ρυθμιστική αρχή ενέργειας κύπρου
cyprus energy regulatory authority

Plenary Speech

Energy transition towards hydrogen economy

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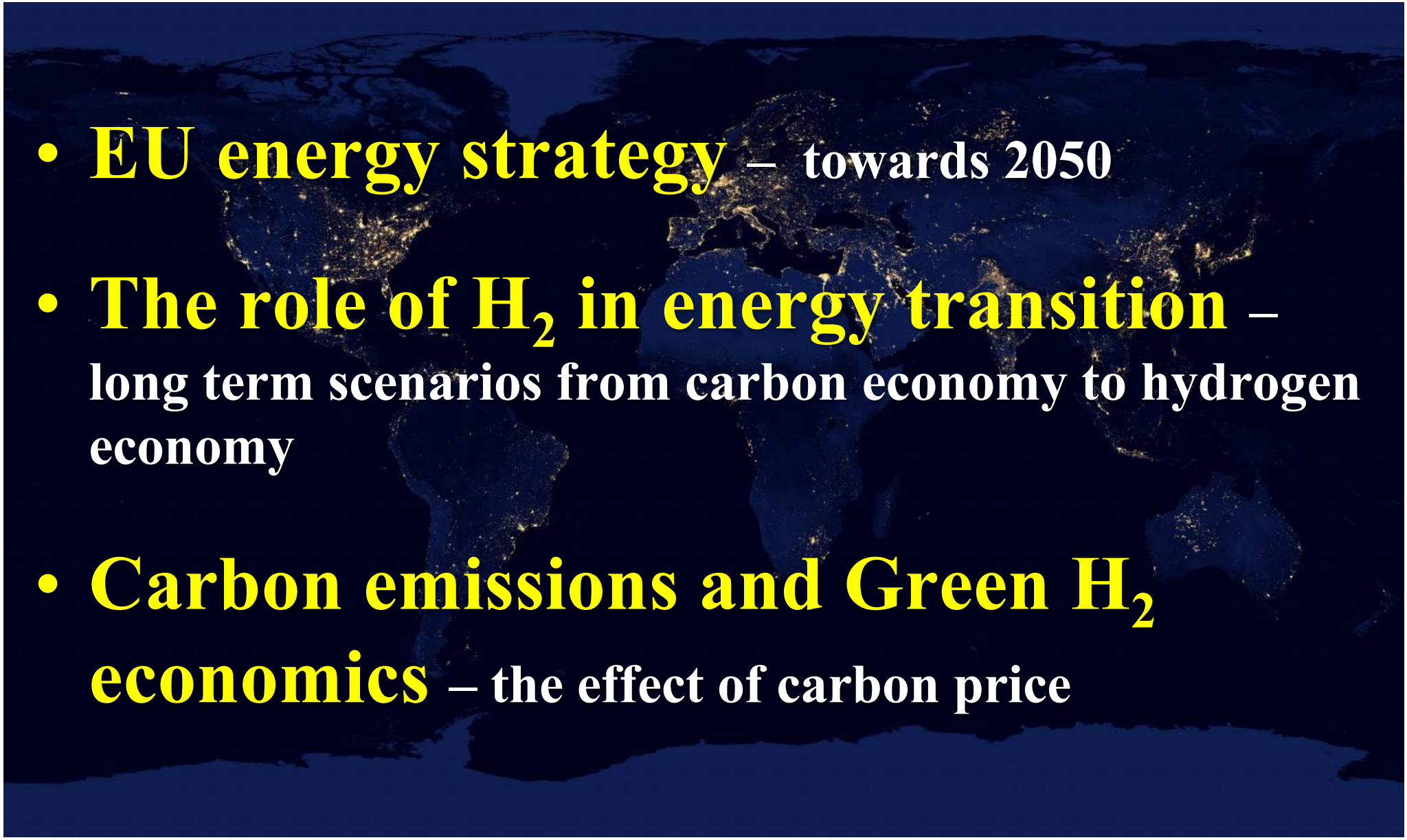


- **EU energy strategy** – towards 2050
- **The role of H_2 in energy transition** – long term scenarios from carbon economy to hydrogen economy
- **Carbon emissions and Green H_2 economics** – the effect of carbon price

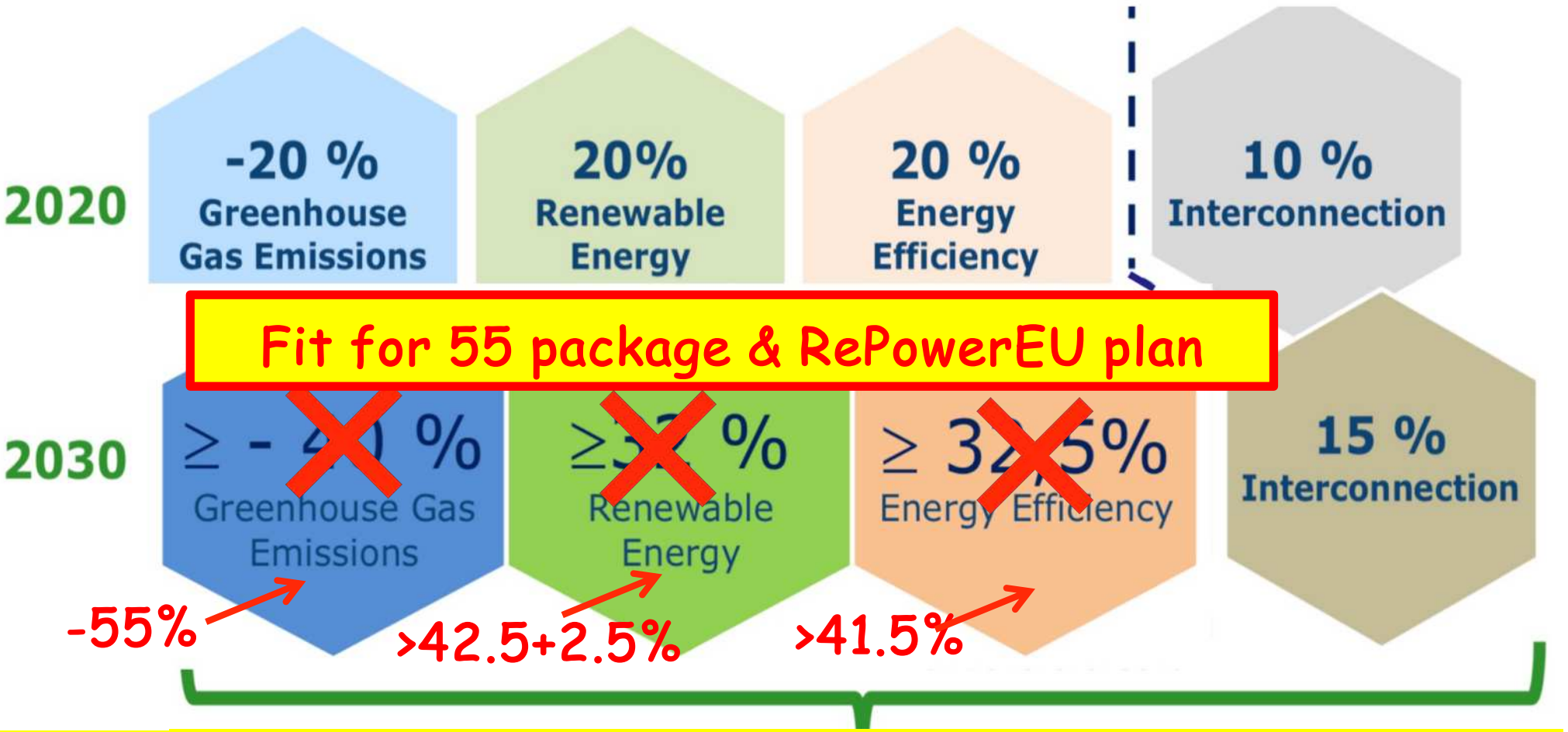
EU energy strategy

towards 2050

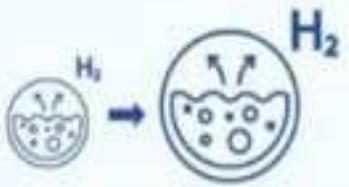
Energy transition

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

EU medium and long term targets



EU H_2 strategy*



Today - 2024	2025-2030	2030
• Installation of Electrolysers: at least 6GW for green H_2 production • Production of green H_2: up to 1mt	• H_2 to become part of the integrated energy system • Production of green H_2: more than 10mt	• RePowerEU H_2 accelerator: more than 20mt • Large scale integration of green H_2

* *A hydrogen strategy for a climate-neutral Europe*, EU, 2020

Saudi Arabia $5bn Helios H2 project

- **Desert area = Belgium**
- **4GW of Wind and PVs**

- **Production of 650t/day of H_2**
- **Reduce of H_2 production from 5US$/kg to 1.5US$/kg**
- **Long-term: Saudi Arabia to become H_2 exporter**

The role of H_2 in Energy Transition

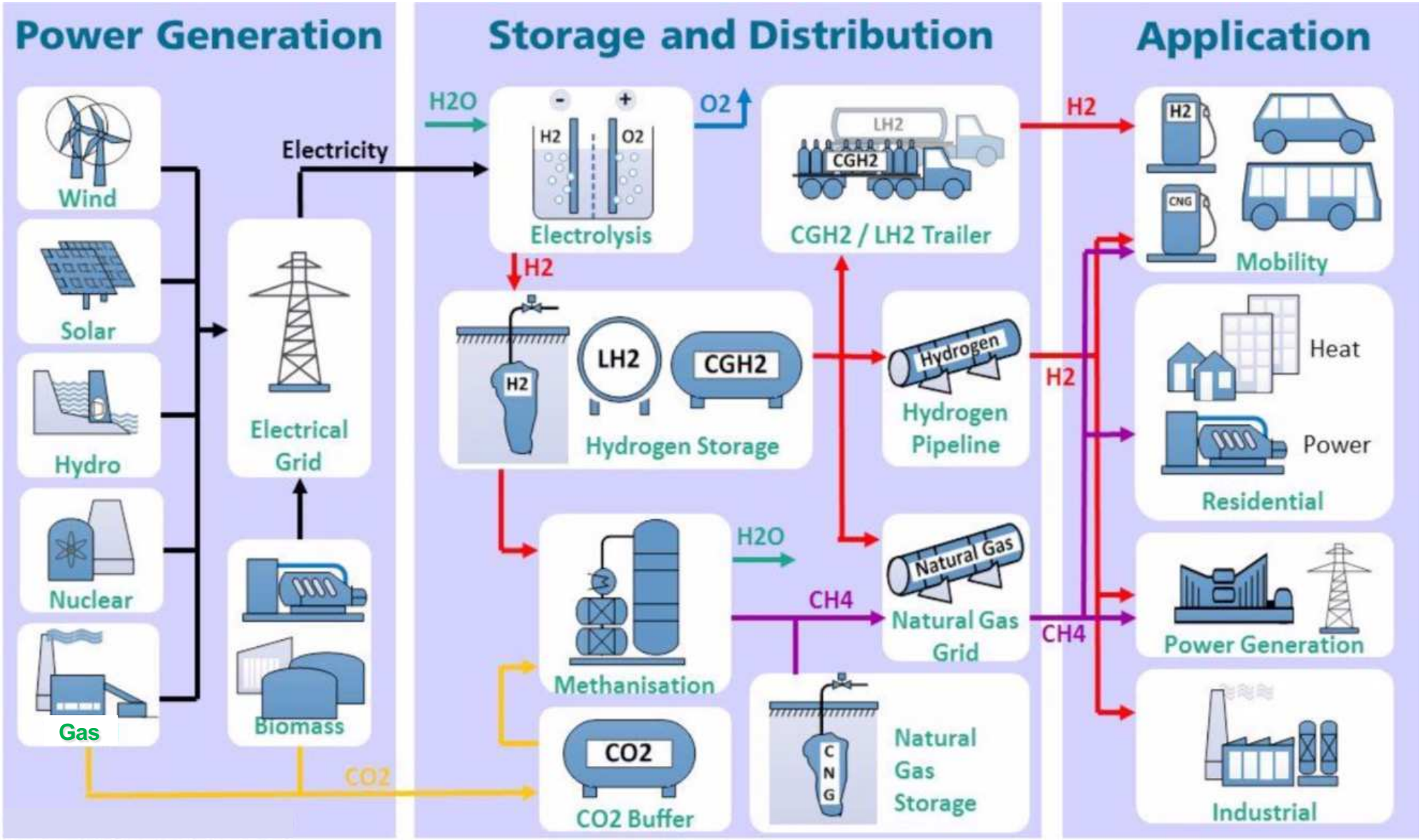
long-term scenarios from carbon economy to hydrogen economy

Jules Verne (1874)

In 1874 science fiction author Jules Verne envisioned a future:

- **"... water will one day be employed as fuel, that hydrogen and oxygen which constitute it, used singly or together, will furnish an inexhaustible source of heat and light, of an intensity of which coal is not capable**
- **Someday the coal-rooms of steamers and the tenders of locomotives will, instead of coal, be stored with these two condensed gases, which will burn in the furnaces with enormous calorific power..."**

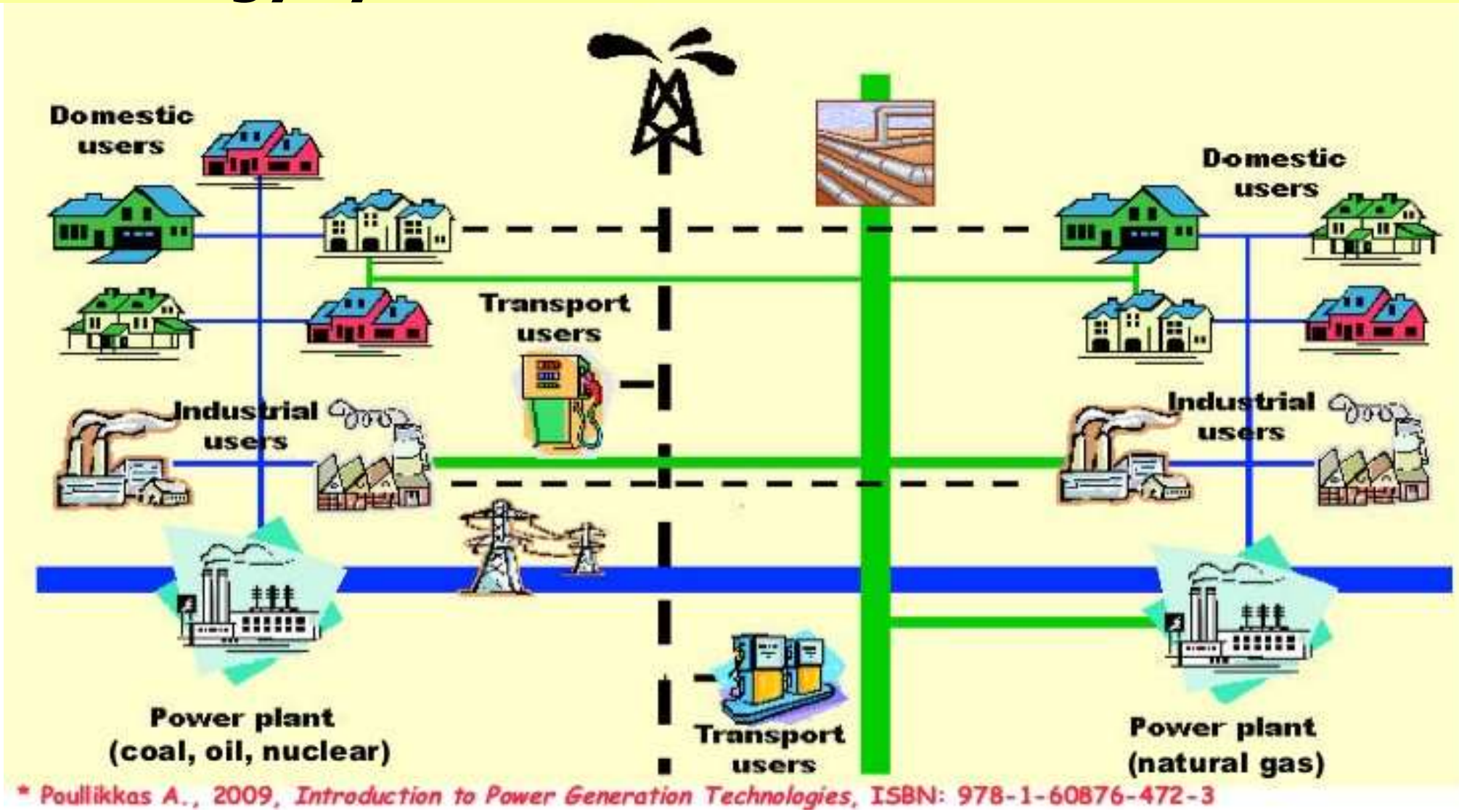
Potential role of hydrogen in the energy transition*



* EU, 2019

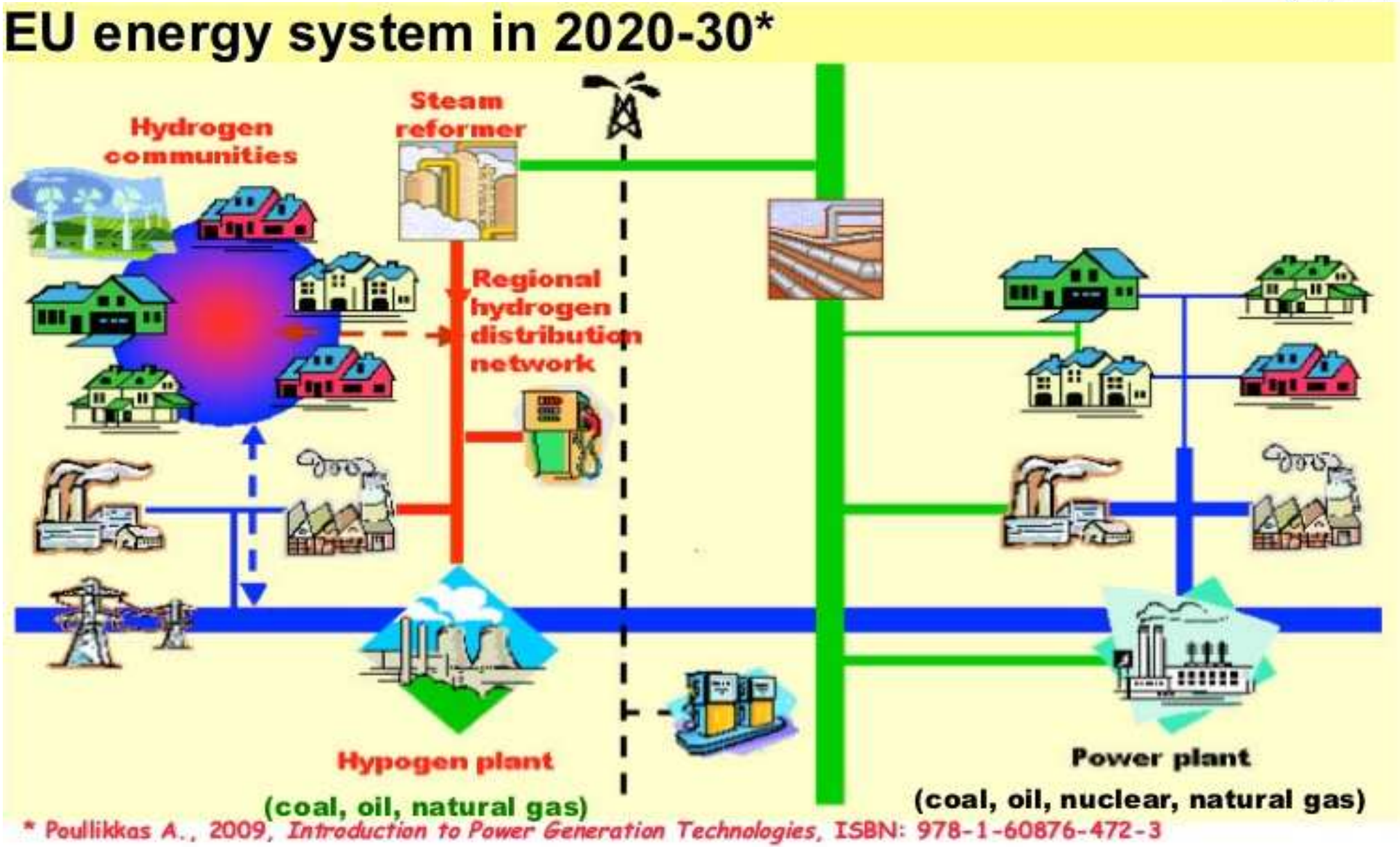
Energy system in 2010

EU energy system in 2010*

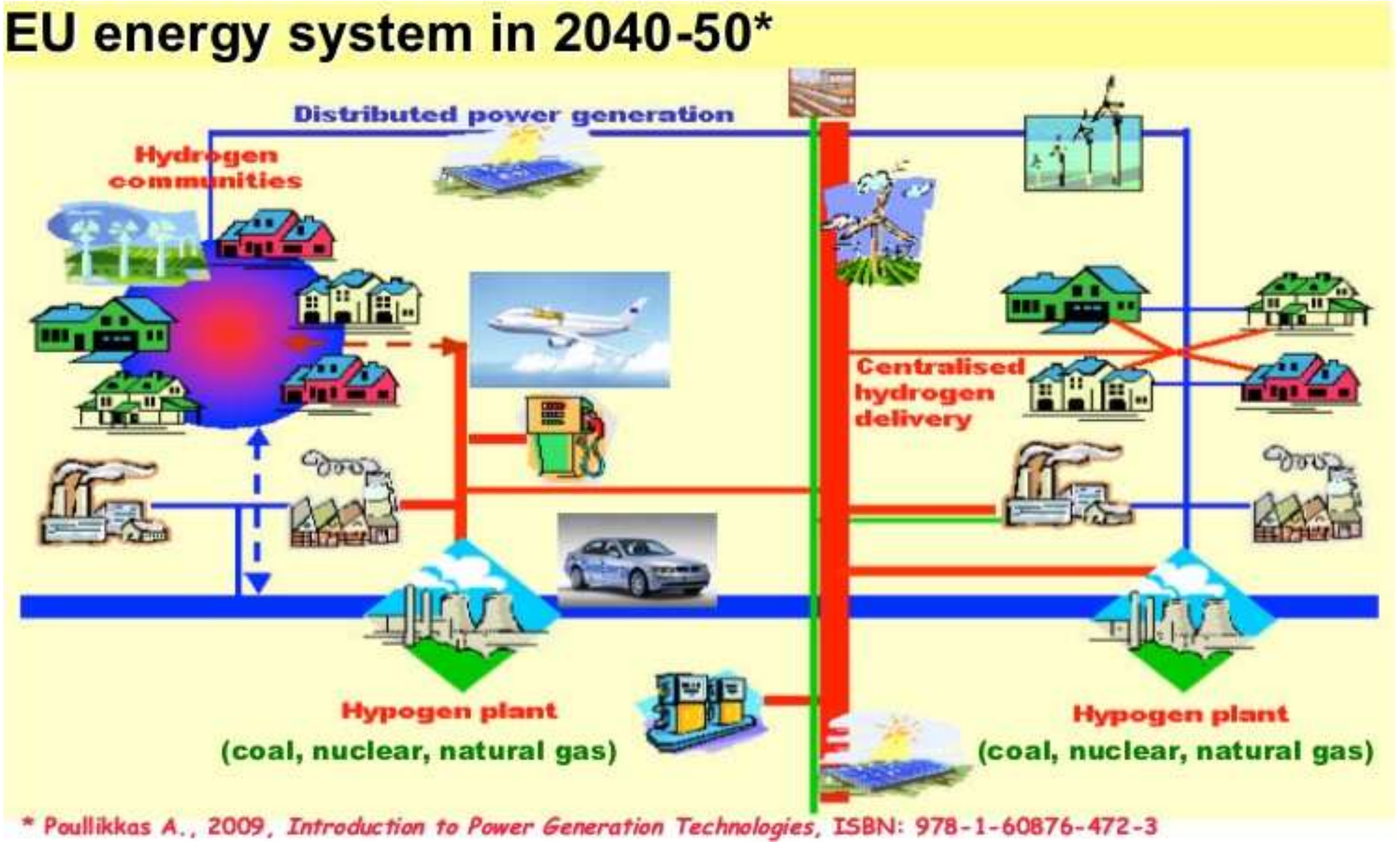


* Poullikkas A., 2009, *Introduction to Power Generation Technologies*, ISBN: 978-1-60876-472-3

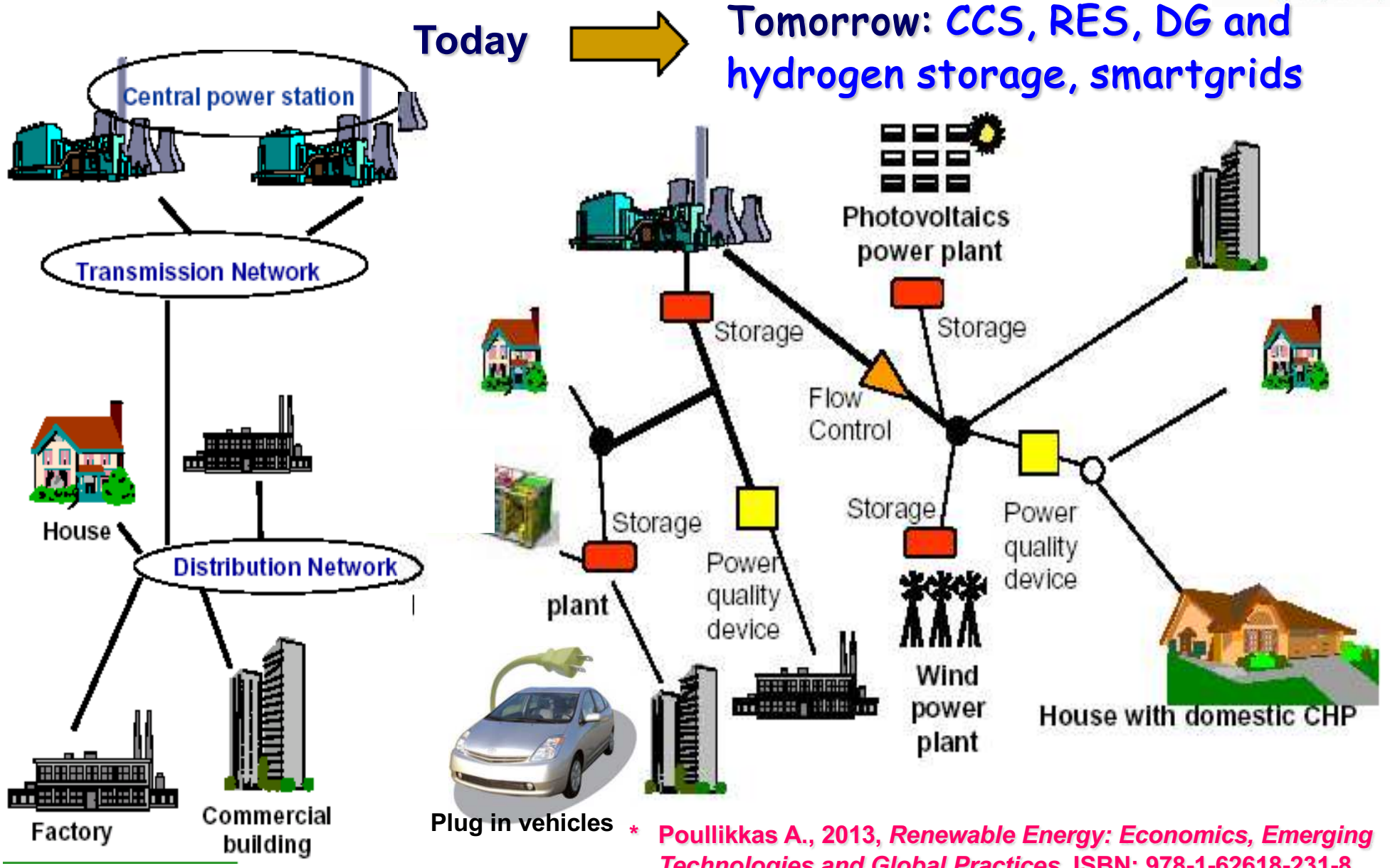
Future energy systems (optimistic scenario)



Future energy systems (optimistic scenario)

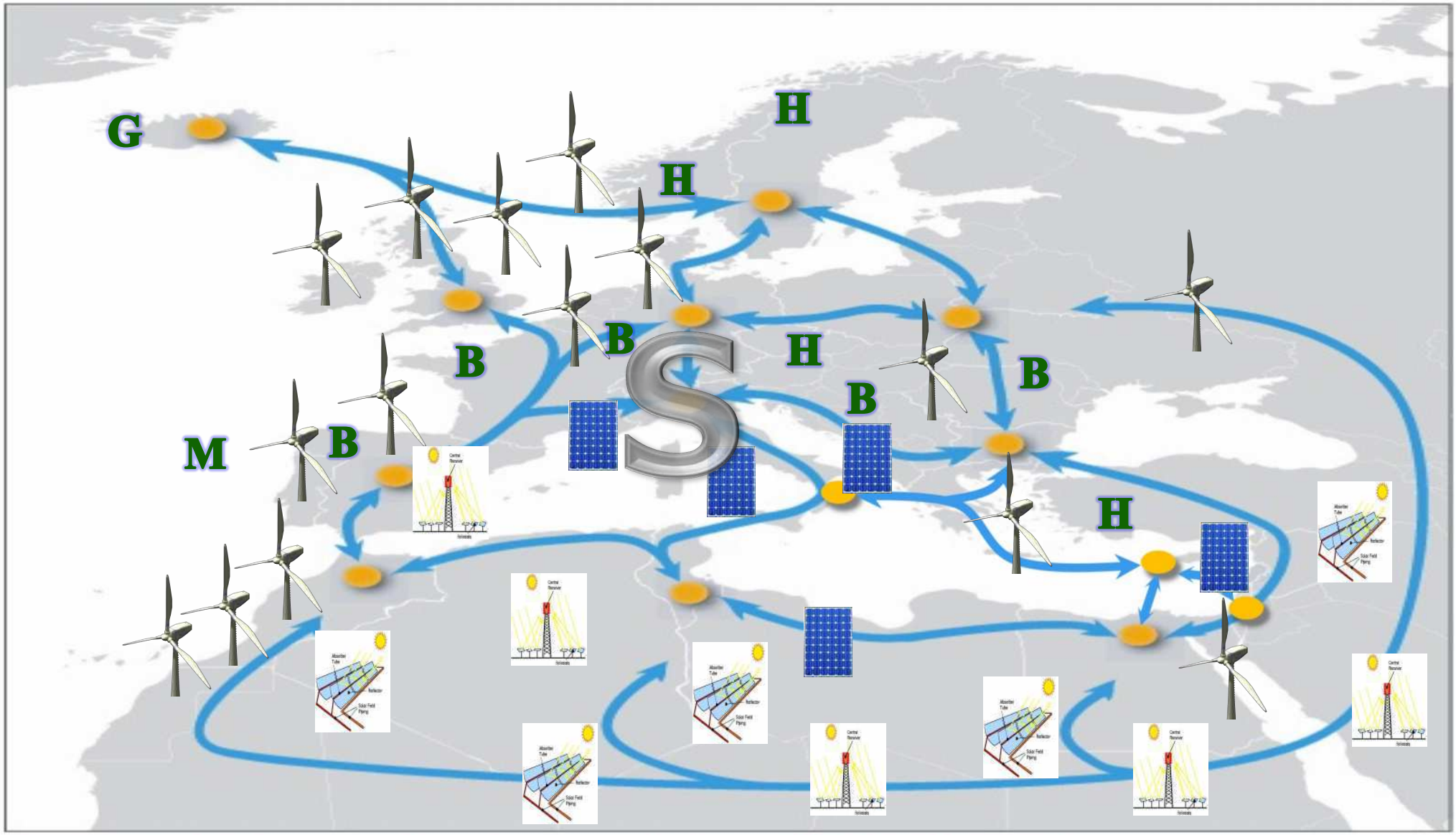


Future power systems*



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

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



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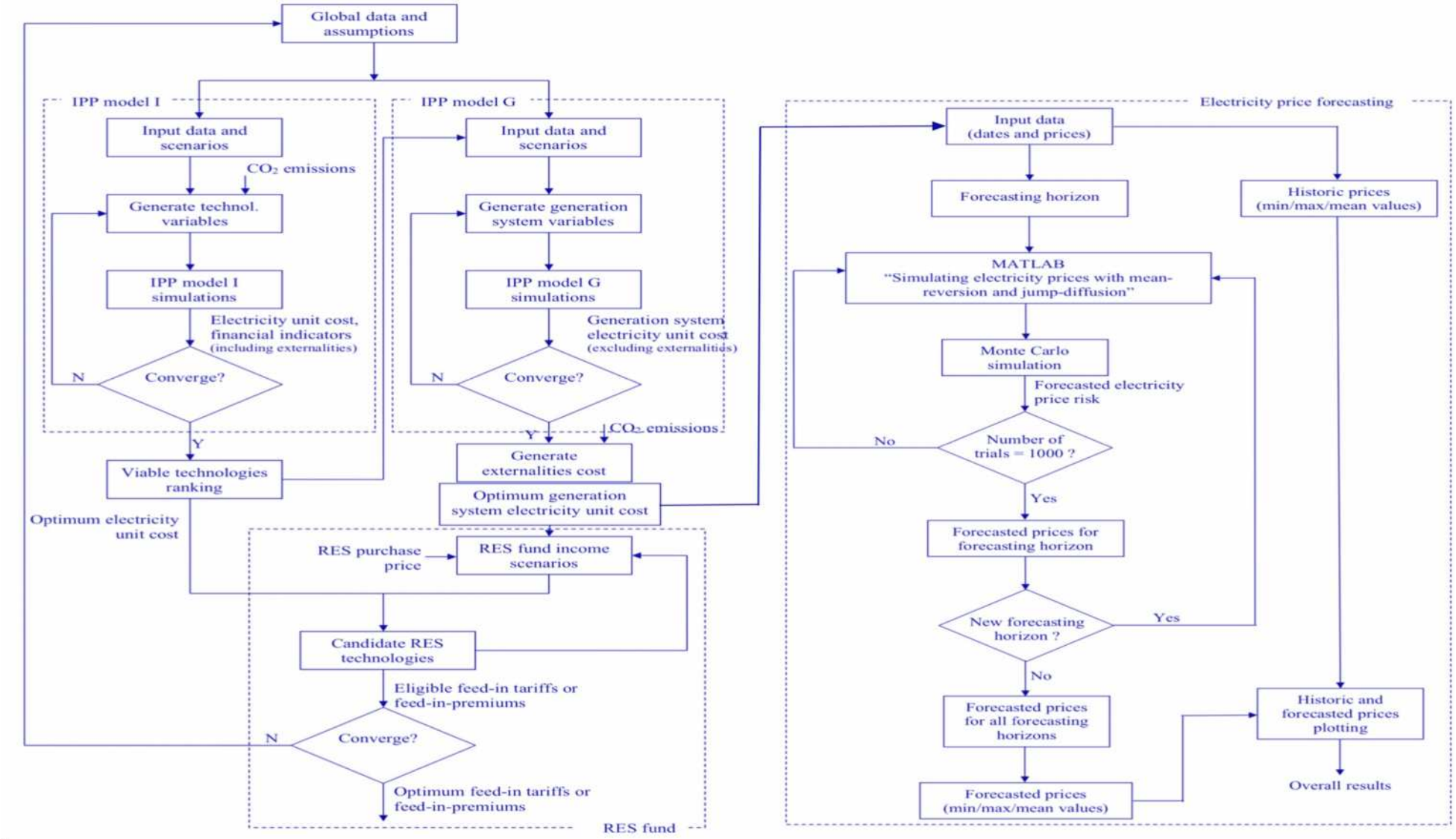
Carbon emissions and Green H_2 economics

the effect of carbon price

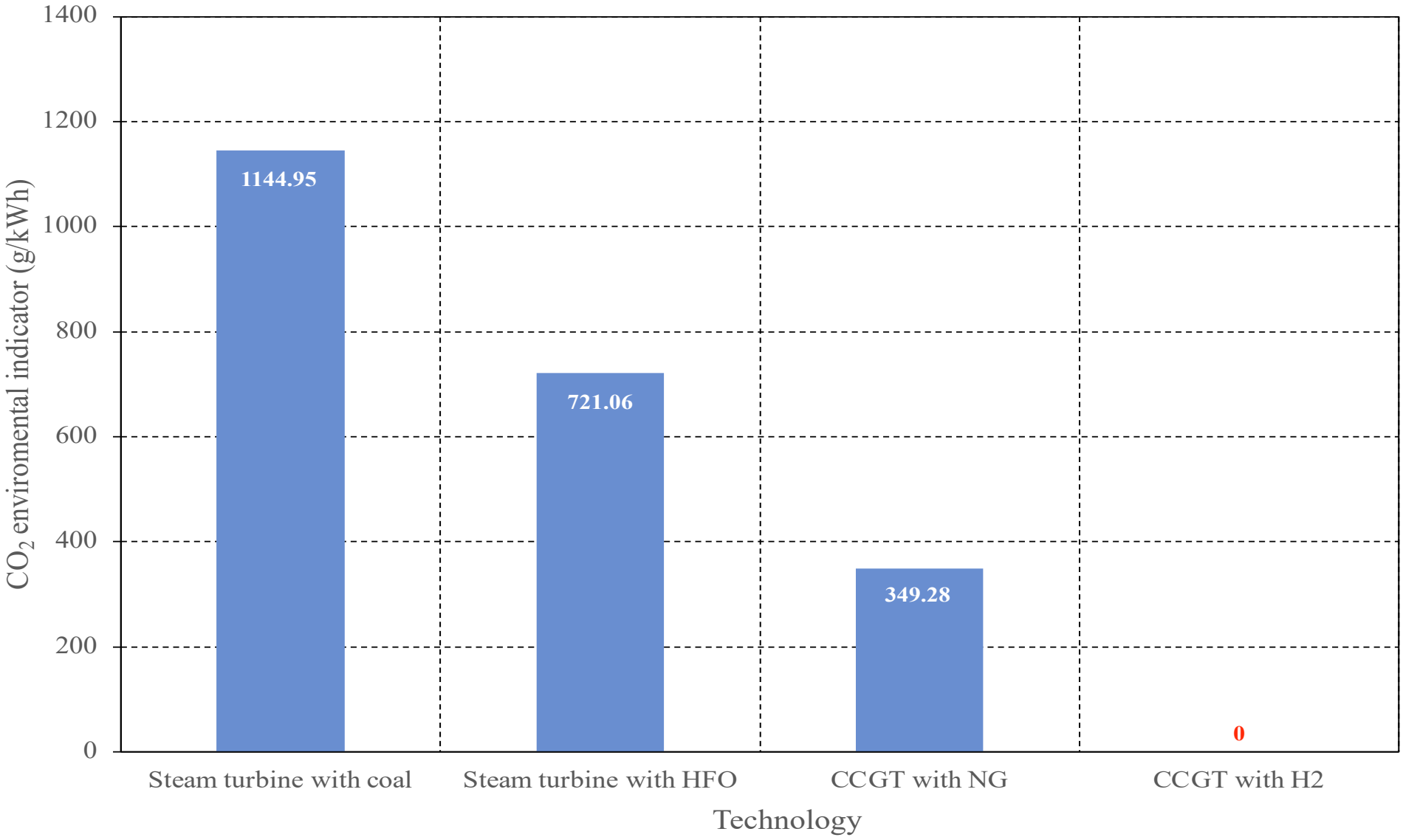
Optimization model*,**



* Poullikkas A., 2009, "A decouple optimization method for power technology selection in competitive markets", *Energy Sources*.

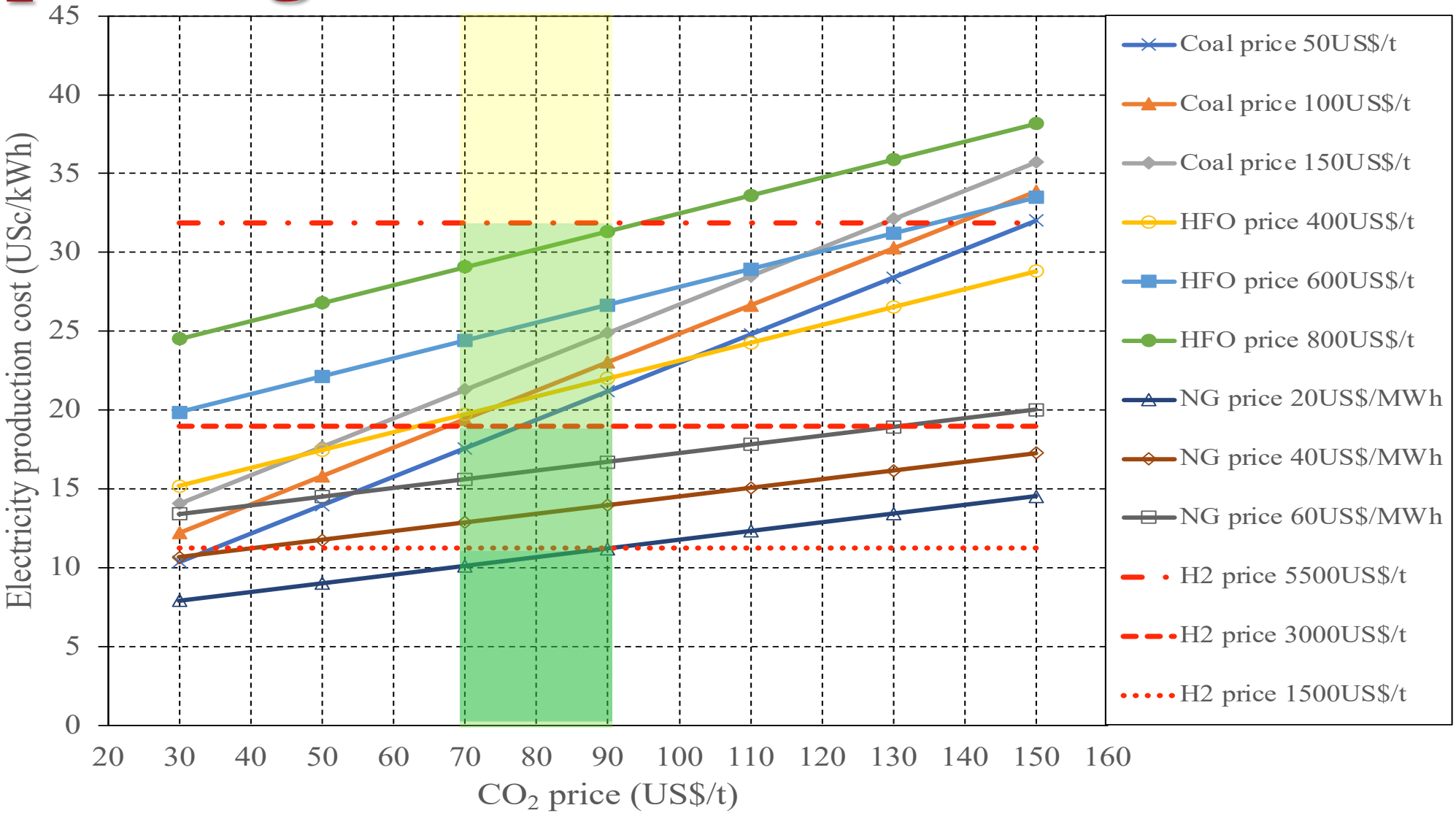
** Poullikkas A., 2018, "An adaptive longterm electricity price forecasting modelling using Monte Carlo simulation", *Journal of Power Technologies*

Carbon emissions *vs* green H_2*



* Nicolaidis P., Poullikkas A., 2023, "Power-to-hydrogen concepts for 100% renewable and sustainable energy systems", *Hydrogen Economy*

Carbon price *vs* green hydrogen power generation*



* **Venizelos V., Poullikkas A., 2023, "The effect of carbon price towards green hydrogen power generation", *in preparation***

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