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Future challenges for SE Mediterranean region natural gas reserves

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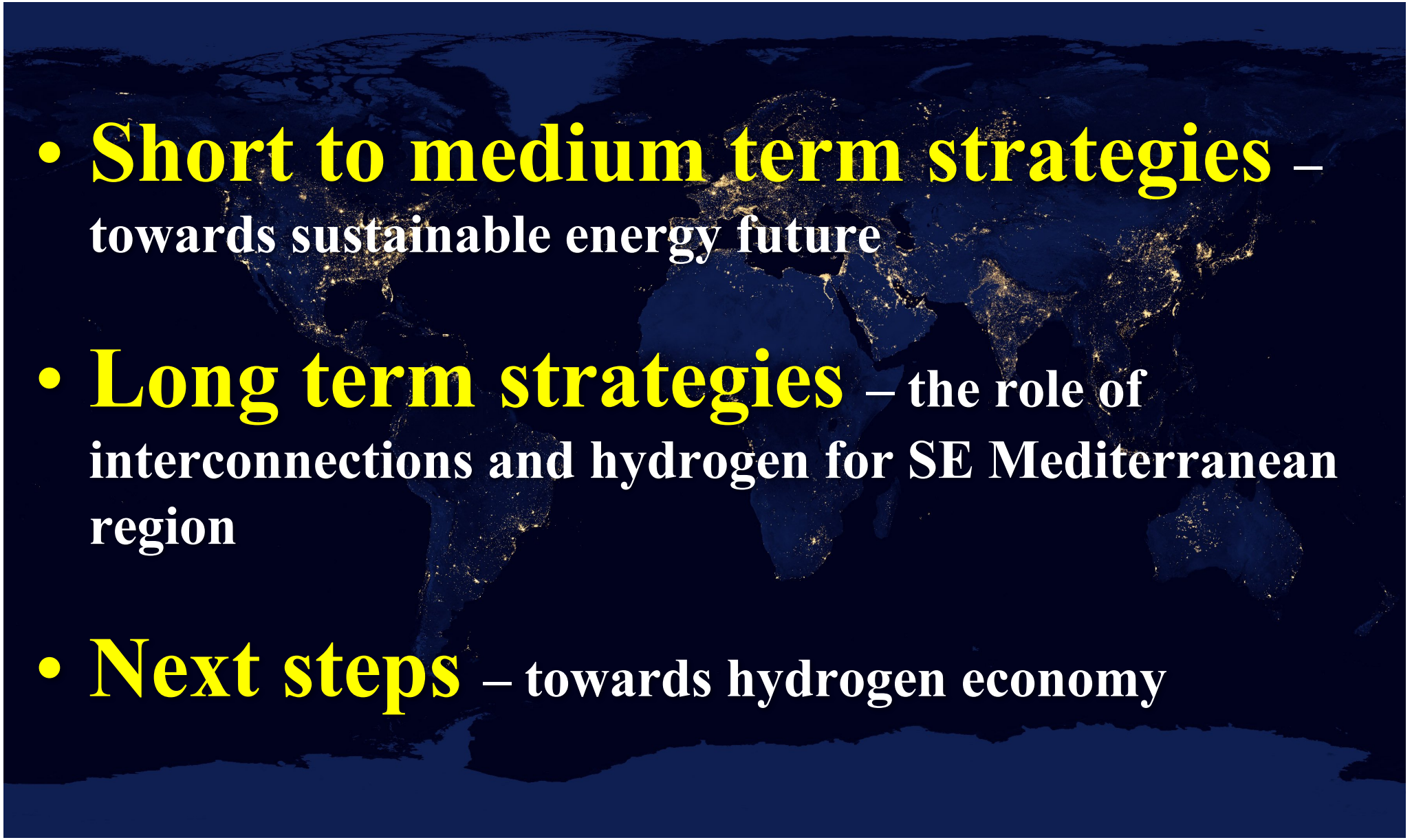

- **Short to medium term strategies** – towards sustainable energy future
- **Long term strategies** – the role of interconnections and hydrogen for SE Mediterranean region
- **Next steps** – towards hydrogen economy

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Short to medium term strategies

Towards sustainable energy future

Use of natural gas as a transition or bridge fuel*

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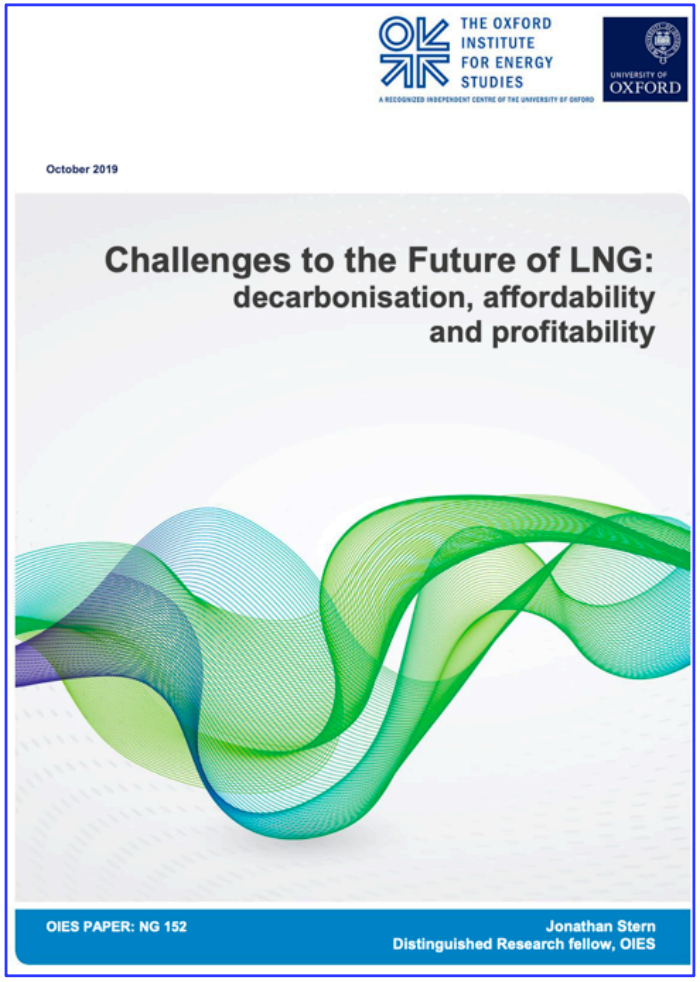
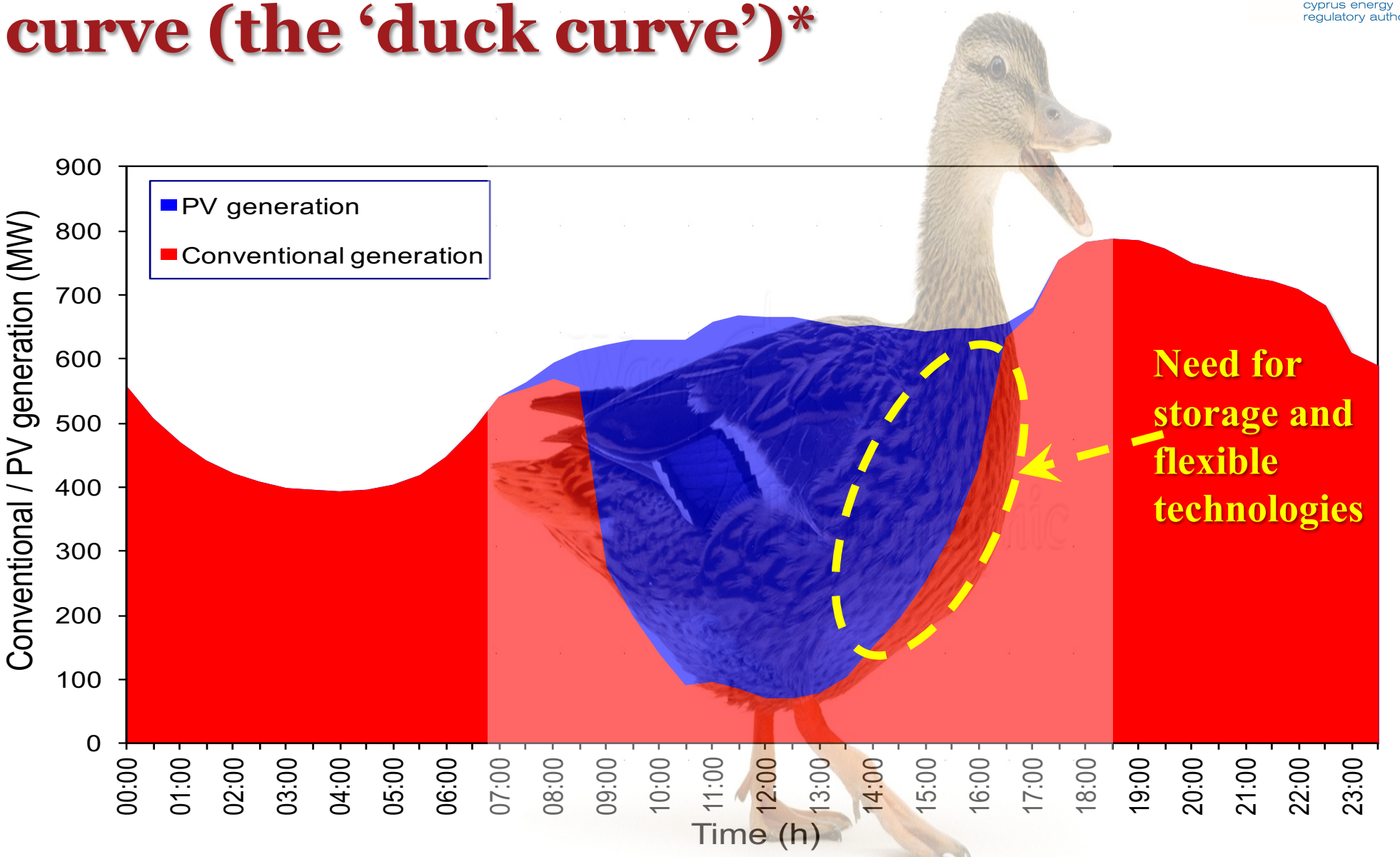
- switching from coal to gas
- using gas to back up intermittent renewables
- the quickest, easiest and lowest cost decarbonisation path



* Sterm J., 2019, *Challenges to the future of LNG: decarbonisation, affordability and profitability*, The Oxford Institute For Energy Studies

Effect of PV generation on load curve (the 'duck curve')*



* Poullikkas A., 2016, "From the 'camel curve' to the 'duck curve' on electric systems with increasing solar power", *Accountancy*

Gas is a pillar of renewable energy (power production in UK*)

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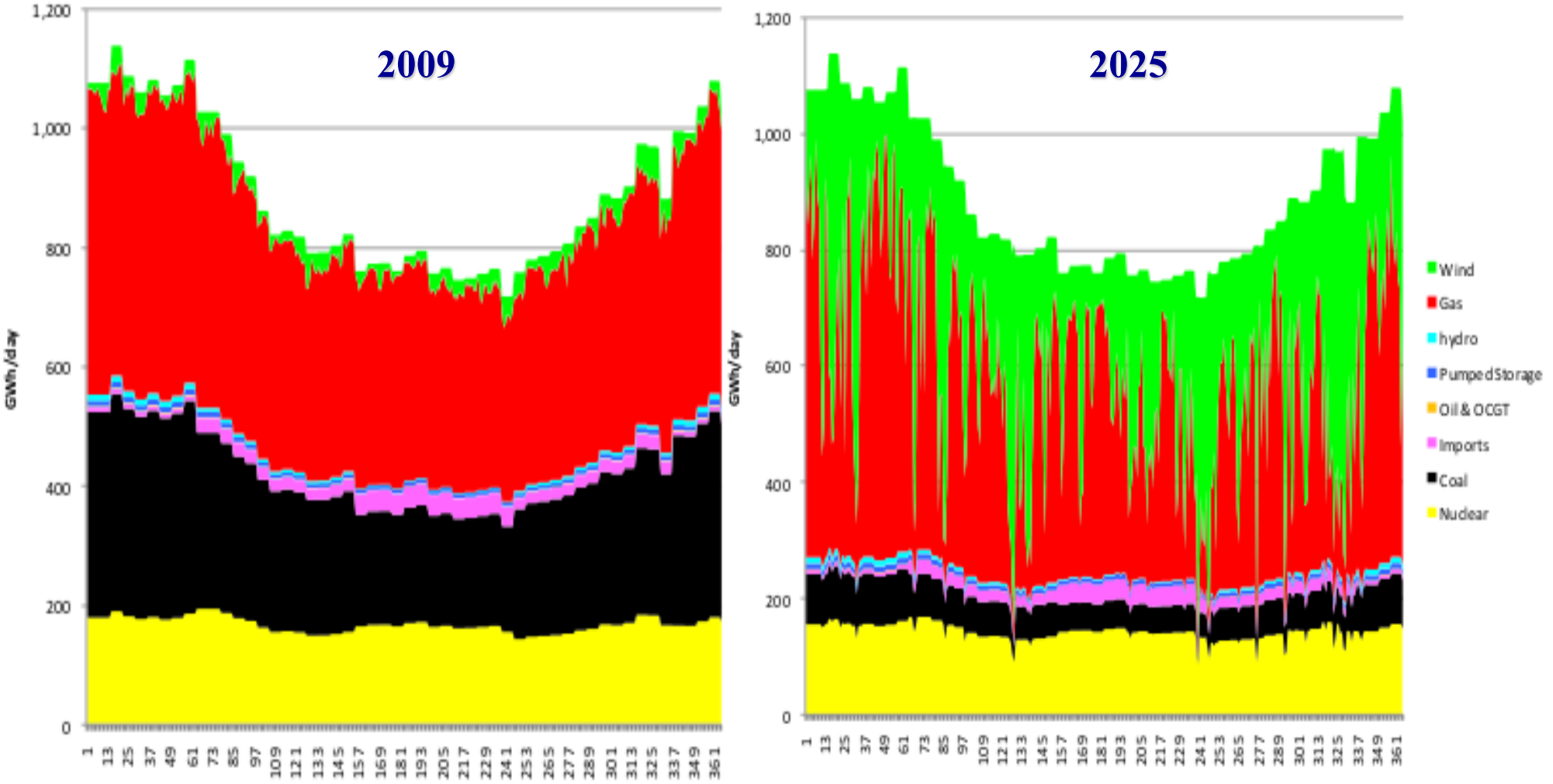
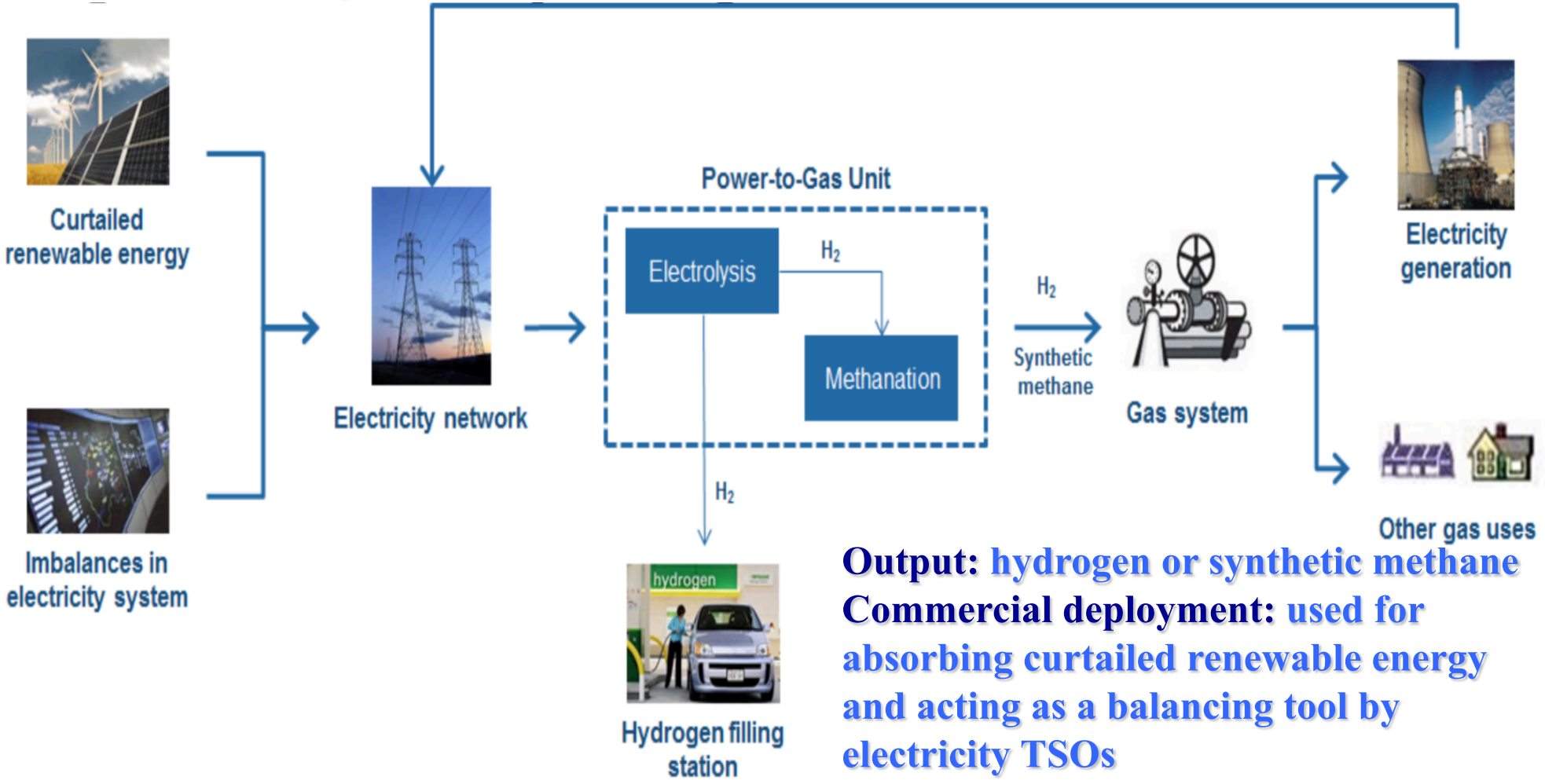


* H.V. Rogers, 2011, *The Impact of Import Dependence and Wind Generation on UK Gas Demand and Security of Supply to 2025*, The Oxford Institute For Energy Studies

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

- Poullikkas A., 2005, "An overview of current and future sustainable gas turbine technologies", *Renewable and Sustainable Energy Reviews*

Medium term role of NG in Europe

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Influenced by three interconnected vectors

- **The energy transition** – NG expected to play an important role in the European energy mix for the foreseeable future
- **European gas market evolution** – growing NG import dependency over time; NG market increasingly internally connected
- **Global LNG market evolution** – LNG supply *vs* demand becoming less well connected; increasing gas-on-gas competition

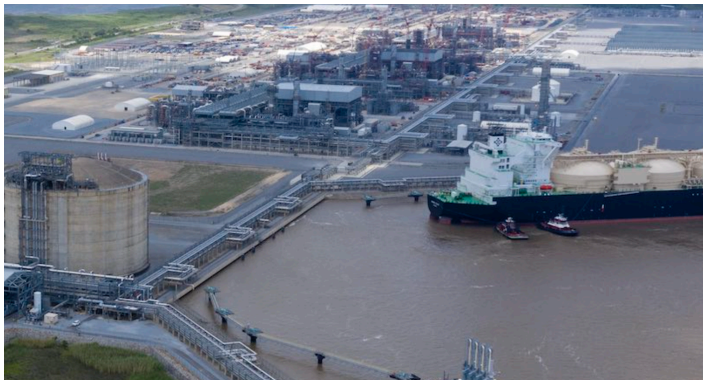
Short to medium term options

- **Natural gas exports from SE Med region**

  ~ Pipeline (EastMed)

  ~ LNG liquefaction terminal

  ~ Floating liquefied natural gas (FLNG)



Long term strategies

The role of interconnections and hydrogen for SE Mediterranean region

Long term strategy for energy exports from SE Mediterranean region

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Indigenous energy sources

Gas reserves in SE Mediterranean region*

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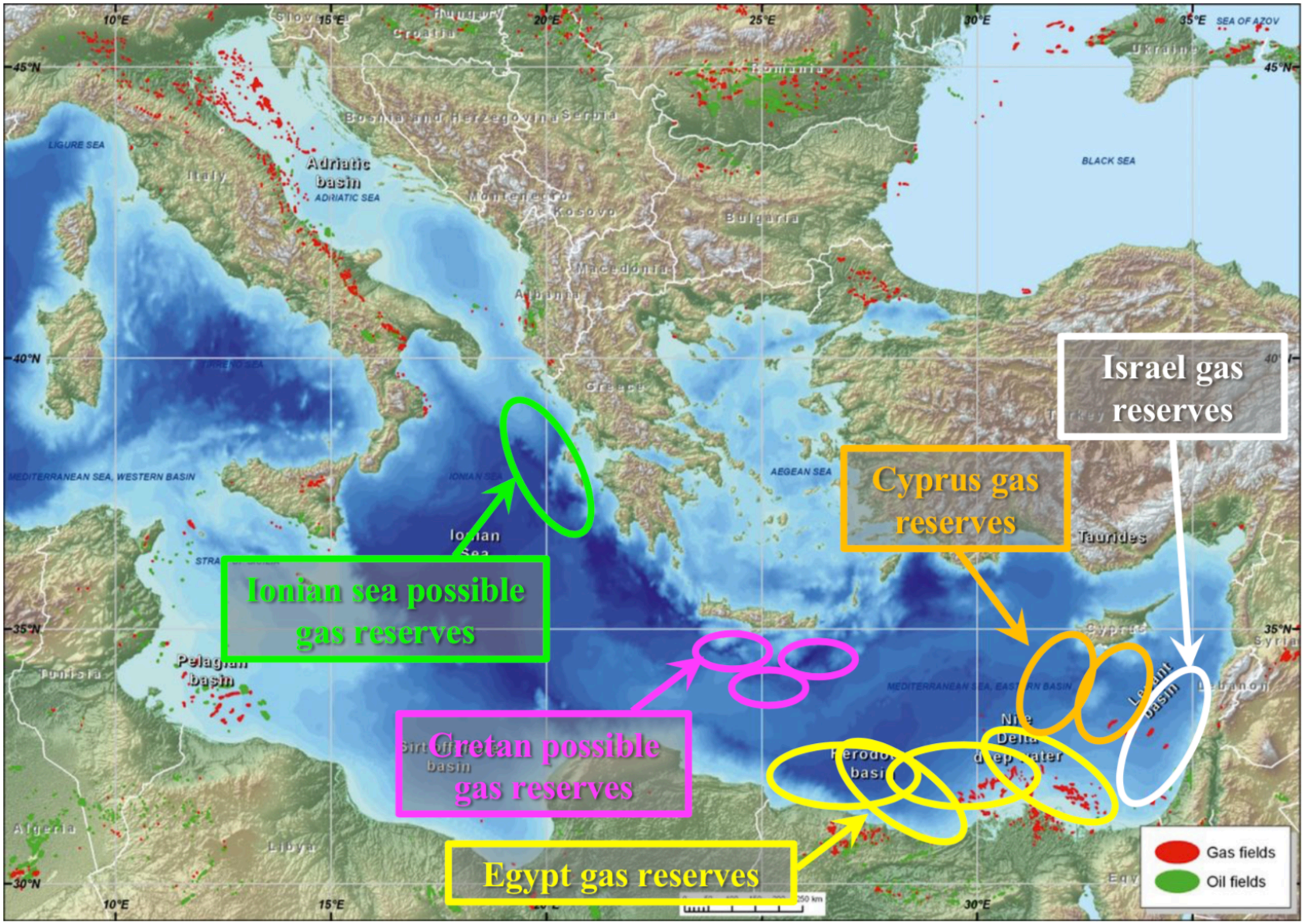

* A. Belopolsky, *et al.*, 2012, "New and emerging plays in the Eastern Mediterranean", *Petroleum Geoscience*

Wind potential in SE Mediterranean region*

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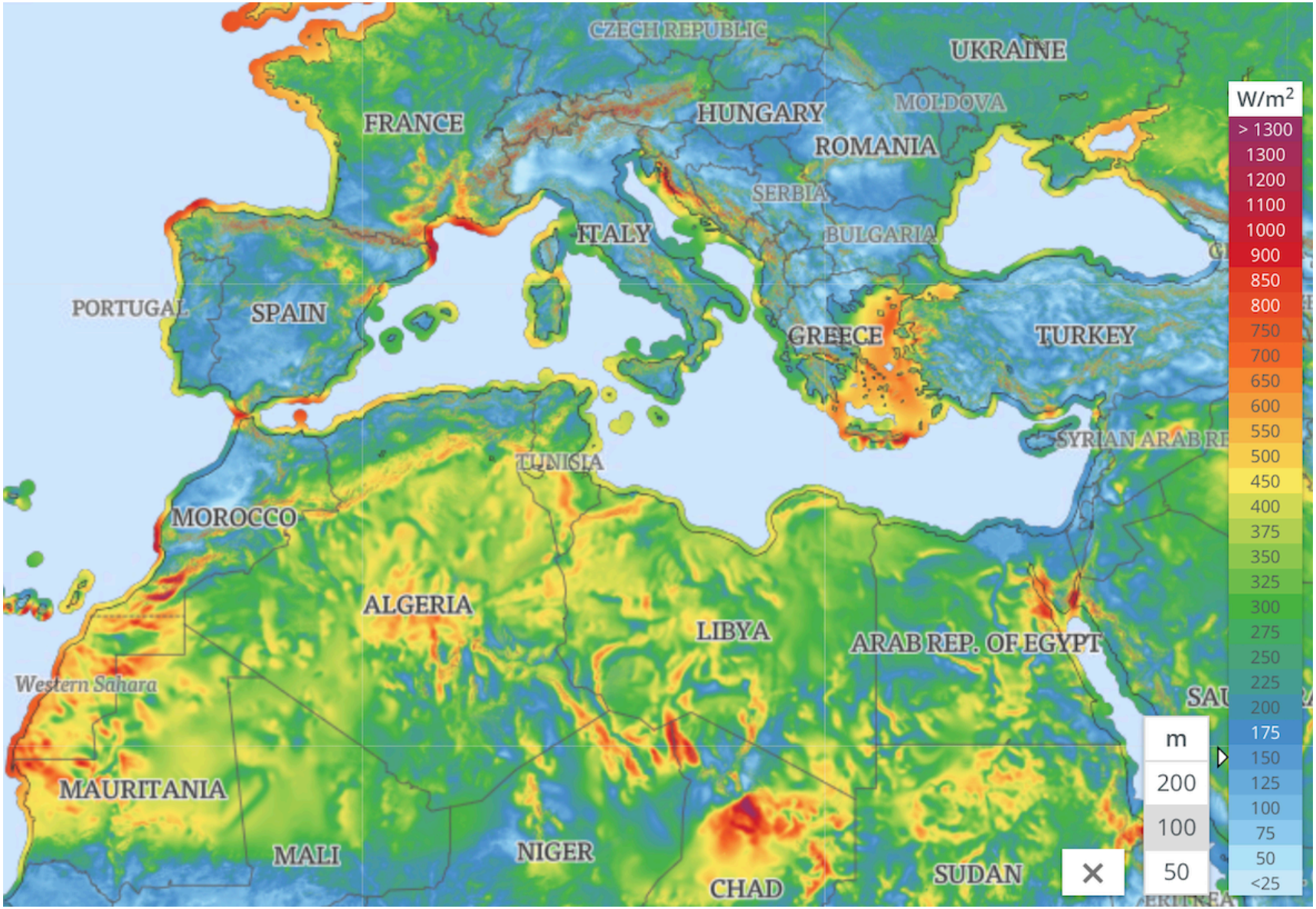

* The Global Wind Atlas (https://globalwindatlas)

Solar potential in SE Mediterranean region*

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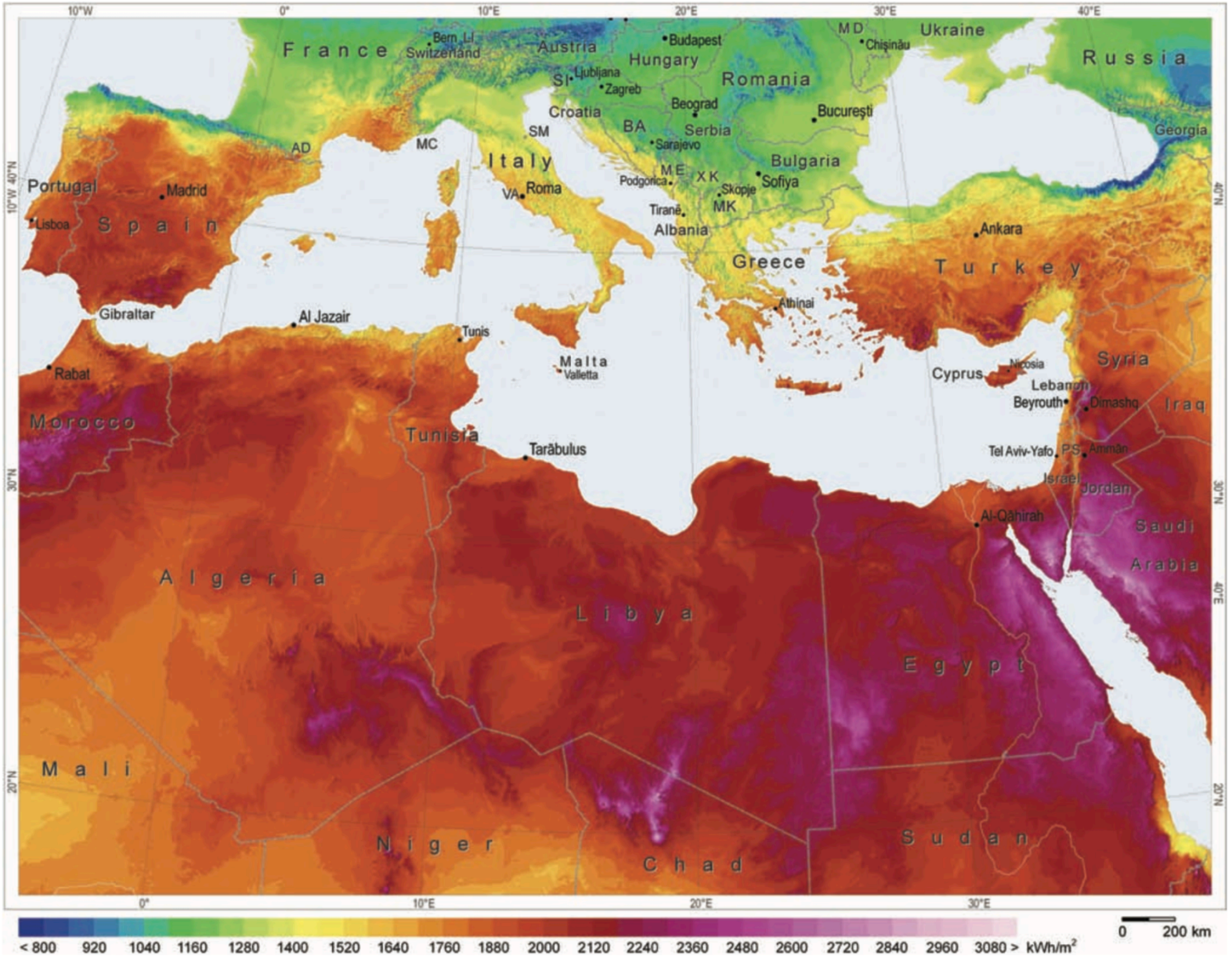
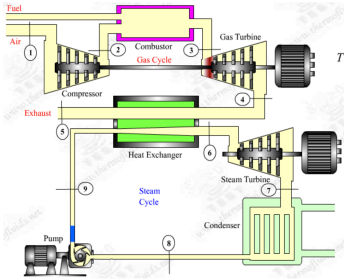


* Easac & Pihl, Erik. (2011). Concentrating Solar Power: Its potential contribution to a sustainable energy future

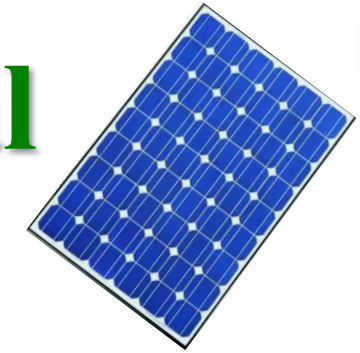
Main indigenous energy sources in SE Mediterranean region

- Natural gas



- Wind potential

- Solar potential



hydrogen

Long term scenarios in Europe

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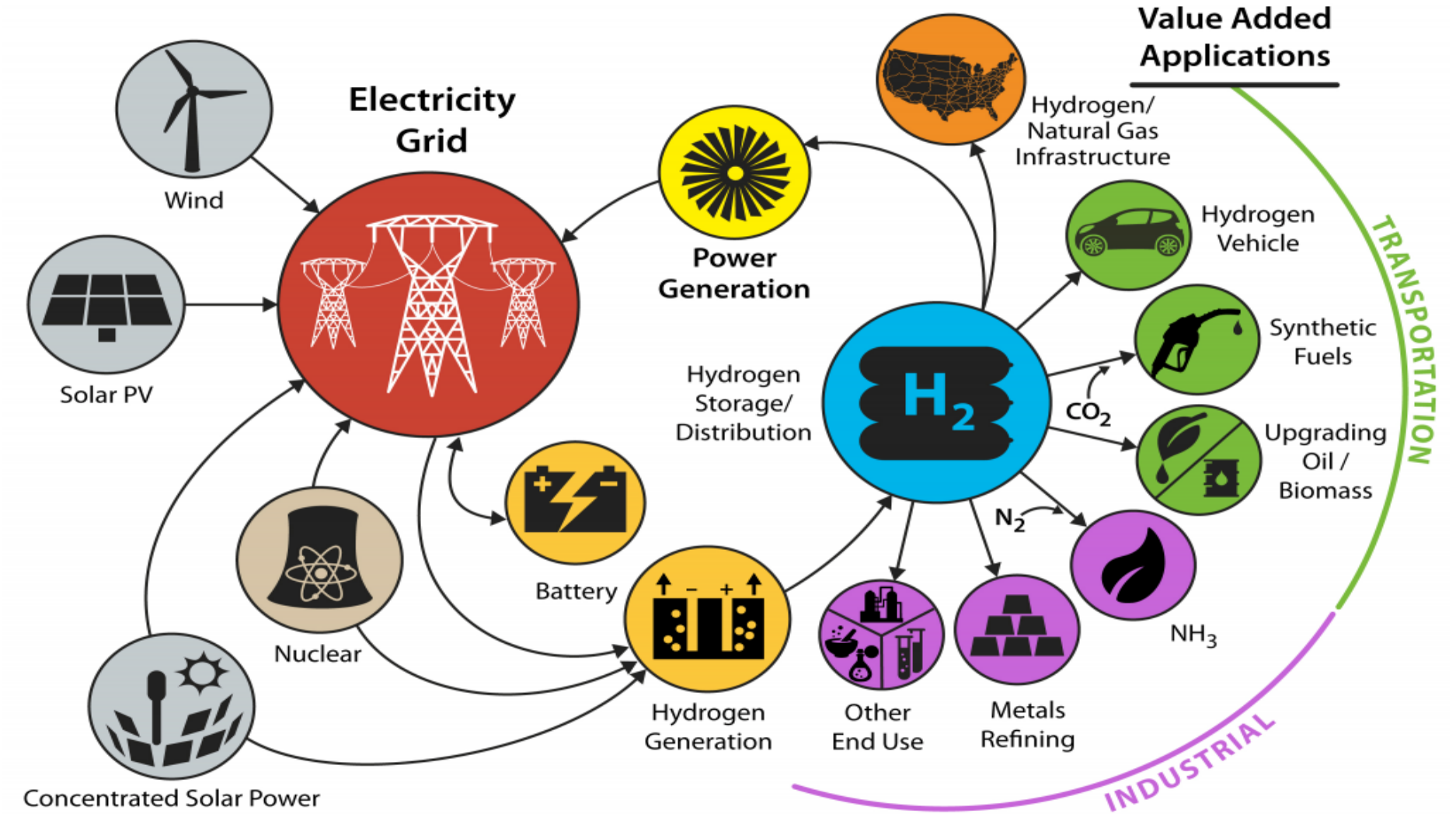
Moving from Carbon economy to Hydrogen economy



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

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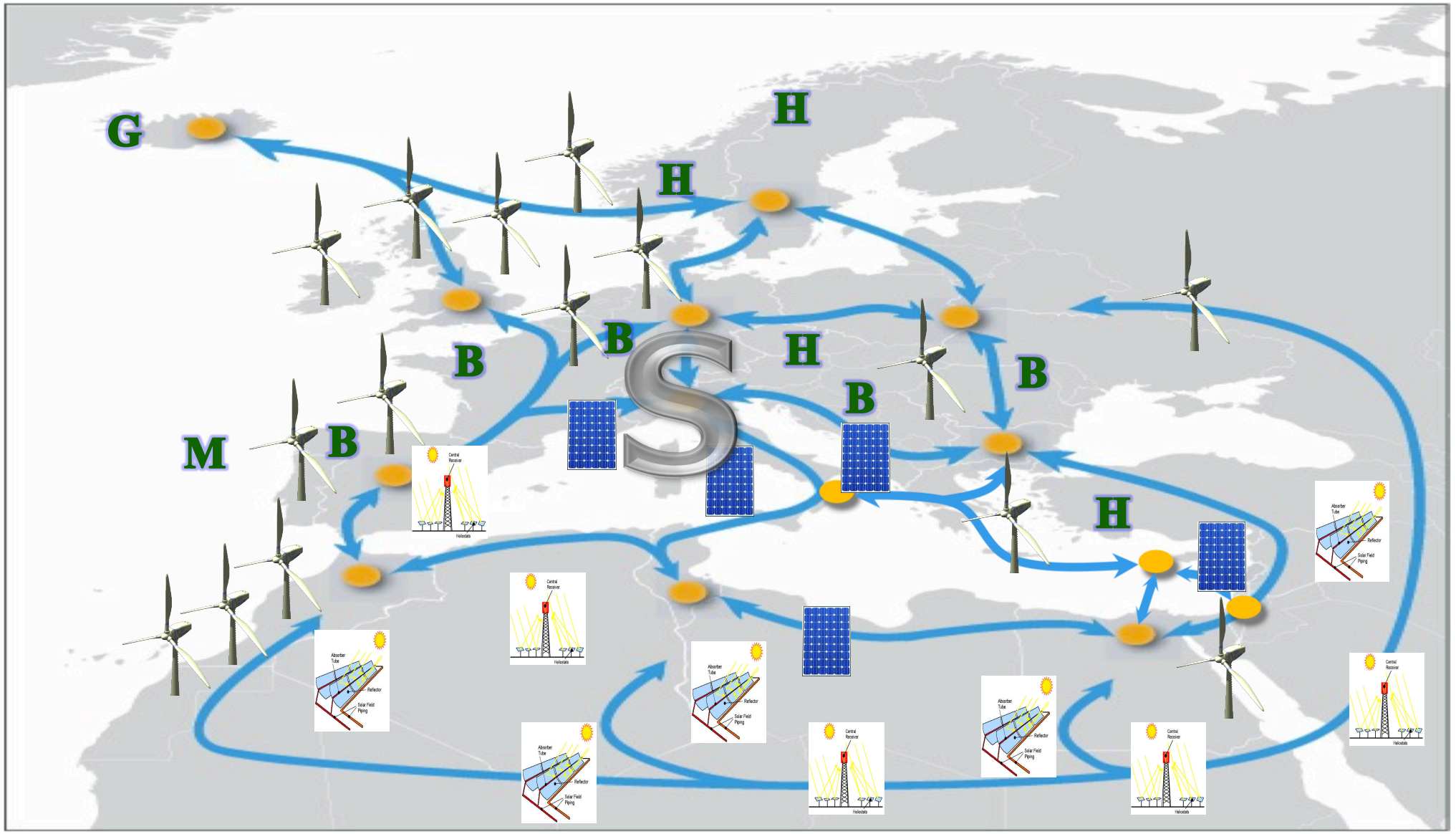

* Poullikkas A., 2013, *Sustainable Energy Development for Cyprus*, ISBN: 978-9963-7355-3-2

Next steps

Towards hydrogen economy

Next steps towards the development of sustainable 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**