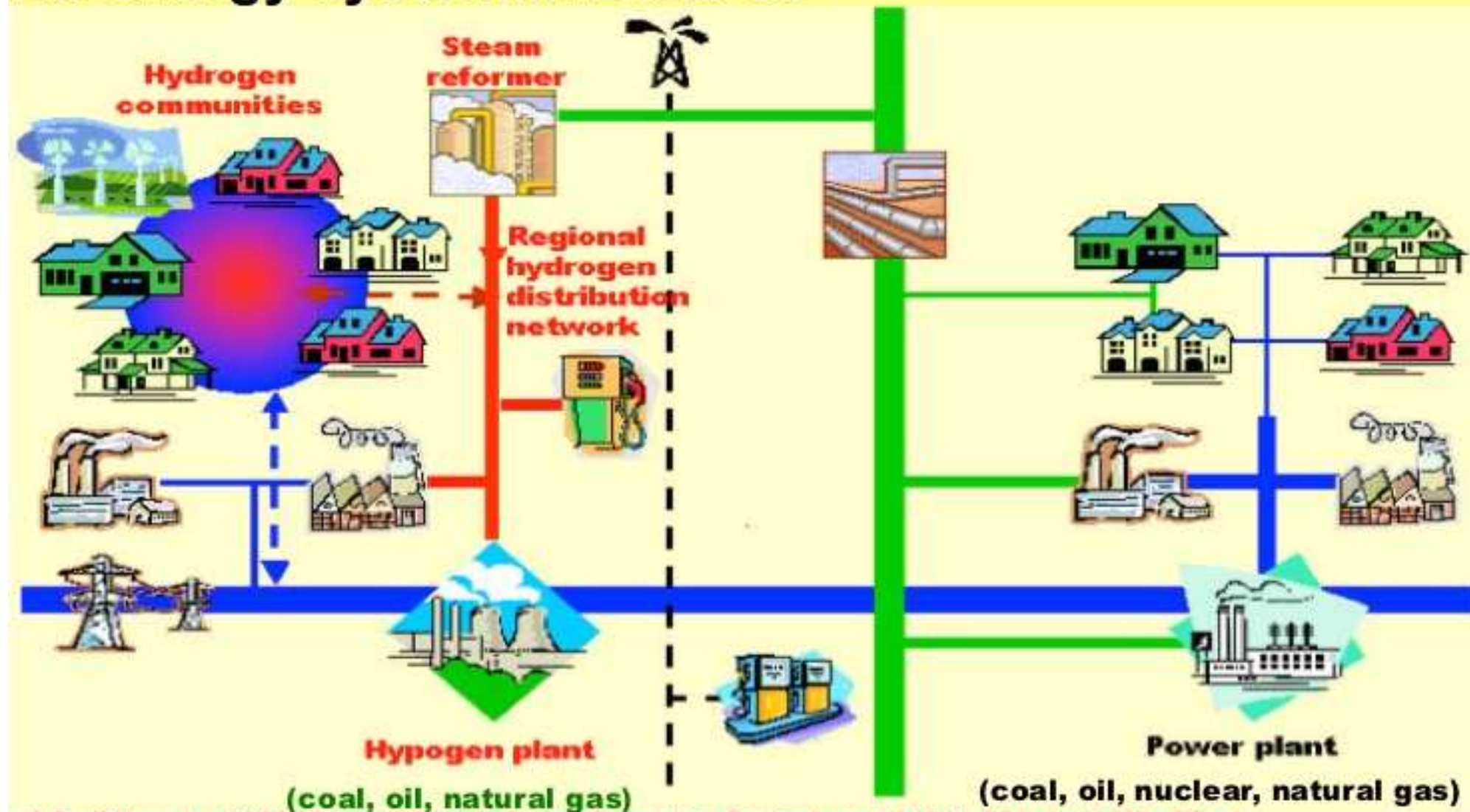
EU energy system in 2010*



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

Future energy systems (optimistic scenario)

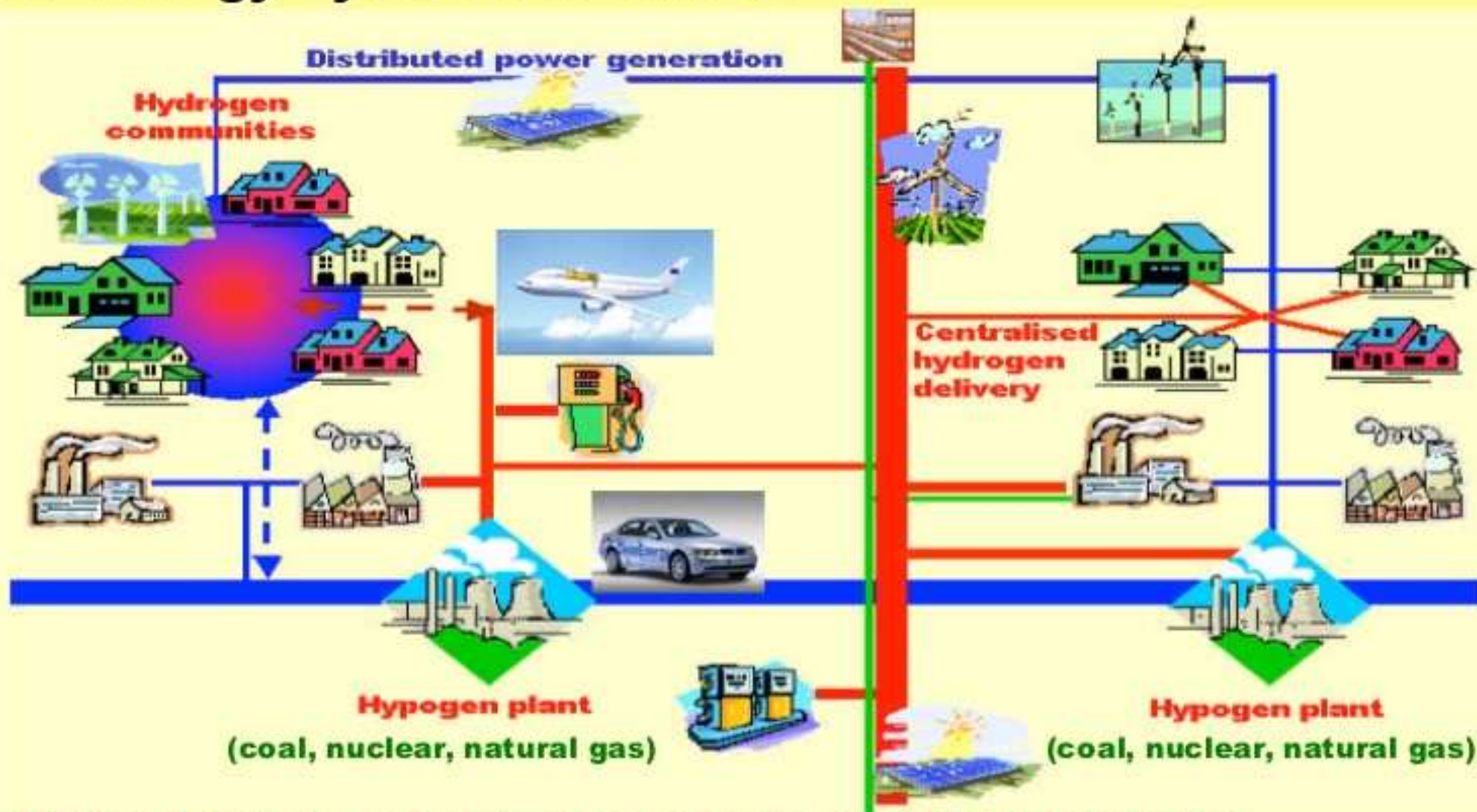
EU energy system in 2020-30*



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

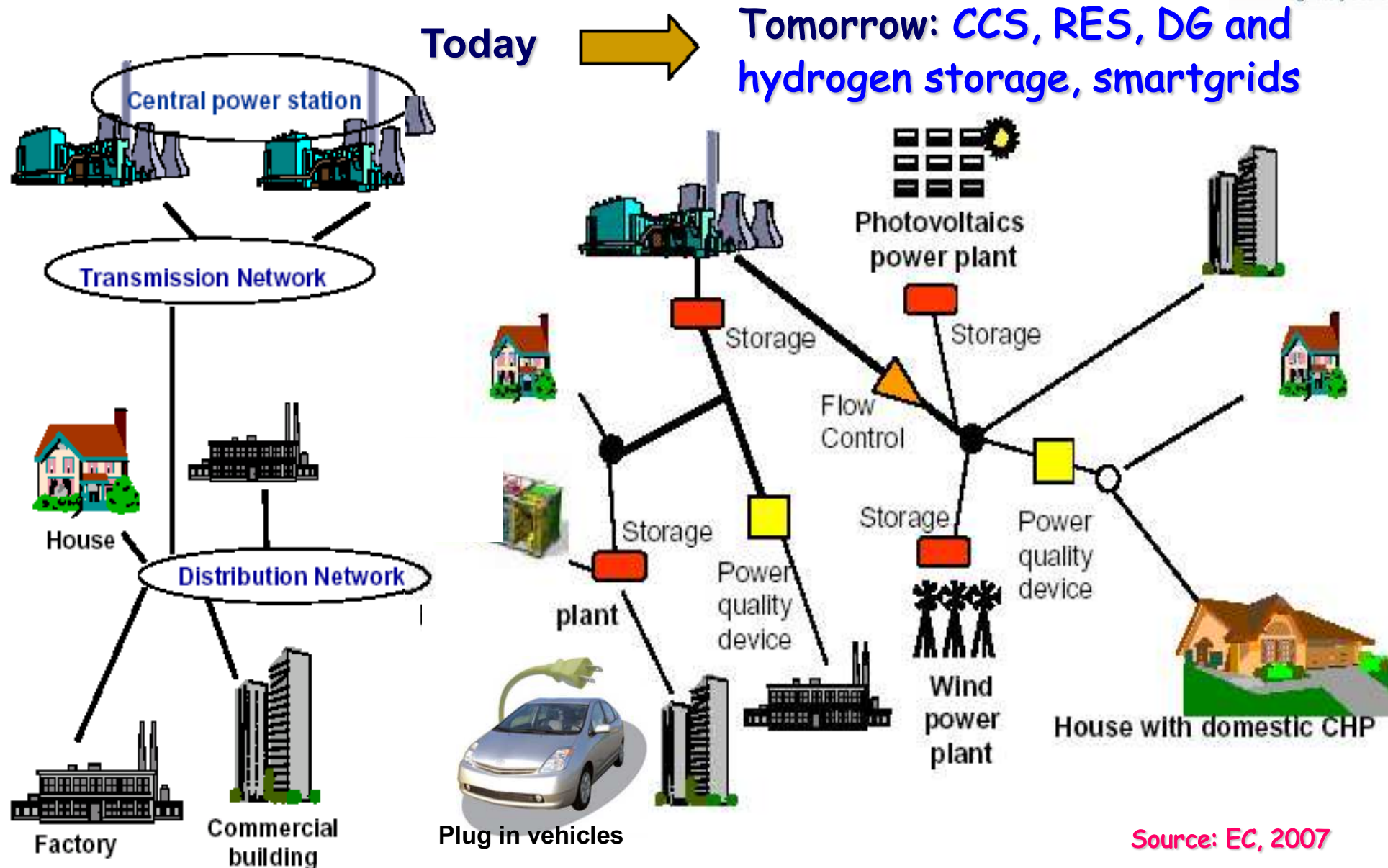
Future energy systems (optimistic scenario)

EU energy system in 2040-50*



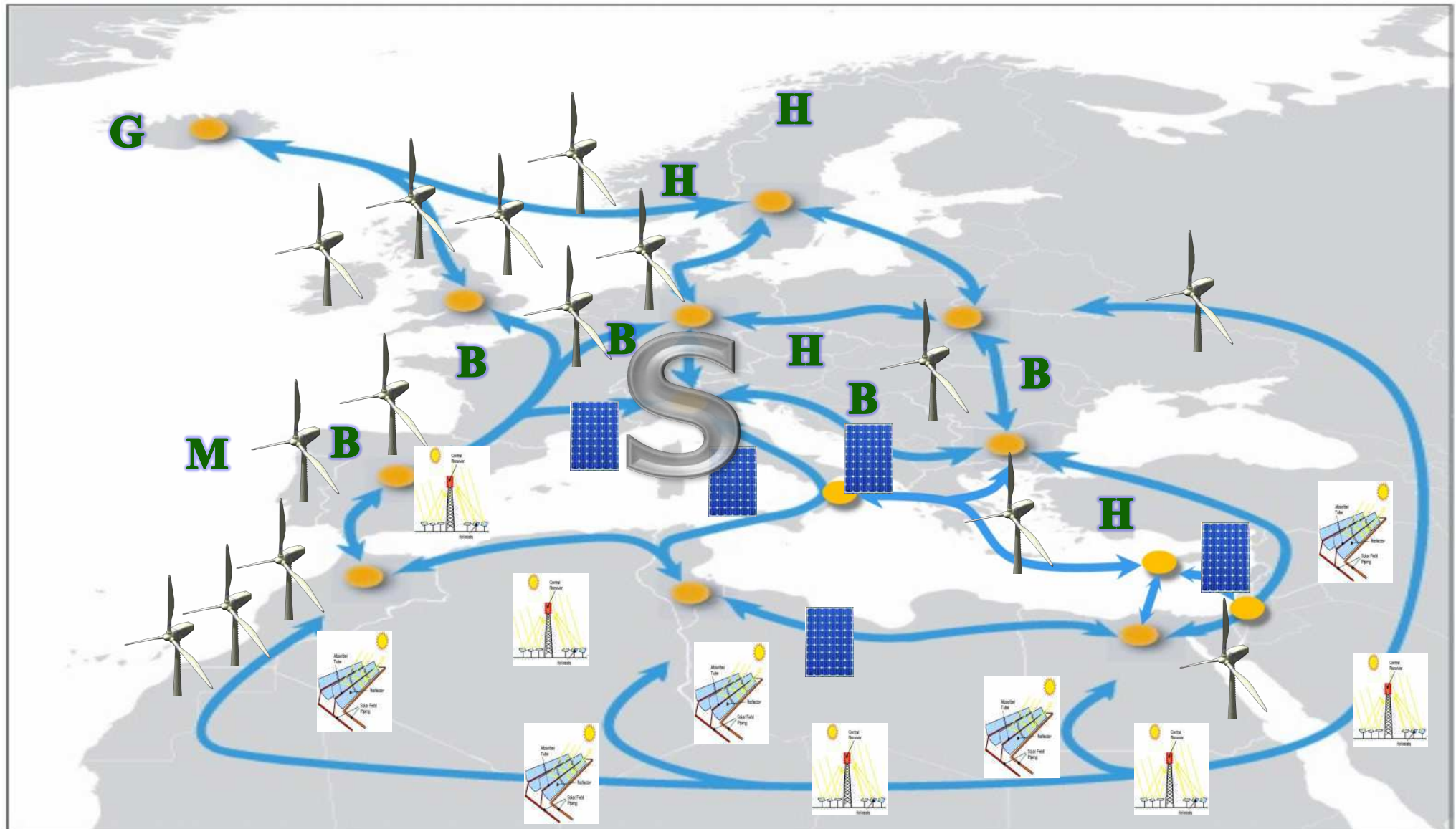
* Poullikkas A., 2009, *Introduction to Power Generation Technologies*, ISBN: 978-1-60876-472-3

Future power systems



The Super Smart Grid after 2050*

(may allow for 100% RES)

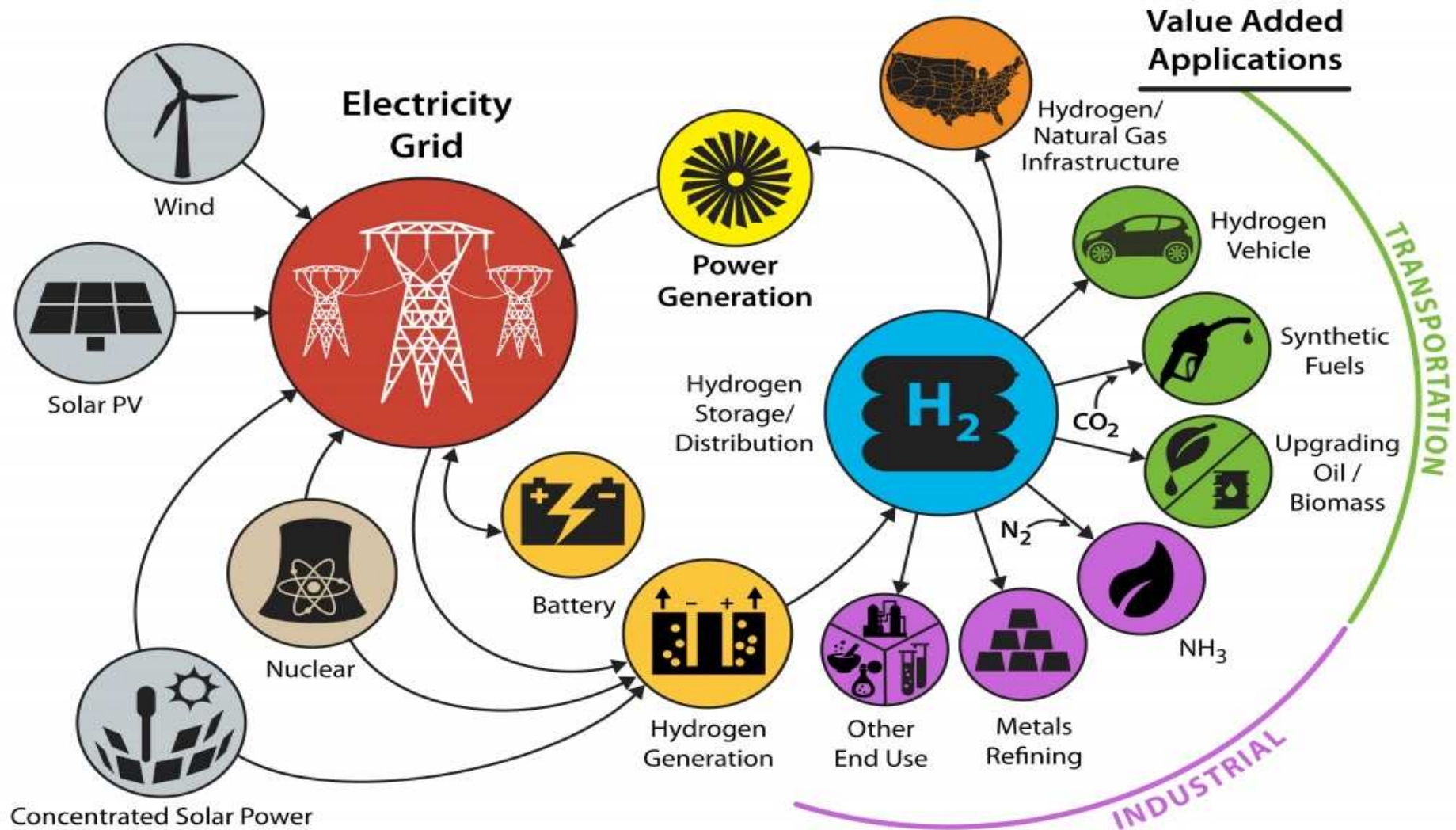


* Poullikkas A., 2013, *Sustainable Energy Development for Cyprus*, ISBN: 978-9963-7355-3-2

Repowering Europe, how to achieve E.U 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

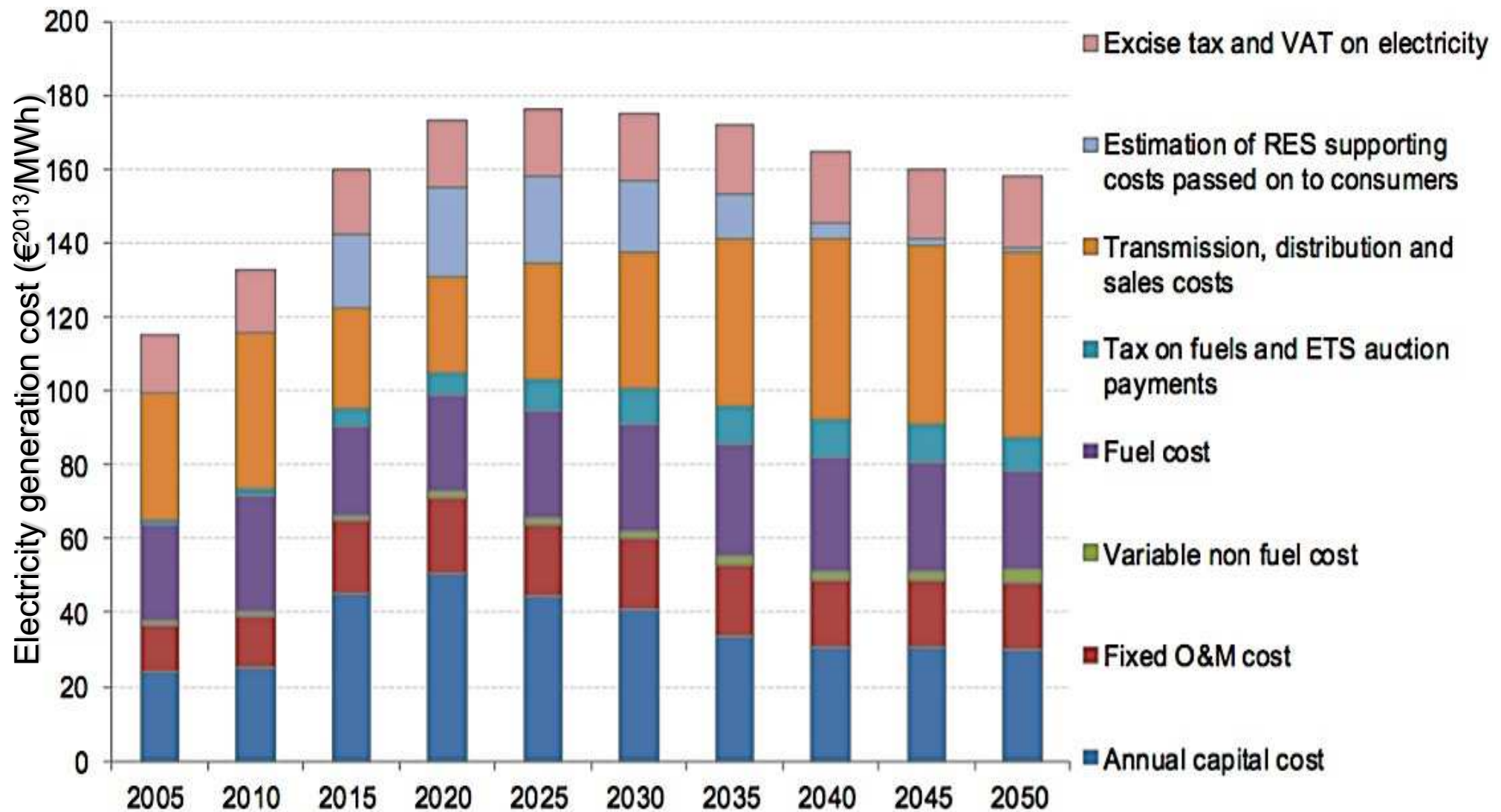


Additional Slides

The energy transition cost

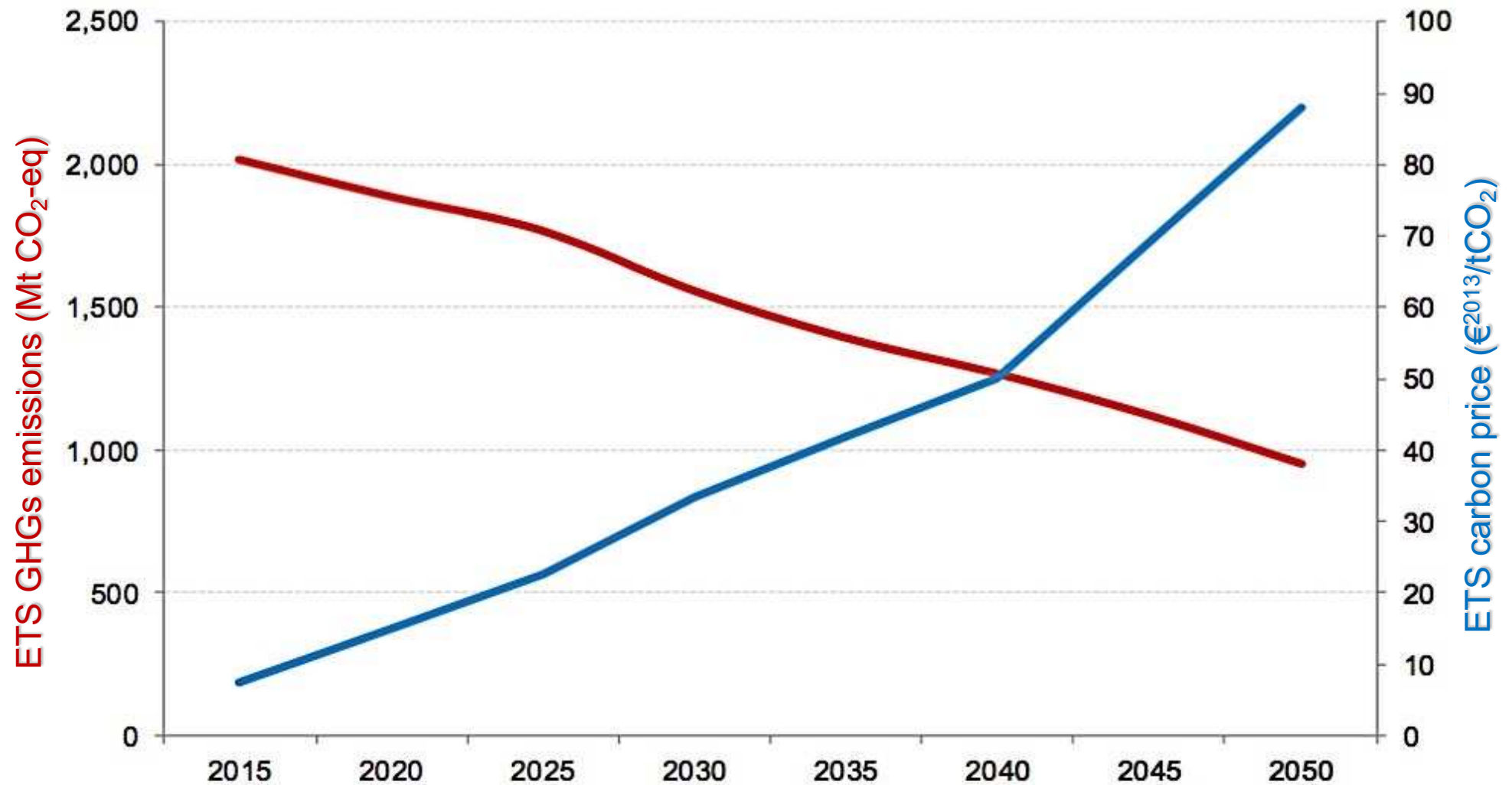
Towards 2050

EU reference scenario 2016



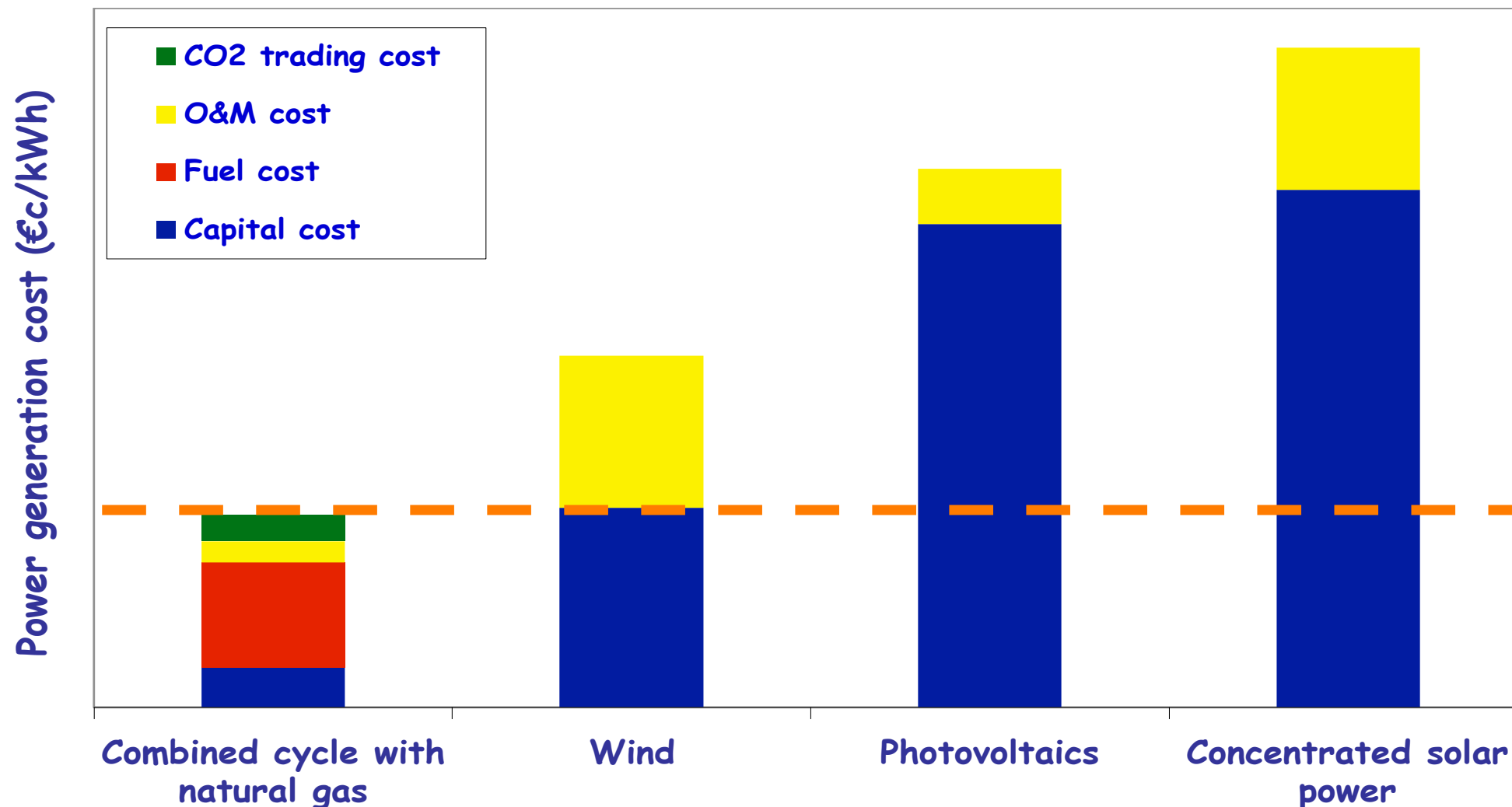
Source: PRIMES

EU reference scenario 2016



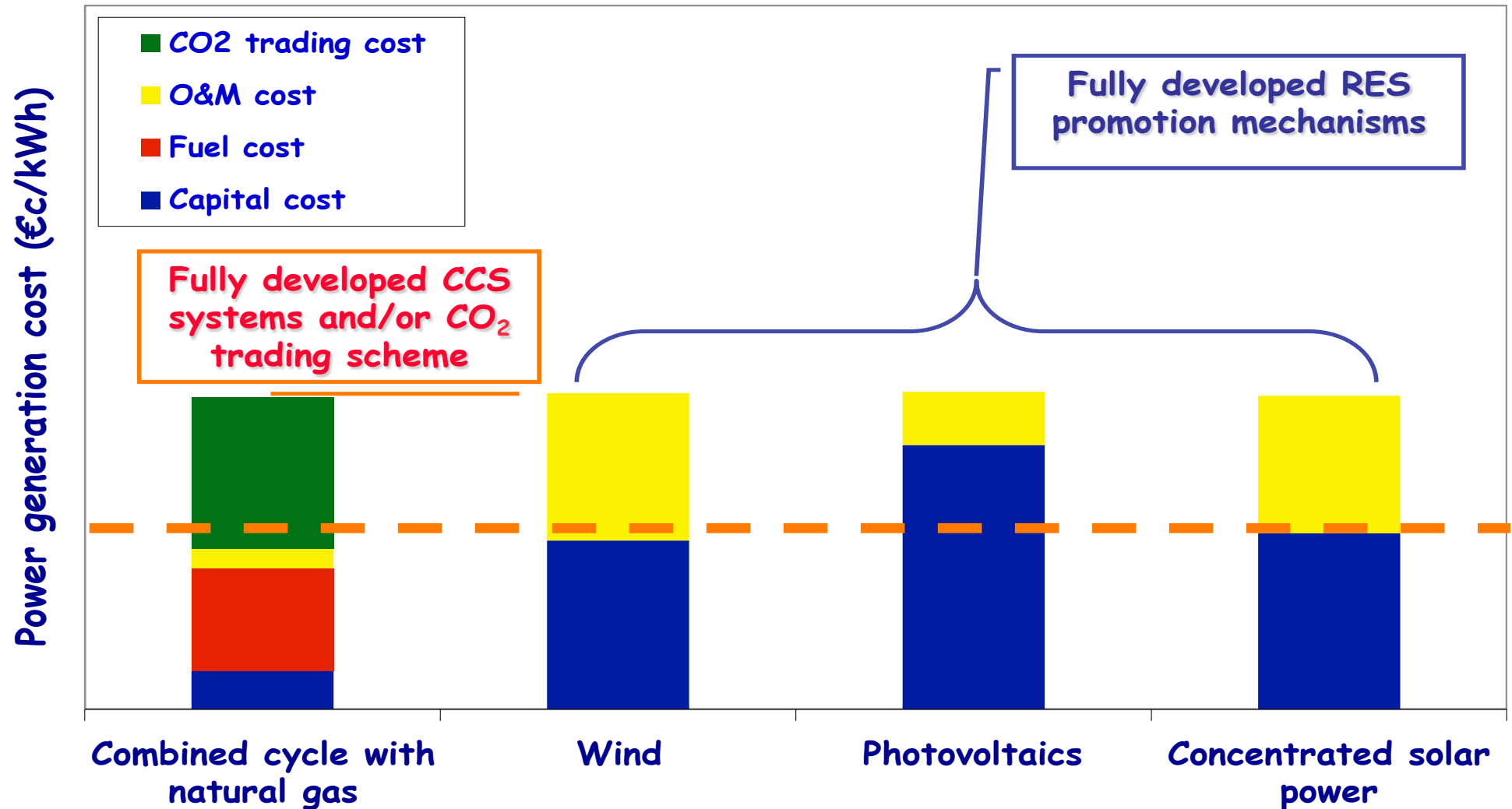
Source: PRIMES, GAINS

Power generation cost (year 2010)*



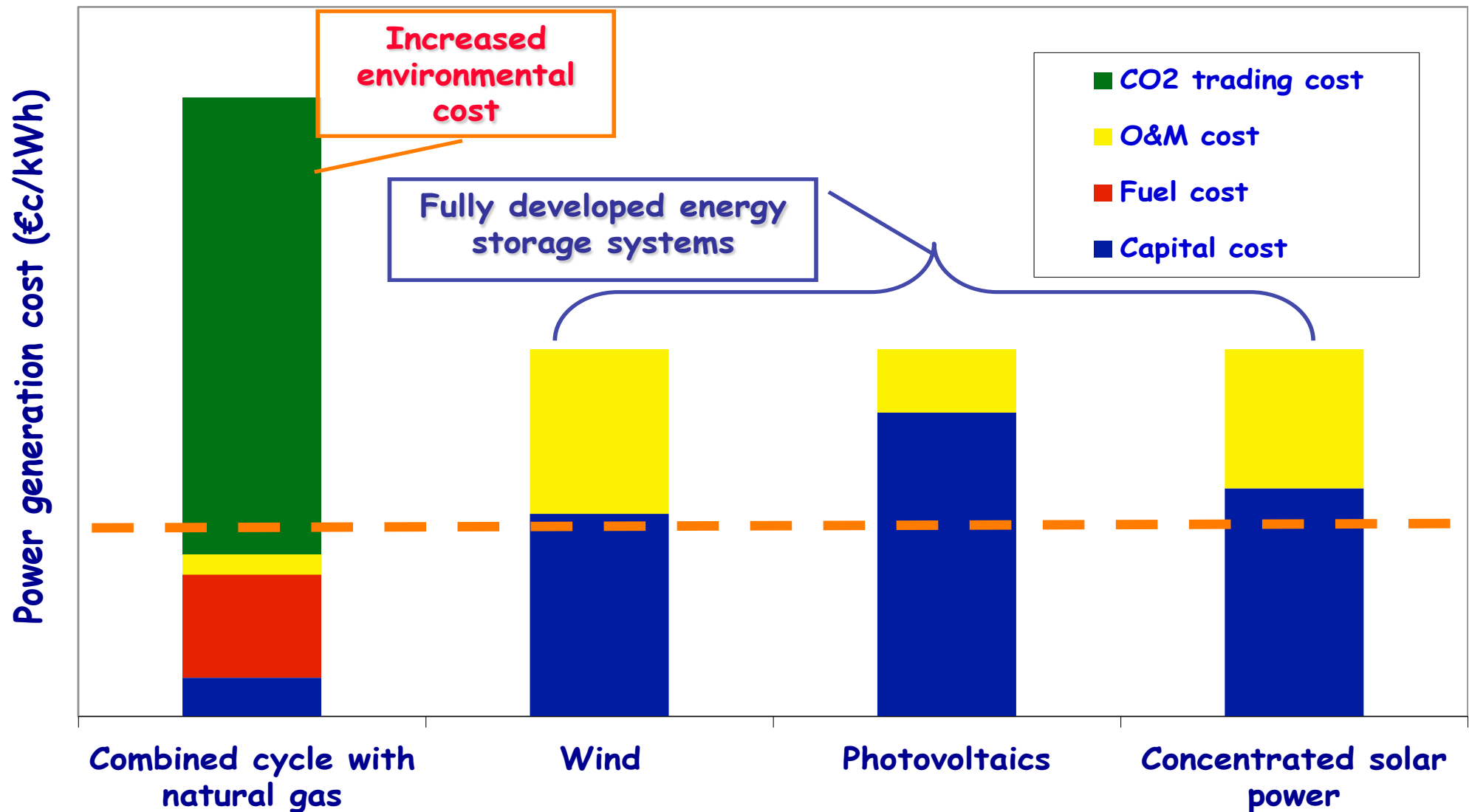
* Poullikkas A., 2010, "The cost of integration of renewable energy sources", Accountancy

Power generation cost (year 2020-30)*



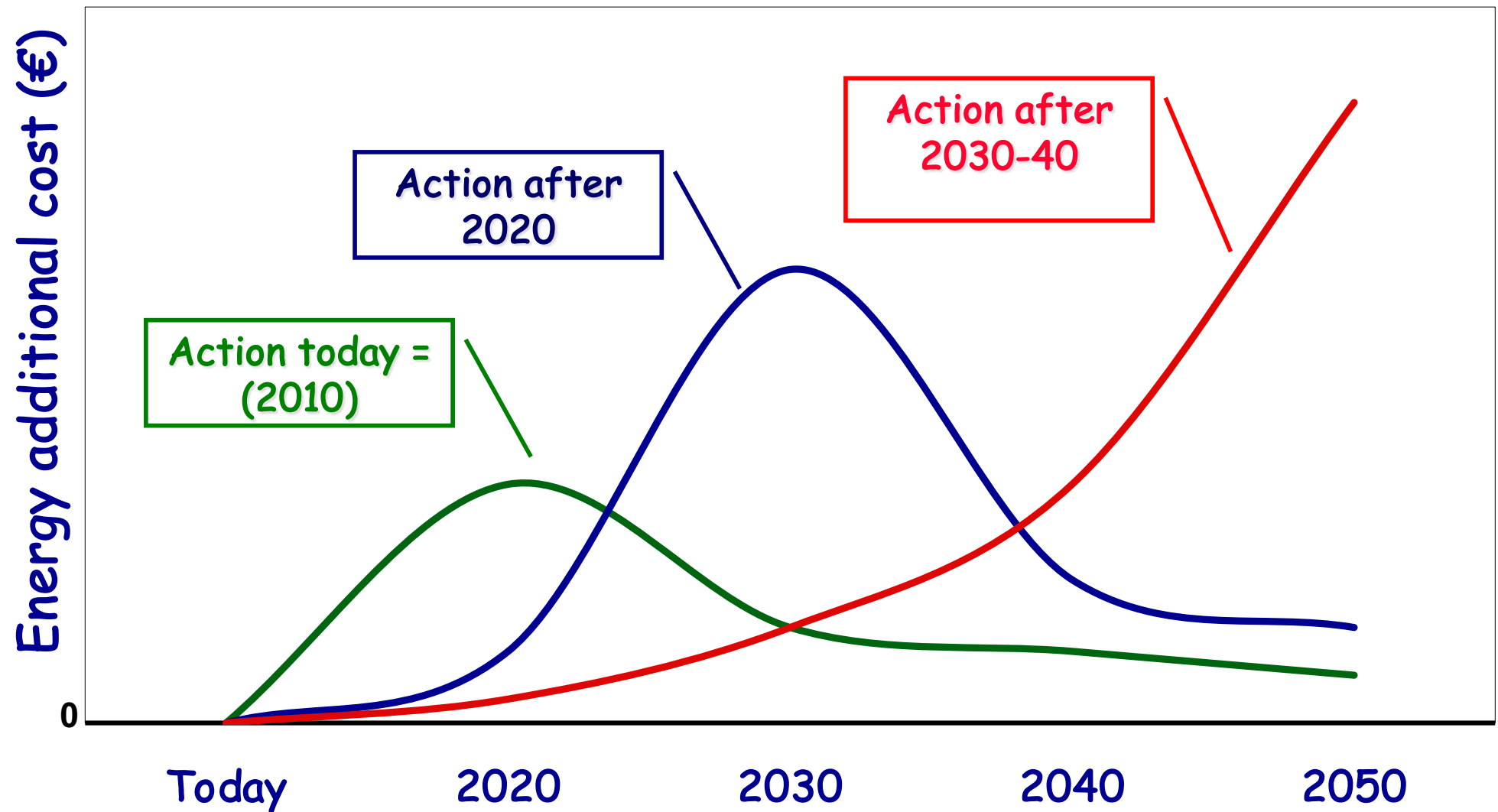
* Poullikkas A., 2010, "The cost of integration of renewable energy sources", Accountancy

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