ρυθμιστική αρχή ενέργειας κύπρου
cyprus energy regulatory authority

Στρατηγικές για την μετάβαση της Κύπρου στην οικονομία του υδρογόνου

Δρ. Ανδρέας Πουλλικκάς
M.Phil, Ph.D, D.Tech, FIET
Πρόεδρος, Ρυθμιστική Αρχή Ενέργειας Κύπρου
apoullikkas@cera.org.cy

Contents

ρυθμιστική αρχή ενέργειας κύπρου
cyprus energy regulatory authority

- **EU energy strategy – towards 2050**
- **Energy transition for island systems – solutions to isolated systems**
- **Long-term energy strategy for Cyprus – towards hydrogen economy**

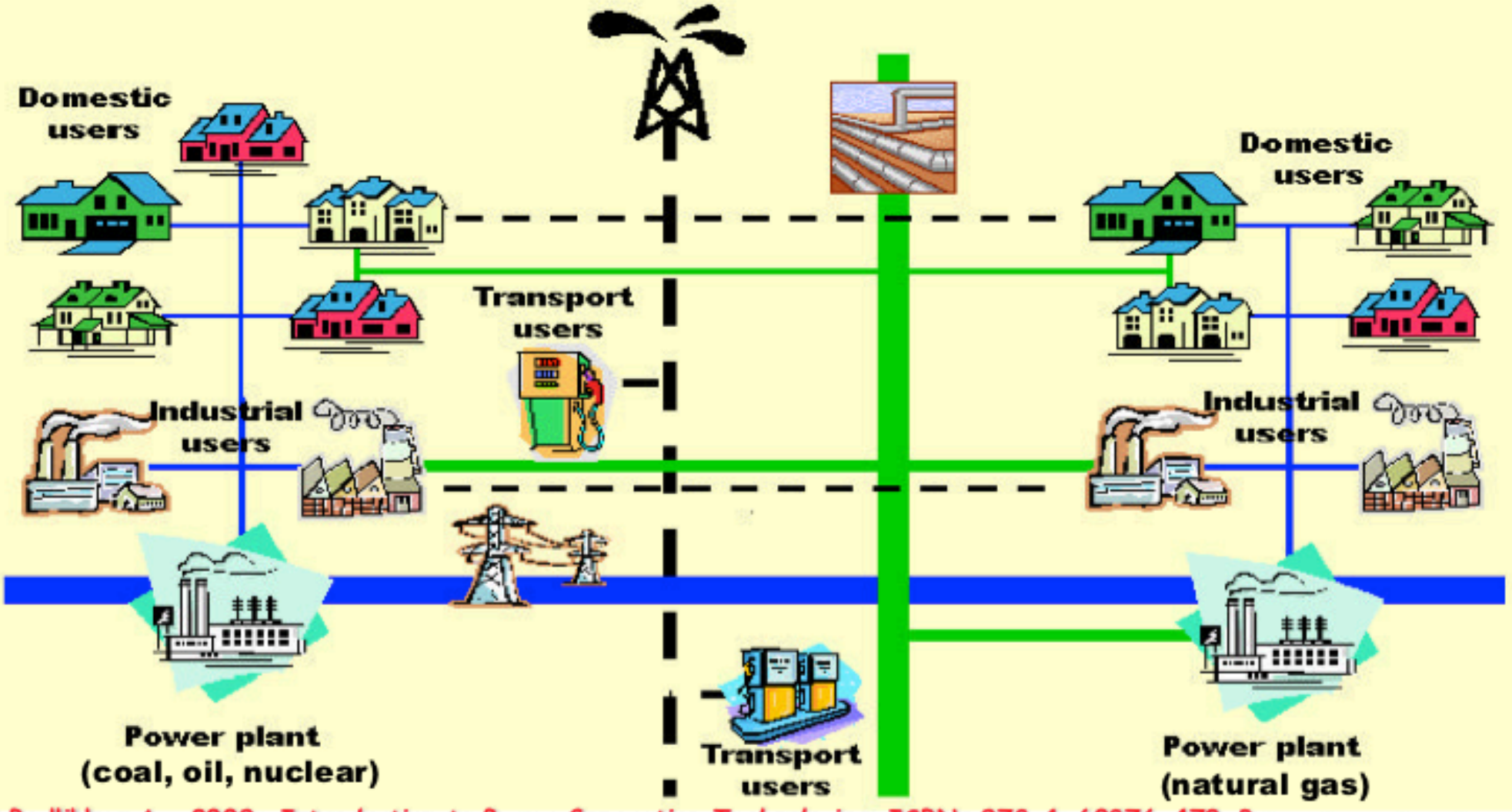
EU energy strategy

towards 2050

Current energy system

ρυθμιστική αρχή ενέργειας κύπρου
cyprus energy regulatory authority

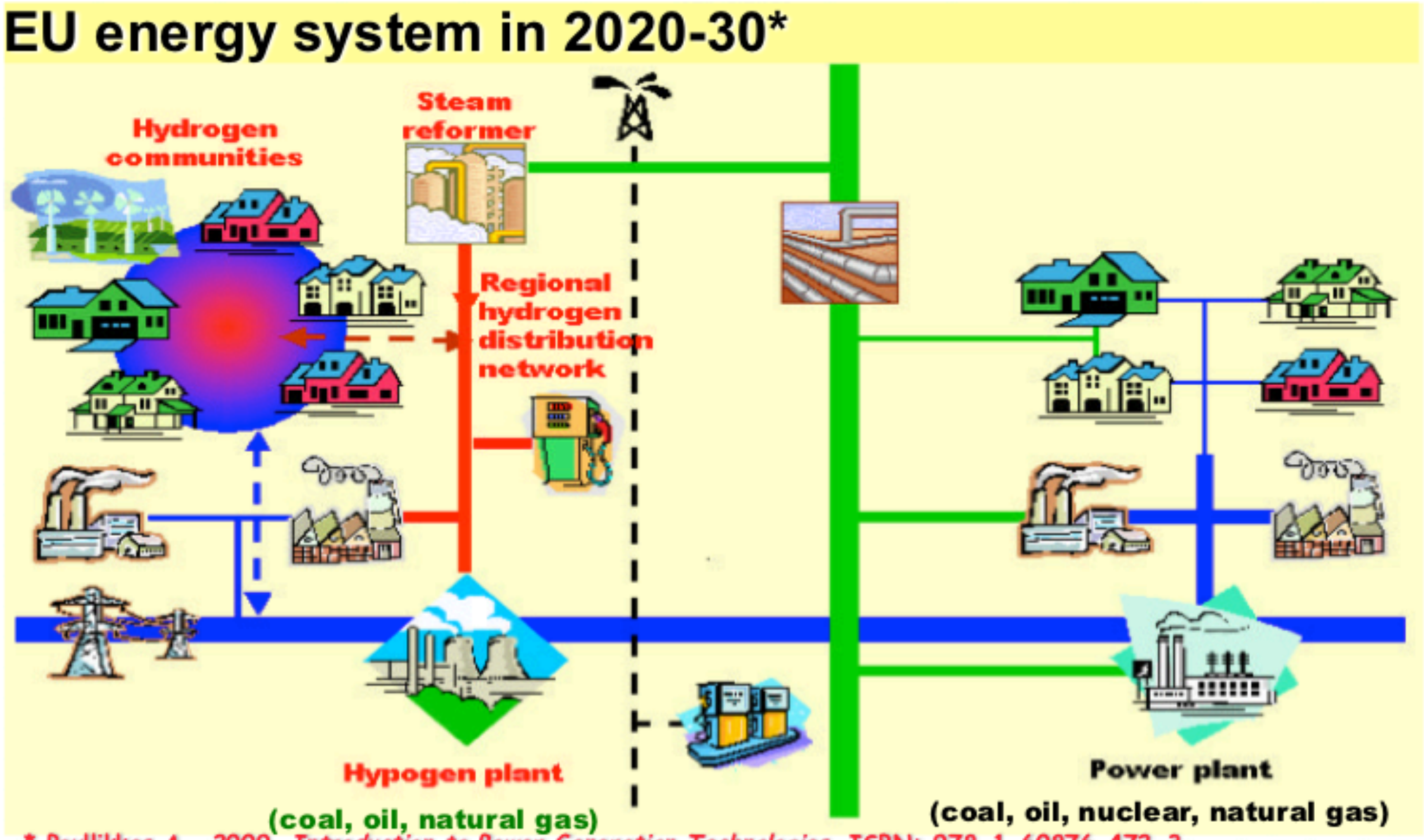
EU energy system today*



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

Future energy systems (optimistic scenario)

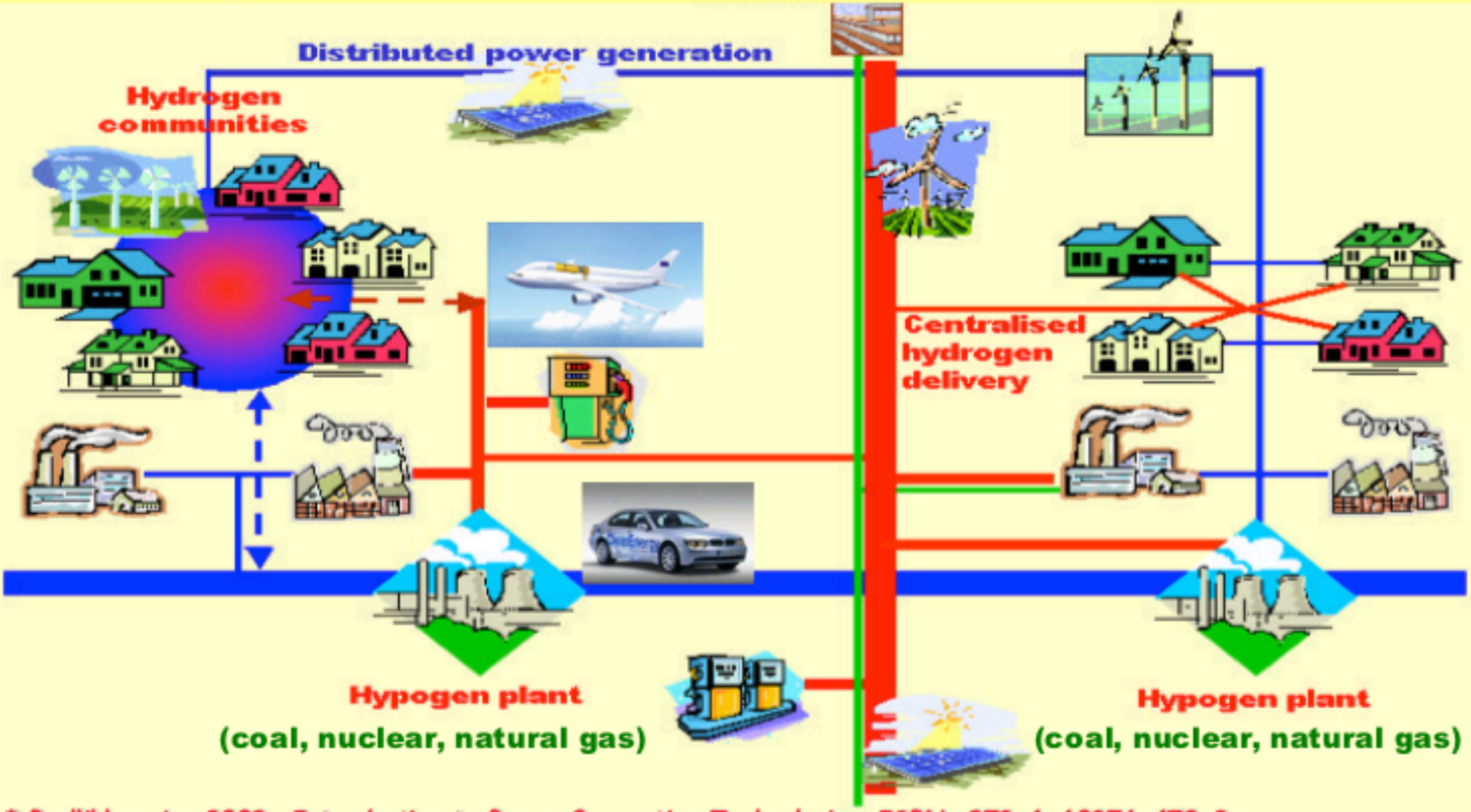
ρυθμιστική αρχή ενέργειας κύπρου
cyprus energy regulatory authority



Future energy systems (optimistic scenario)

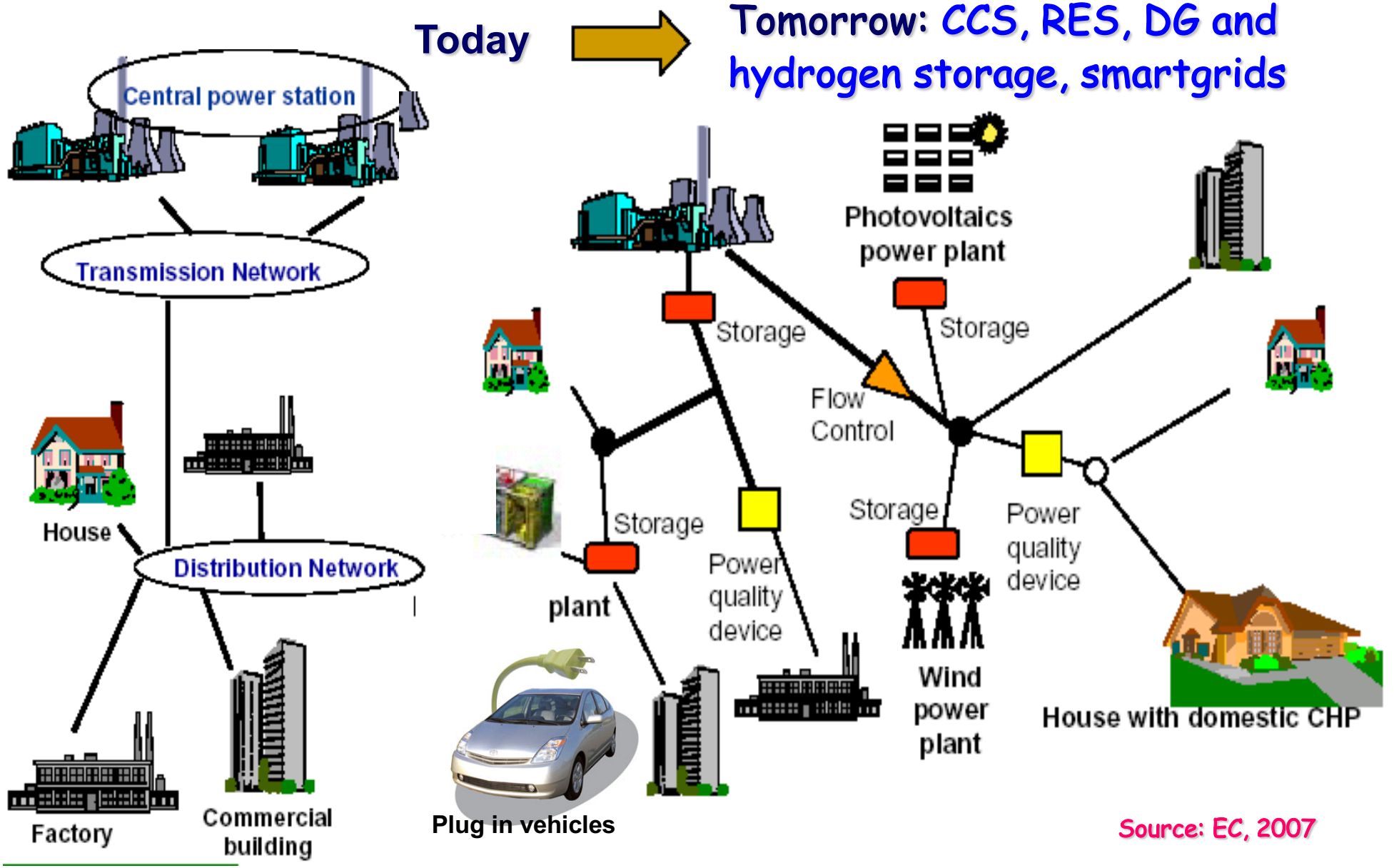
ρυθμιστική αρχή ενέργειας κύπρου
cyprus energy regulatory authority

EU energy system in 2040-50*



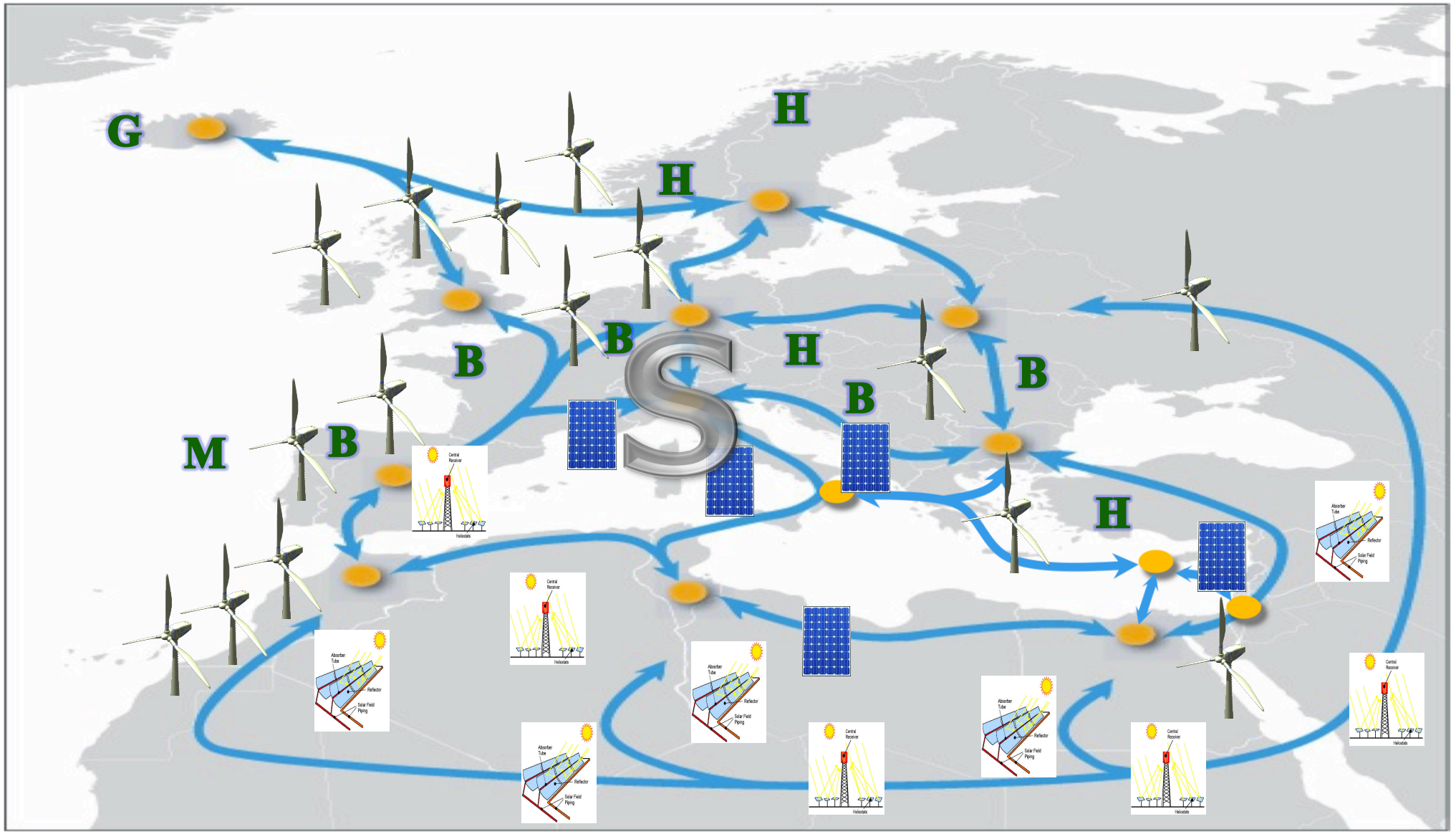
* Poullikkas A., 2009, *Introduction to Power Generation Technologies*, ISBN: 978-1-60876-472-3

Future power systems



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

ρυθμιστική αρχή ενέργειας κύπρου
cyprus energy regulatory authority

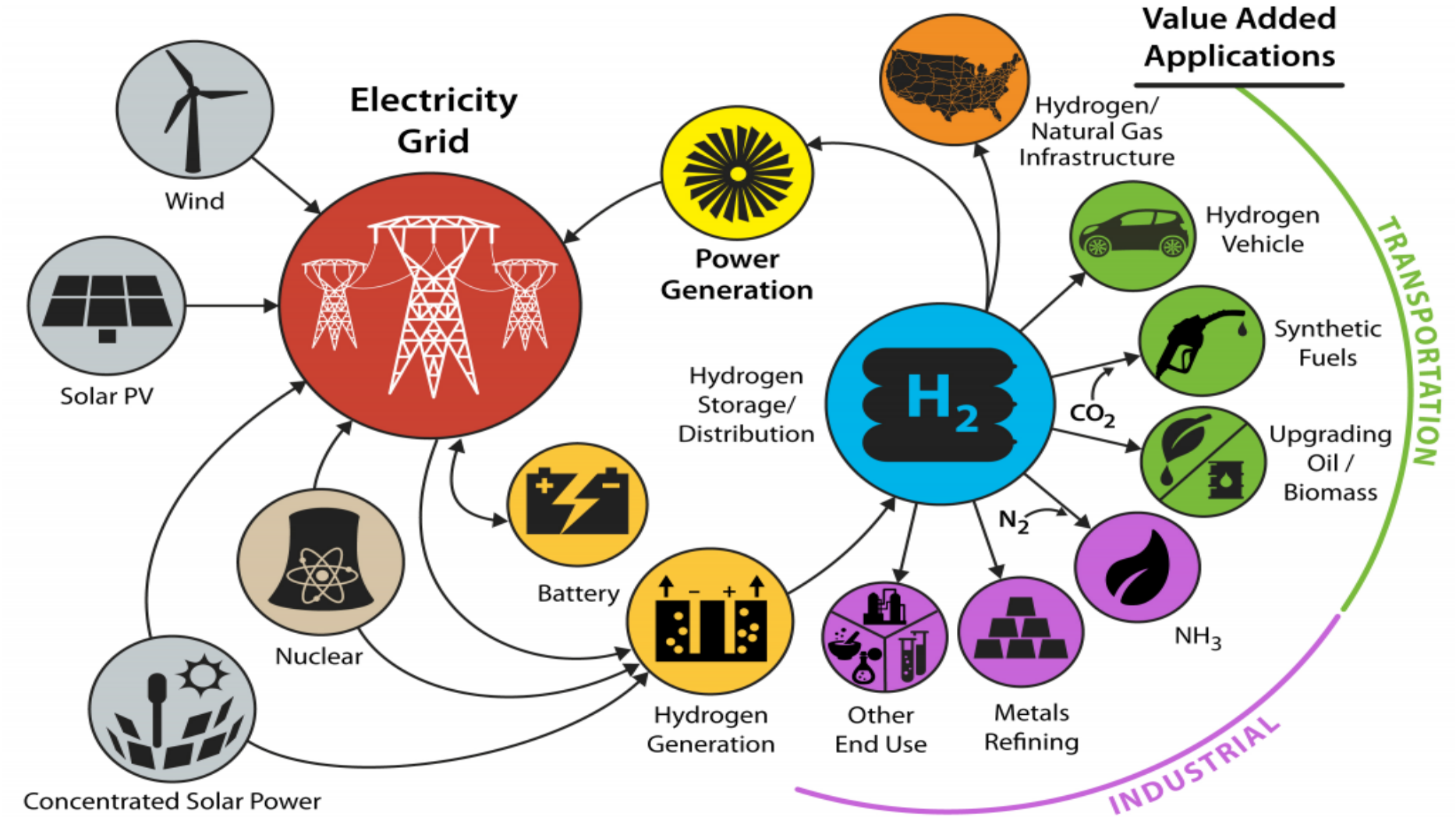


* Poullikkas A., 2013, *Sustainable Energy Development for Cyprus*, ISBN: 978-9963-7355-3-2

Long term scenarios in Europe

ρυθμιστική αρχή ενέργειας κύπρου
cyprus energy regulatory authority

Moving from Carbon economy to Hydrogen economy



Energy transition for island systems

Solutions to isolated systems

Characteristics of isolated electricity systems*

- **High fuel costs**
  - ~ use of oil derivatives
- **Economies of scale cannot be adequately exploited**
  - ~ generation units cannot exceed a certain size since the loss of a unit would mean the loss of a high percentage of the entire system
- **Need to maintain high reserve capacity to ensure power system reliability**

The smaller the electrical system size, the more the expenses will be

* Poullikkas A., 2015, *Sustainable Energy Policy for Cyprus*, ISBN: 978-9963-7355-6-3

Energy transition for non-interconnected islands*

ρυθμιστική αρχή ενέργειας κύπρου
cyprus energy regulatory authority

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 solution*

- **Increase system flexibility**
  - ~ integrate RES into electricity market
  - ~ use natural gas, storage and RES for power generation
  - ~ promote e-mobility (V2G technology - bidirectional flow of electricity between the electric car and the grid)
- **Establish electricity interconnections**
  - ~ with EU internal electricity market (the island of Cyprus is the only non-interconnected Member State)
- **Production of hydrogen** (energy carrier)
  - ~ from RES and natural gas

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

Long-term energy strategy for Cyprus

Towards hydrogen economy

Main goal

ρυθμιστική αρχή ενέργειας κύπρου
cyprus energy regulatory authority

The sustainable satisfaction of Cyprus' future energy needs with safety and reliability

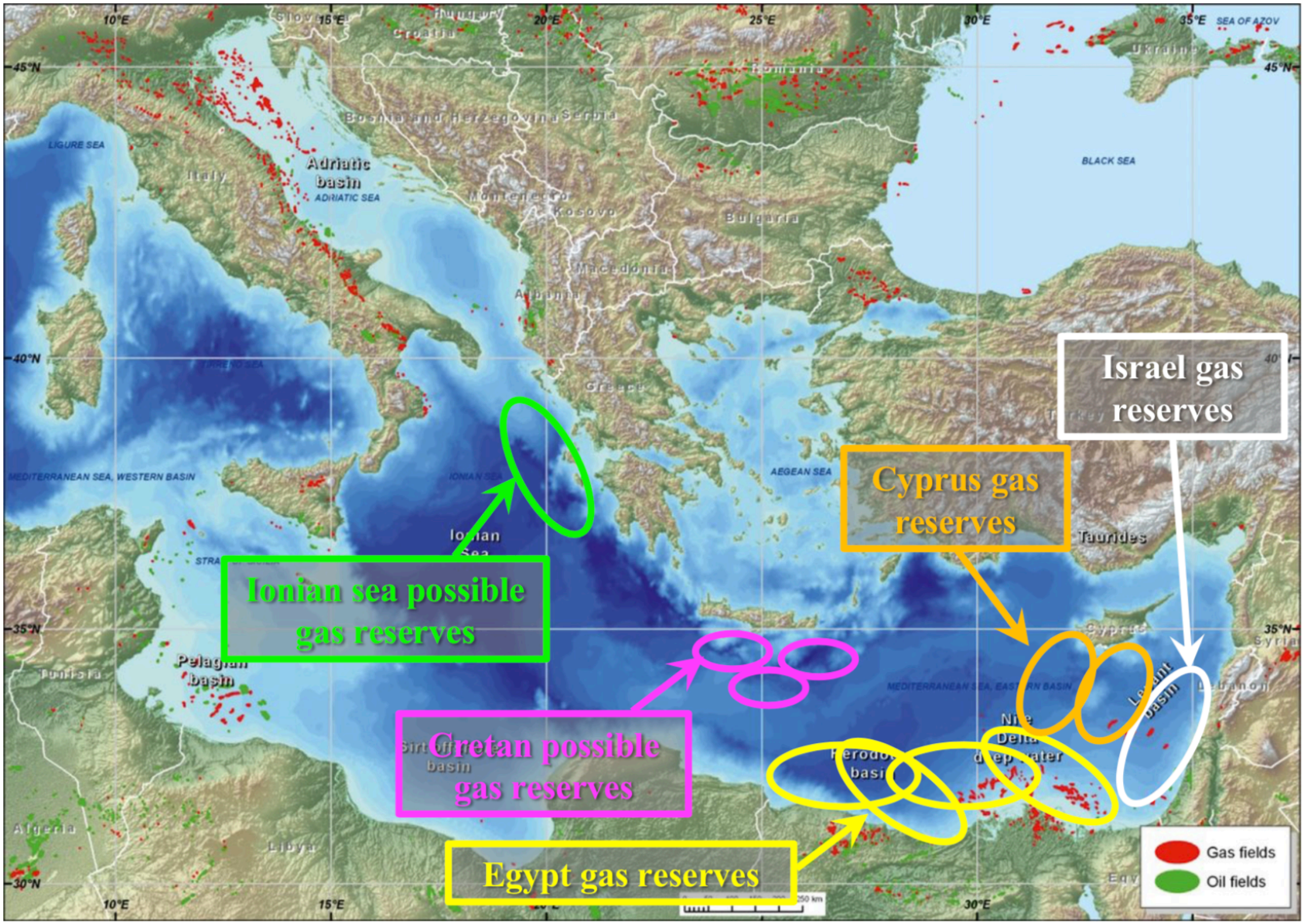
Regional primary energy sources

ρυθμιστική αρχή ενέργειας κύπρου
cyprus energy regulatory authority

Indigenous energy sources

Gas reserves in SE Mediterranean region*

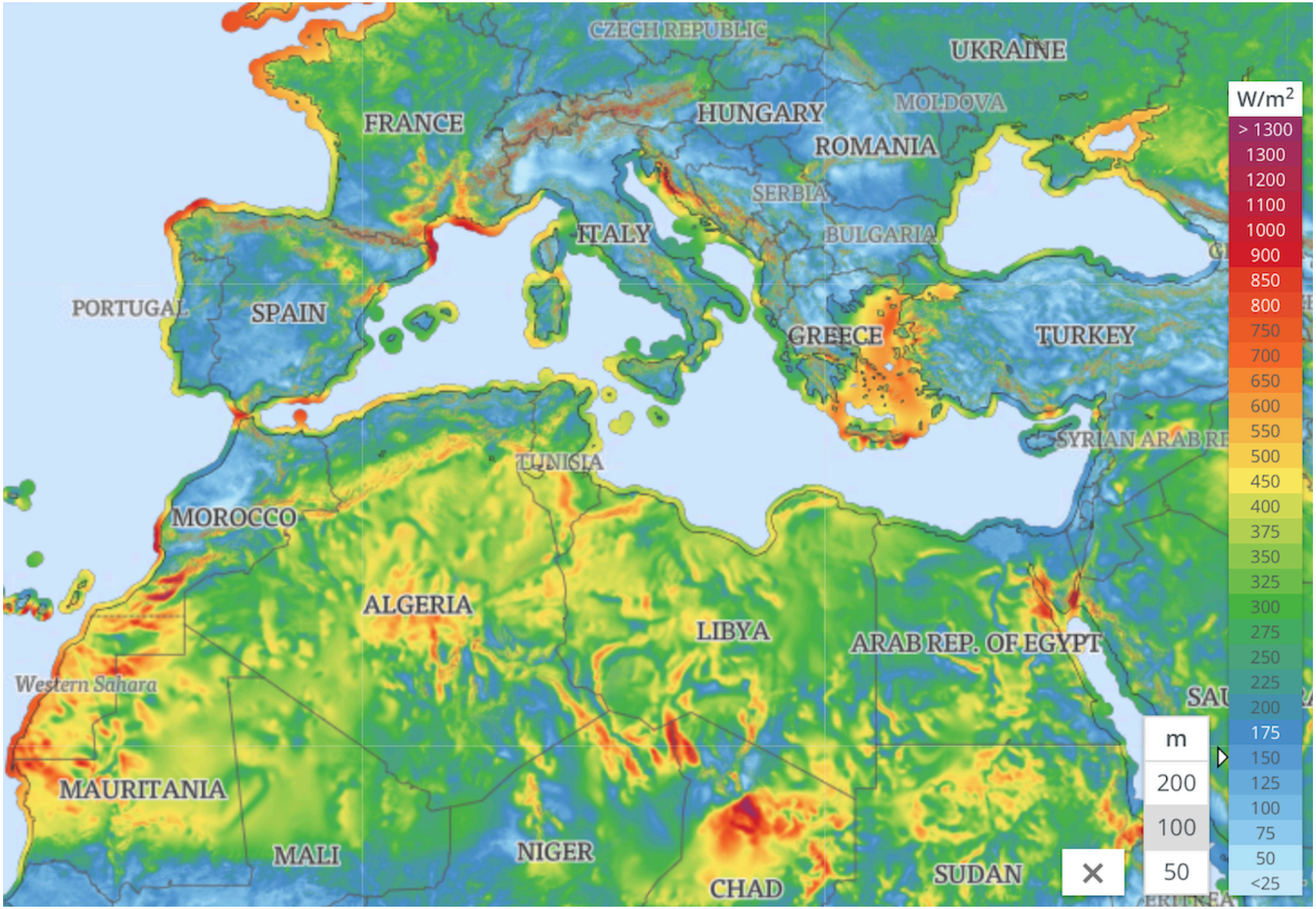
ρυθμιστική αρχή ενέργειας κύπρου
cyprus energy regulatory authority



* A. Belopolsky, *et al.*, 2012, "New and emerging plays in the Eastern Mediterranean", *Petroleum Geoscience*

Wind potential in SE Mediterranean region*

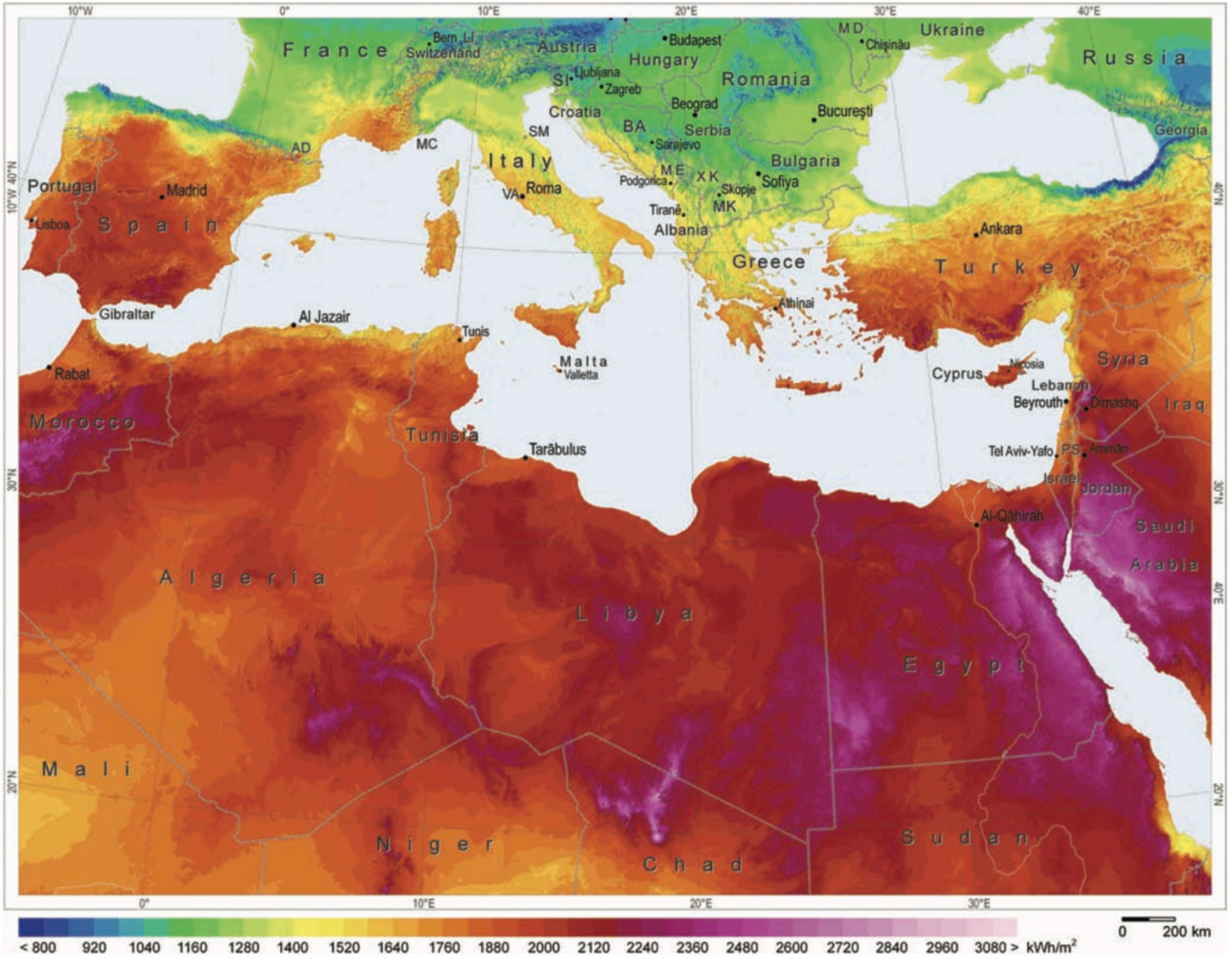
ρυθμιστική αρχή ενέργειας κύπρου
cyprus energy regulatory authority



* The Global Wind Atlas (https://globalwindatlas)

Solar potential in SE Mediterranean region*

ρυθμιστική αρχή ενέργειας κύπρου
cyprus energy regulatory authority

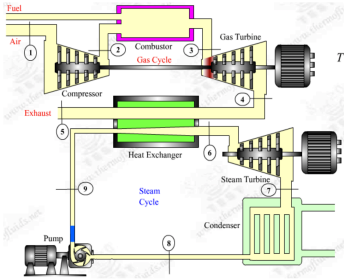


* Easac & Pihl, Erik. (2011). Concentrating Solar Power: Its potential contribution to a sustainable energy future

Main indigenous energy sources in SE Mediterranean region

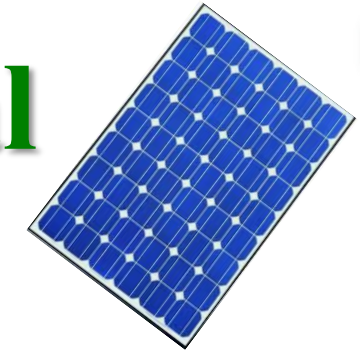
ρυθμιστική αρχή ενέργειας κύπρου
cyprus energy regulatory authority

- Natural gas



- Wind potential

- Solar potential



hydrogen

Target-setting for Cyprus' transition to hydrogen economy*

ρυθμιστική αρχή ενέργειας κύπρου
cyprus energy regulatory authority

Target	Year		
	2030	2040	2050
Greenhouse gases	-30%	-75%	-100%
Renewable energy sources	30%	75%	100%
Electrical interconnections	50%	65%	80%

Cyprus could set a long-term goal of reducing greenhouse gas emissions by 100% by 2050 !

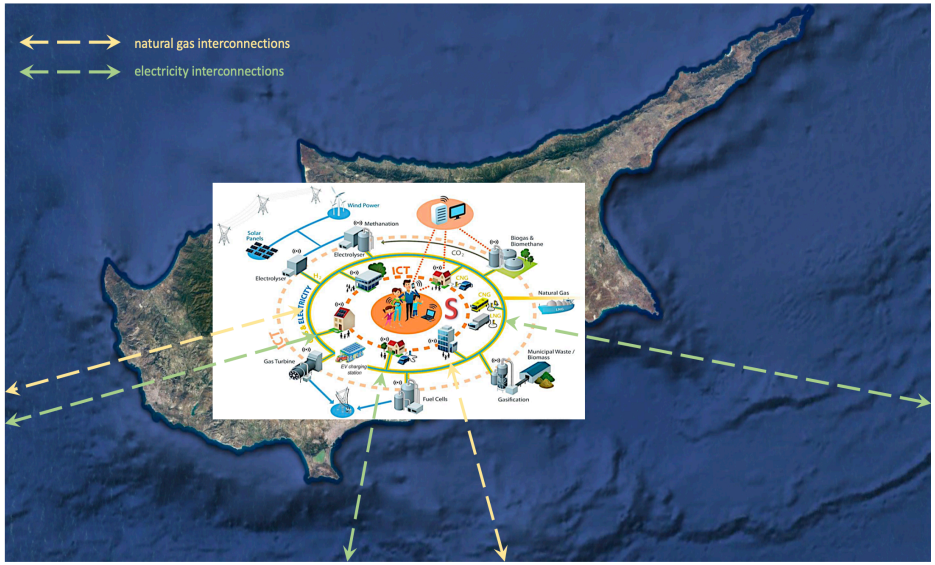
* Poullikkas A., 2020, *Long-term Sustainable Energy Strategy: Cyprus' Energy Transition to Hydrogen Economy*, ISBN: 978-9925-7710-0-4

Energy transition by 2050

ρυθμιστική αρχή ενέργειας κύπρου
cyprus energy regulatory authority

Cyprus' energy system:

- smart and digitised
- flexible
- decentralised
- electrically interconnected
- interconnected gas and/or hydrogen pipelines



Integration:

- hydrogen in all energy sectors
- renewable energy sources
- storage energy systems
- electric mobility

Transition of Cyprus from the current carbon economy to hydrogen economy by the year 2050

Development of regional energy strategy ?

- **Horizon up to 2060**
- **Development of strategic plan for SE Med region:**
  - ~ **Electrical interconnections**
  - ~ **Pipeline interconnections (or virtual pipelines)**
  - ~ **Integration of sustainable technologies and storage**
  - ~ **Use of hydrogen after 2030**
  - ~ **Hydrogen production**
    - From natural gas
    - From renewables
- **Energy exporters to EU**