



Towards climate neutral (H₂) cities

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Contents

- **EU energy strategy** – towards 2050
- **RePowerEU plan** – phase out dependency on Russian fossil fuels
- **The role of H₂ in energy transition** – long-term scenarios from carbon economy to hydrogen economy
- **National H₂ strategies** – towards 2030-2050

EU energy strategy towards 2050

Energy transition

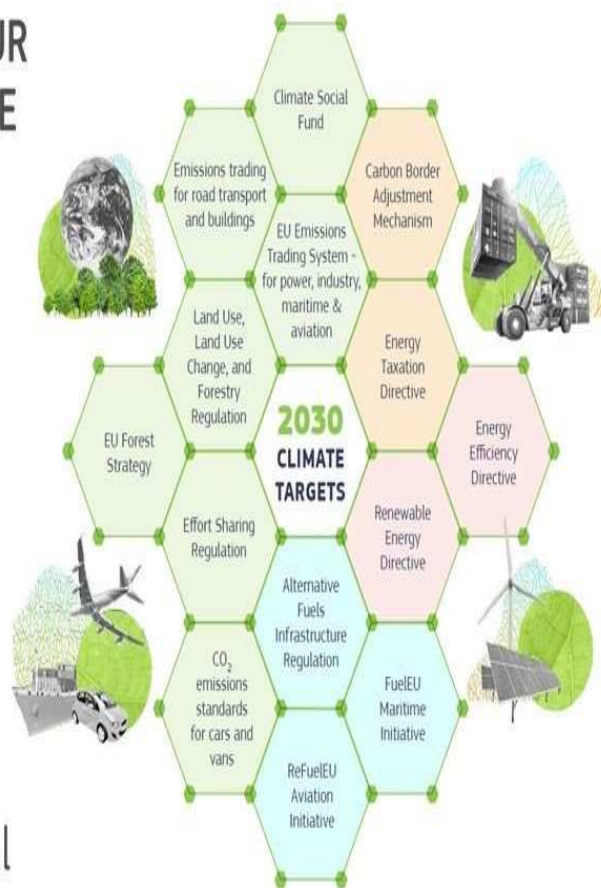
- **greenhouse gas reduction**
 - EU: climate neutral by 2050
- **sustainable production and consumption**
- **competition in electricity and natural gas markets**
- **security of supply**



The EU Green Deal and Fit-for-55

EUROPEAN GREEN DEAL

REACHING OUR
2030 CLIMATE
TARGETS



#EUGreenDeal

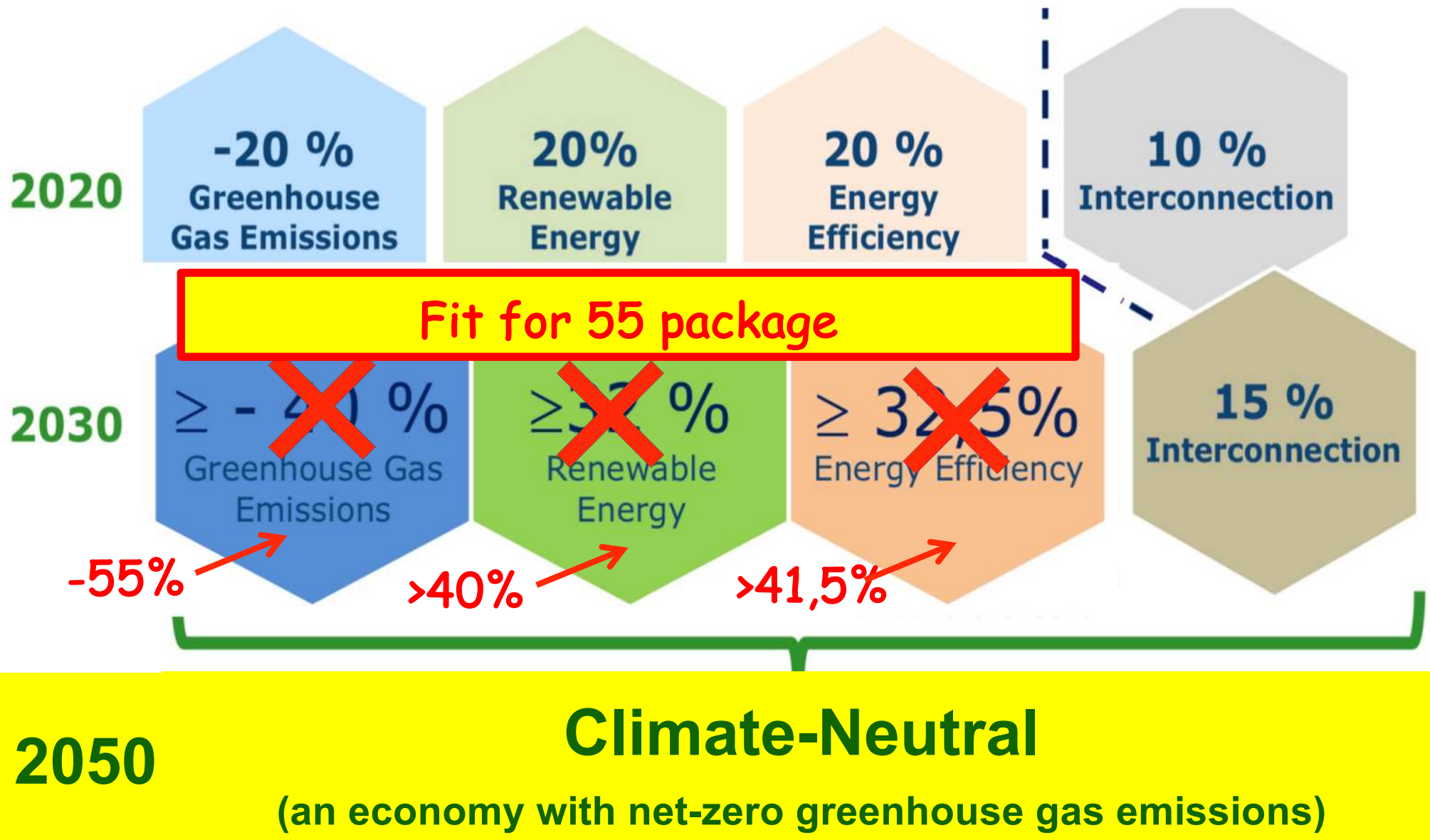


...to reach our
targets in a:

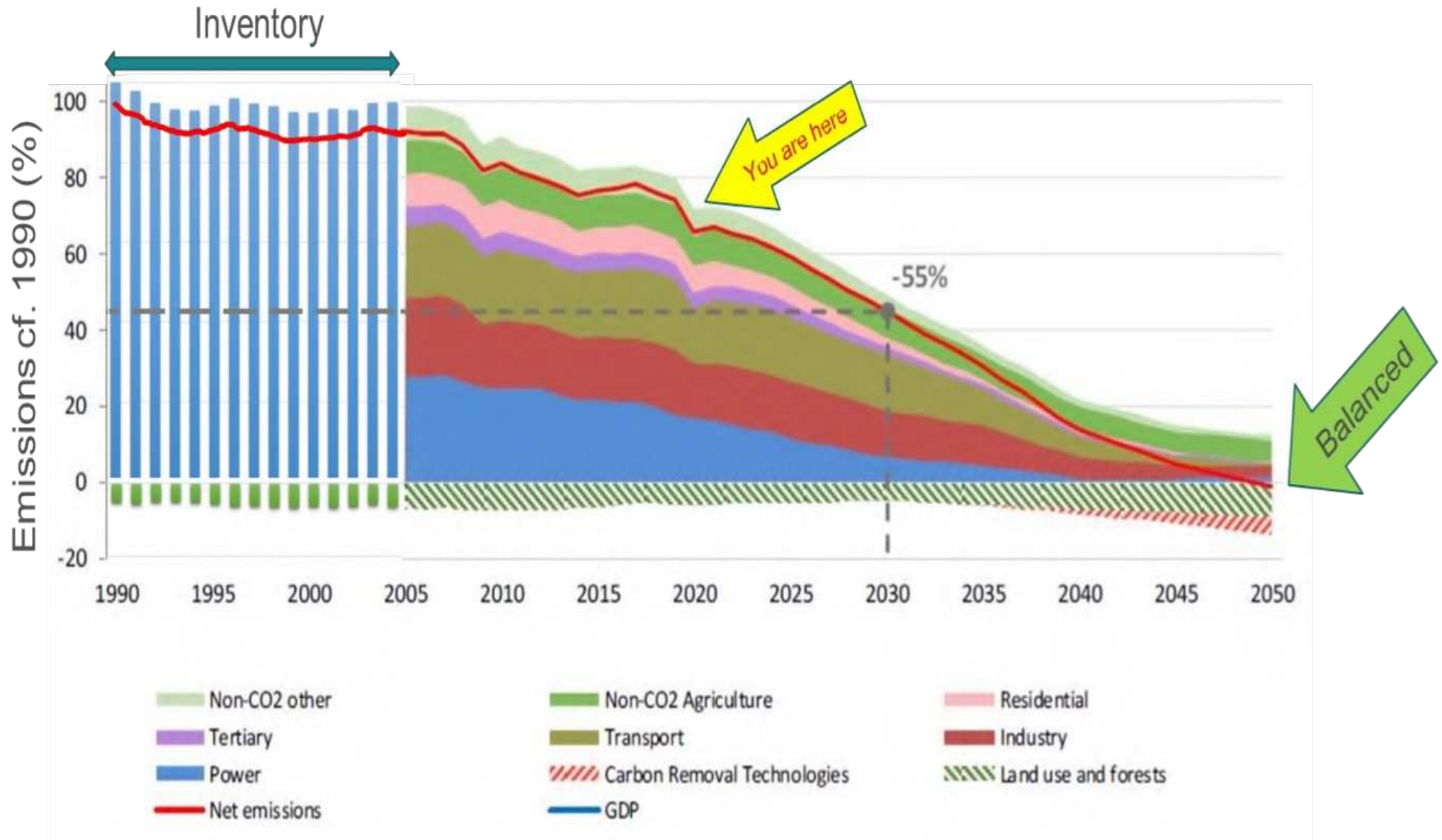
- socially fair
- cost-efficient
- competitive

way...

EU medium and long term targets



Fit-for-55 strategy



CEEA Energy Transition Regulatory Decisions

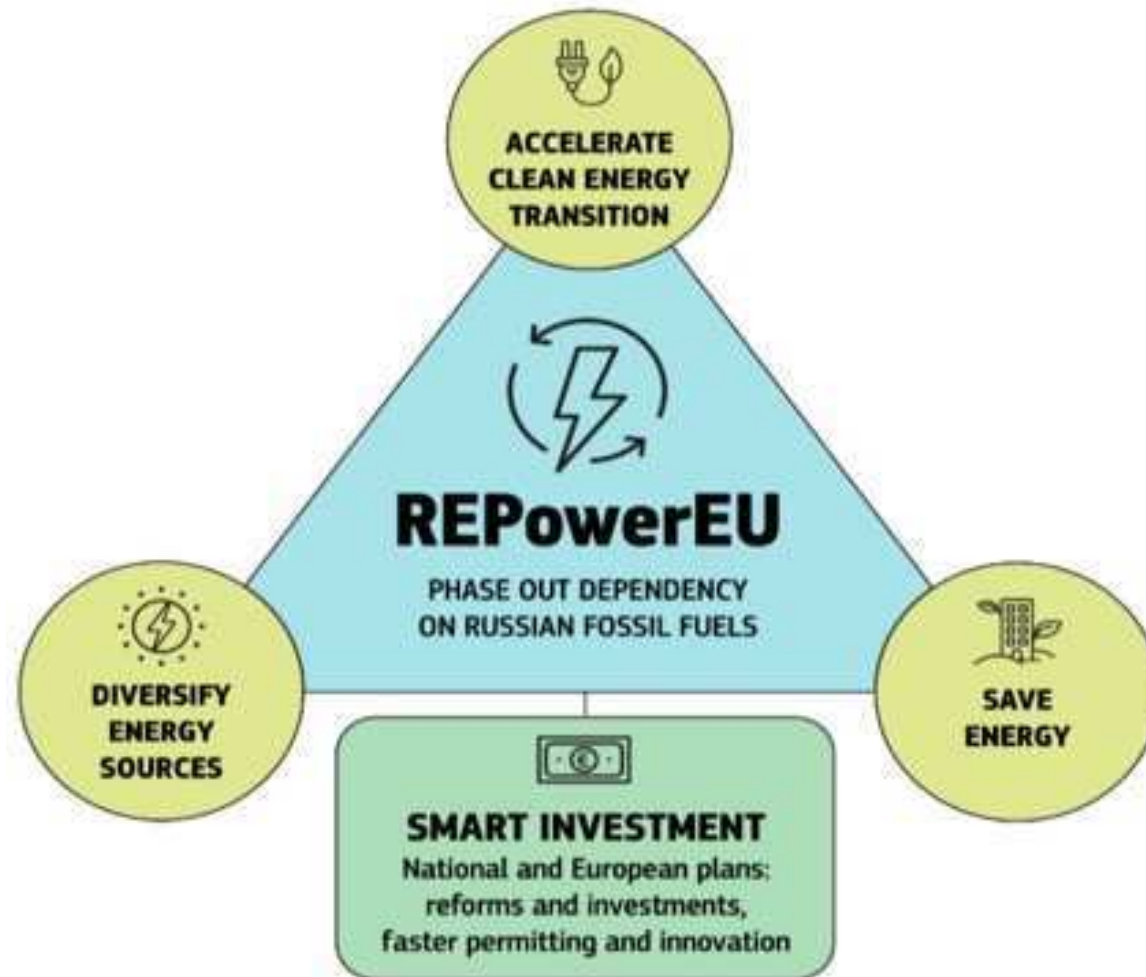
- **Regulatory Decision 01/2017 (ΚΑΠ 34/2017):** A detailed schedule for the implementation of EU electricity market target model
- **Regulatory Decision 02/2018 (ΚΑΠ 259/2018):** The mass installation of an Advanced Metering Infrastructure including smartmeters to all electricity consumers
- **Regulatory Decision 02/2019 (ΚΑΠ 204/2019):** The establishment of basic principles of a regulatory framework for the operation of electricity storage systems in the wholesale electricity market
- **Regulatory Decision 03/2019 (ΚΑΠ 224/2019):** The redesign of the power grid to become smart and bi-directional in order to allow integration of large quantities of renewable energy sources in combination with energy storage systems

RePowerEU plan

phase out dependency on Russian fossil fuels

RePowerEU plan*

Phase out dependency on Russian fossil fuels

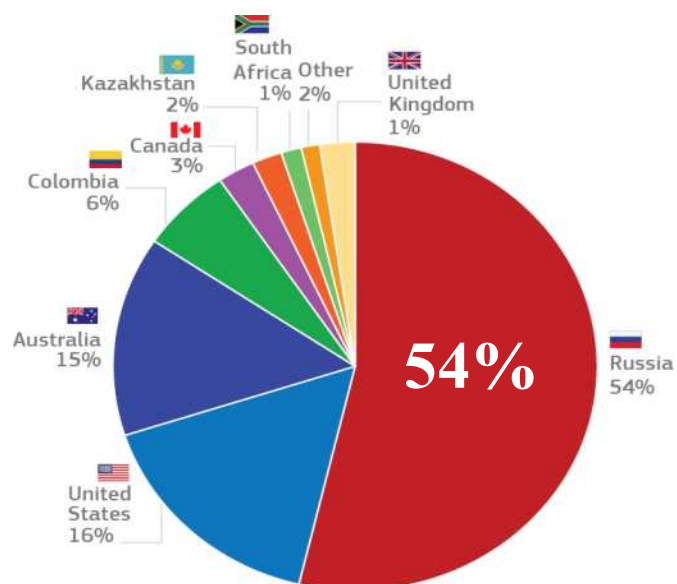


* *RePowerEU Plan, EU, 2022*

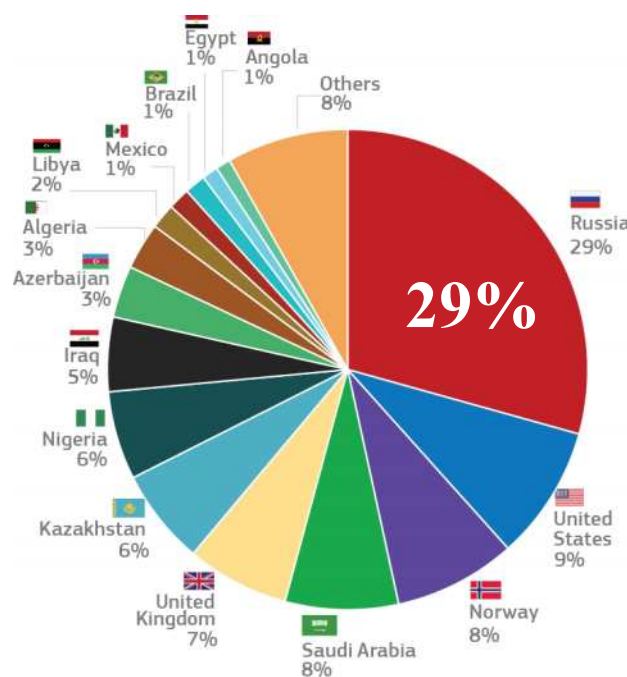
Ενεργειακές εκδηλώσεις ΡΑΕ, 86η Διεθνής Έκθεση Θεσσαλονίκης
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EU energy import dependency on Russia (year 2021)

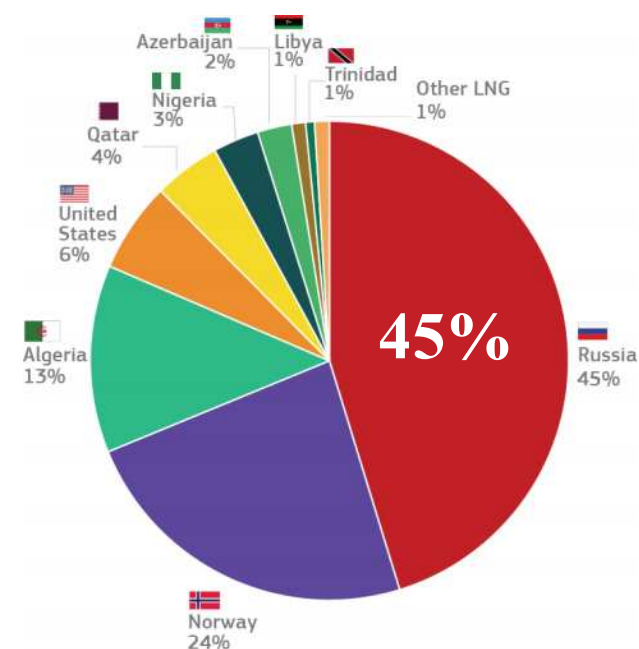
Coal



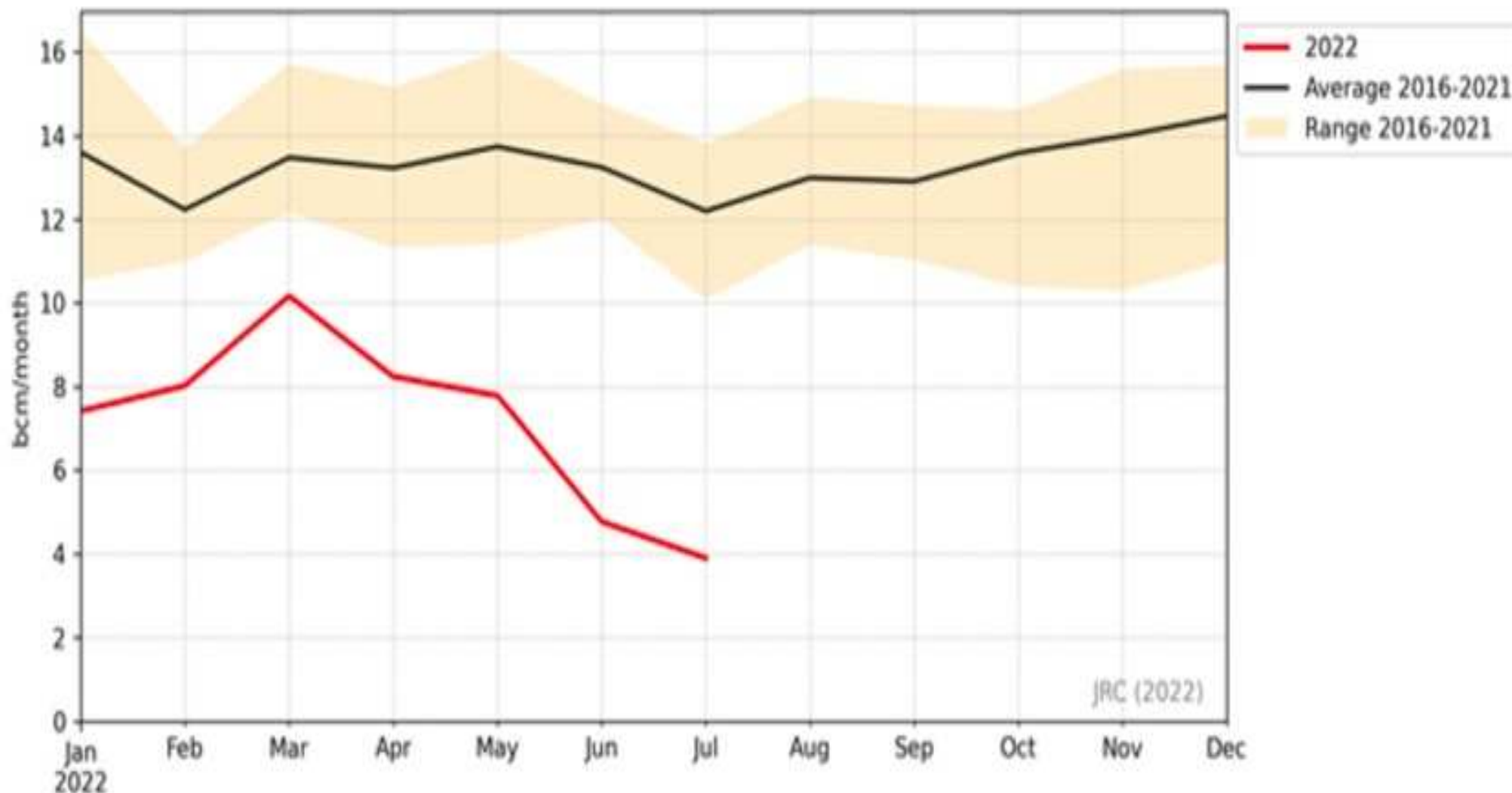
Oil



Natural gas (pipe and LNG)



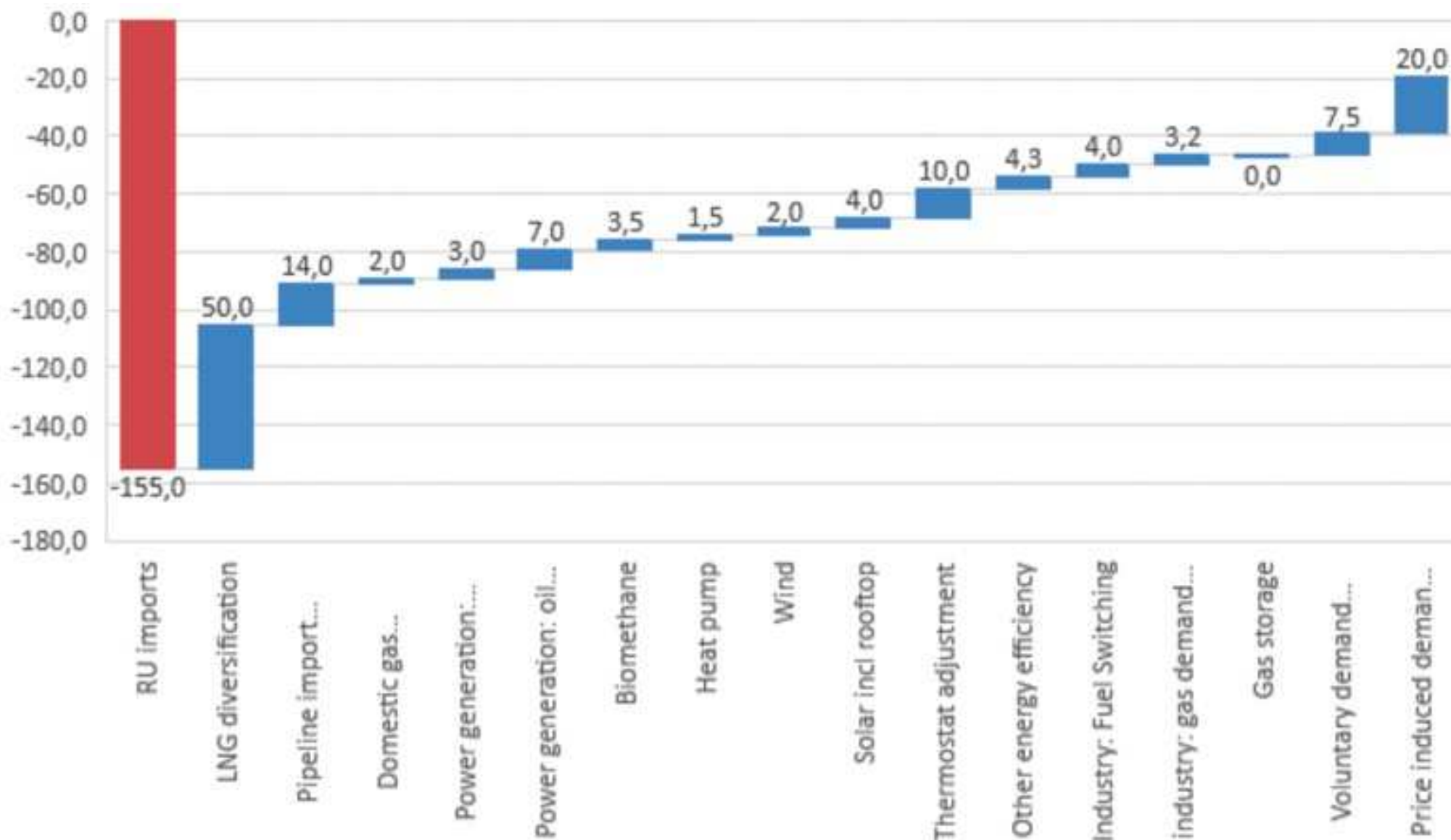
Flows from Russian gas in 2022*



* *Save Gas for Safe Winter, EU, 2022*

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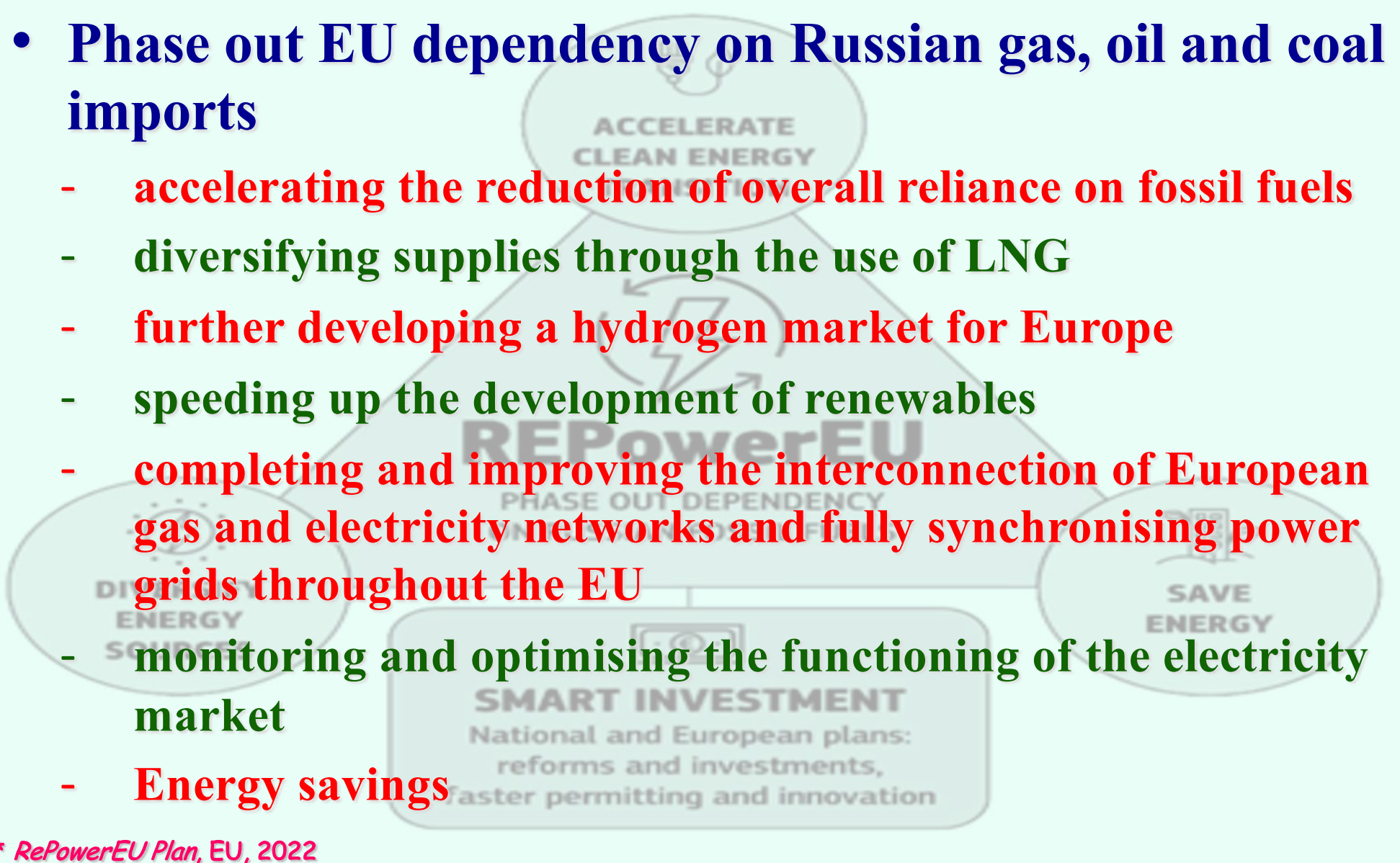
Measures to bridge the gap*



* *Save Gas for Safe Winter, EU, 2022*

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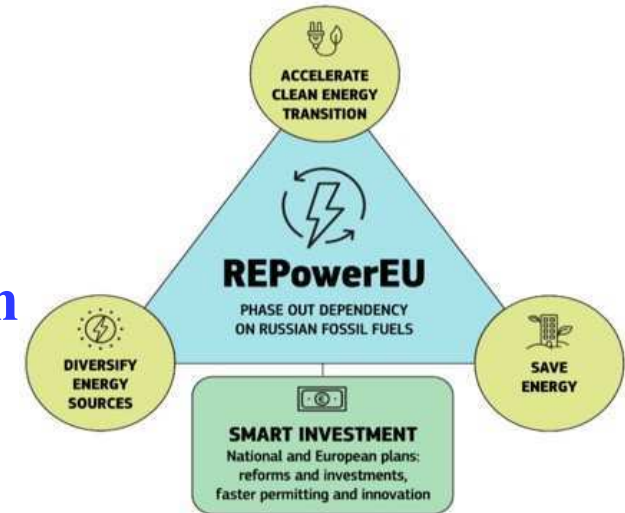
RePowerEU plan*

- **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**
- 
- ACCELERATE CLEAN ENERGY**
- DIVERSIFY ENERGY SOURCES**
- SAVE ENERGY**
- SMART INVESTMENT**
National and European plans:
reforms and investments,
faster permitting and innovation
- REPowerEU**
PHASE OUT DEPENDENCY
ON RUSSIAN FOSSIL FUELS

* *RePowerEU Plan, EU, 2022*

REPowerEU: from goals to actions

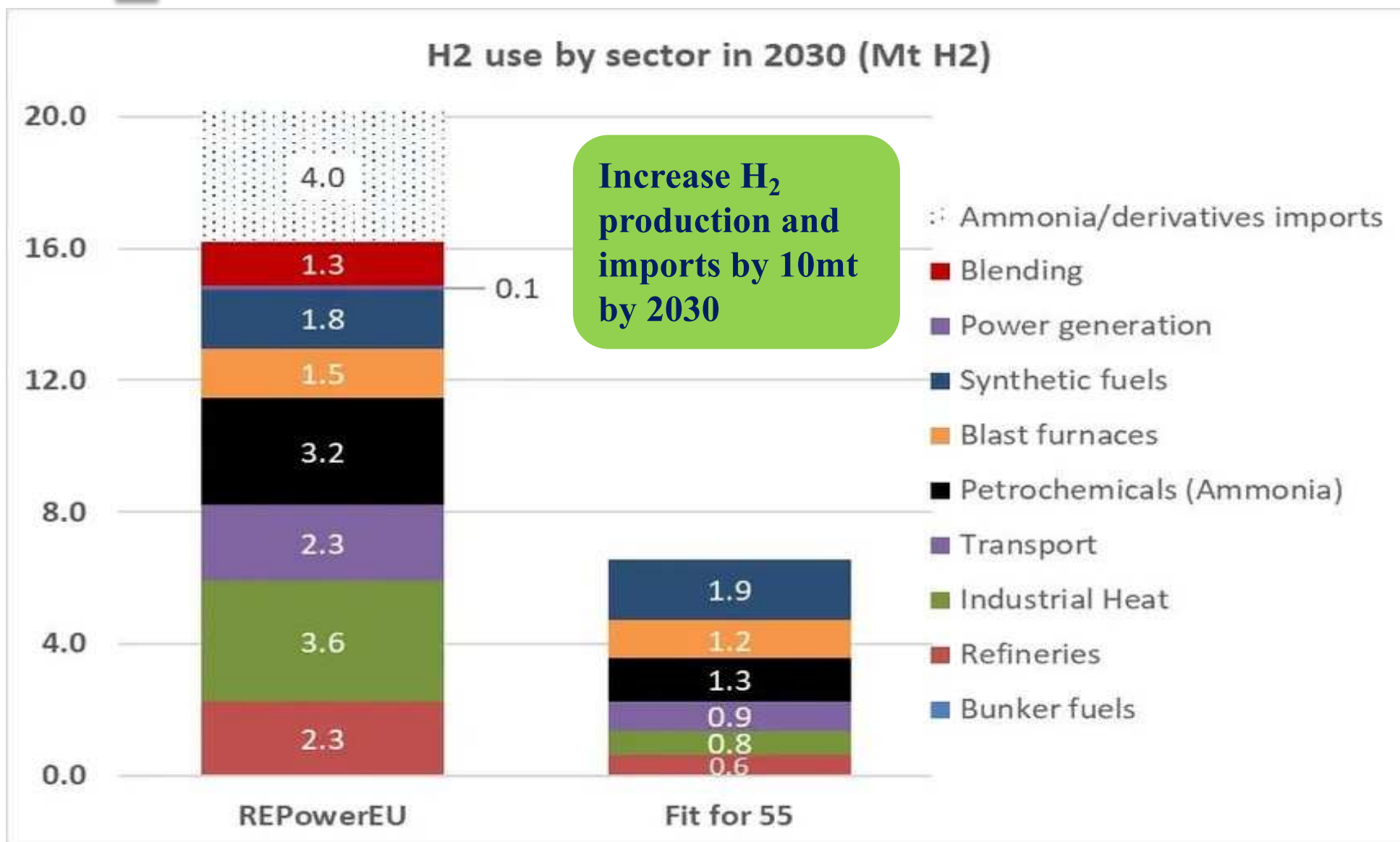
- Independence from Russian fossil fuels by 2027
- Increase imports of LNG by 50 bcm
- Increase pipeline natural gas imports by 10 bcm
- Increase biomethane production by 3.5 bcm
- EU-wide energy saving to cut gas demand by 14 bcm
- Rooftop solar to reduce gas demand by 2.5 bcm
- Heat pumps to reduce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



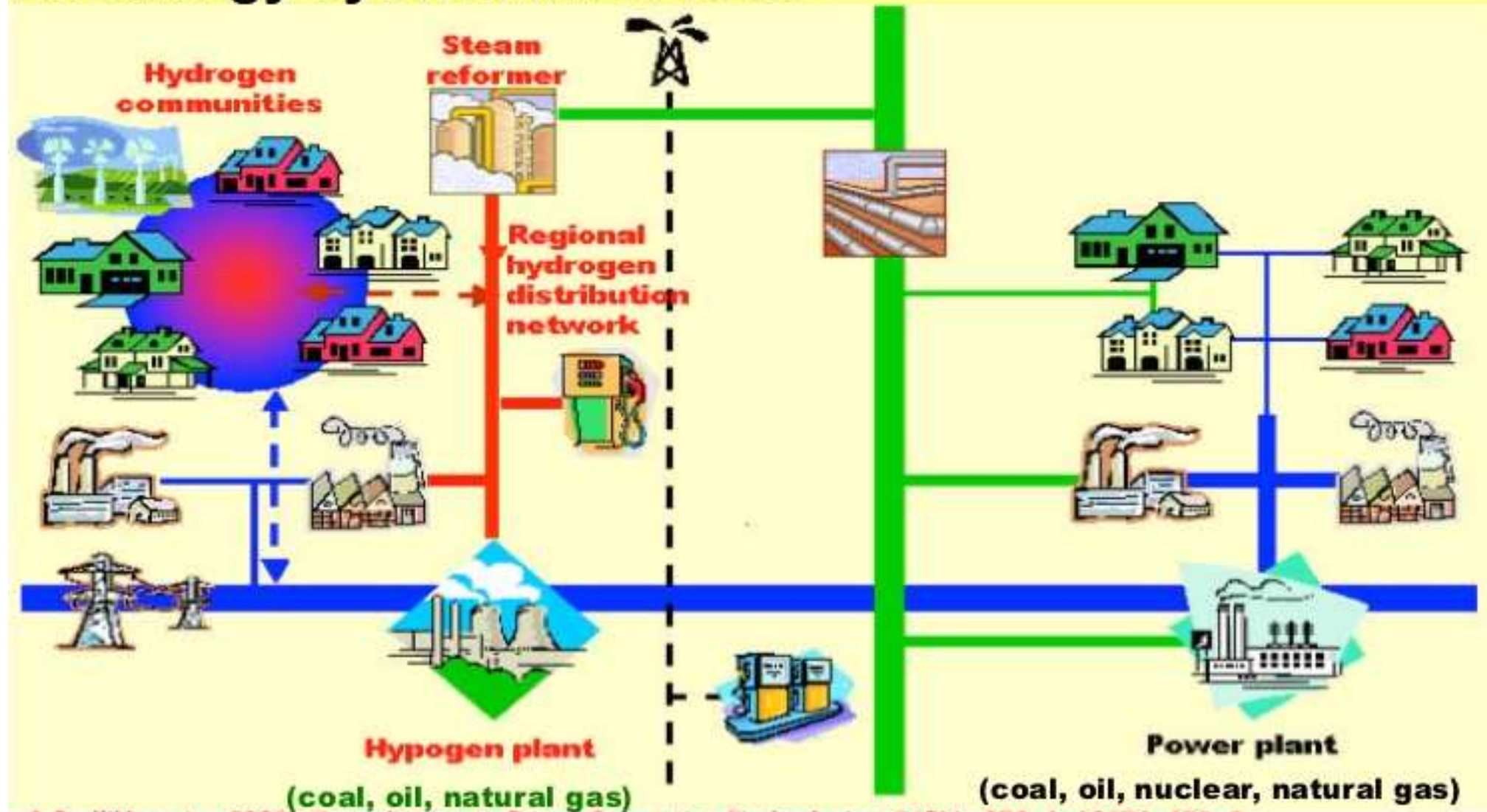
* RePowerEU Plan, EU, 2022

The role of H₂ in Energy Transition

Long-term scenarios from carbon
economy to hydrogen economy

Future energy systems (optimistic scenario)

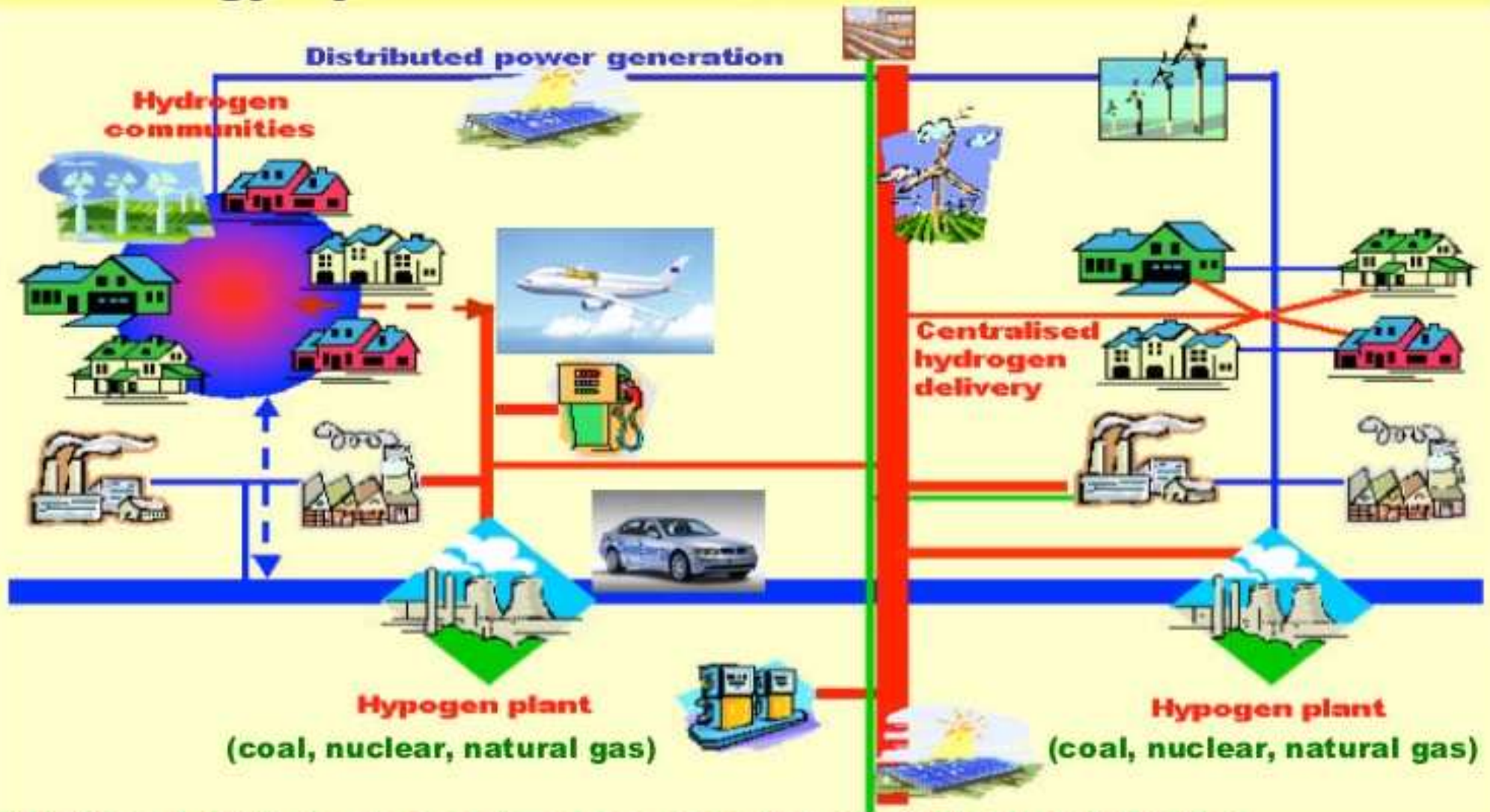
EU energy system in 2020-30*



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

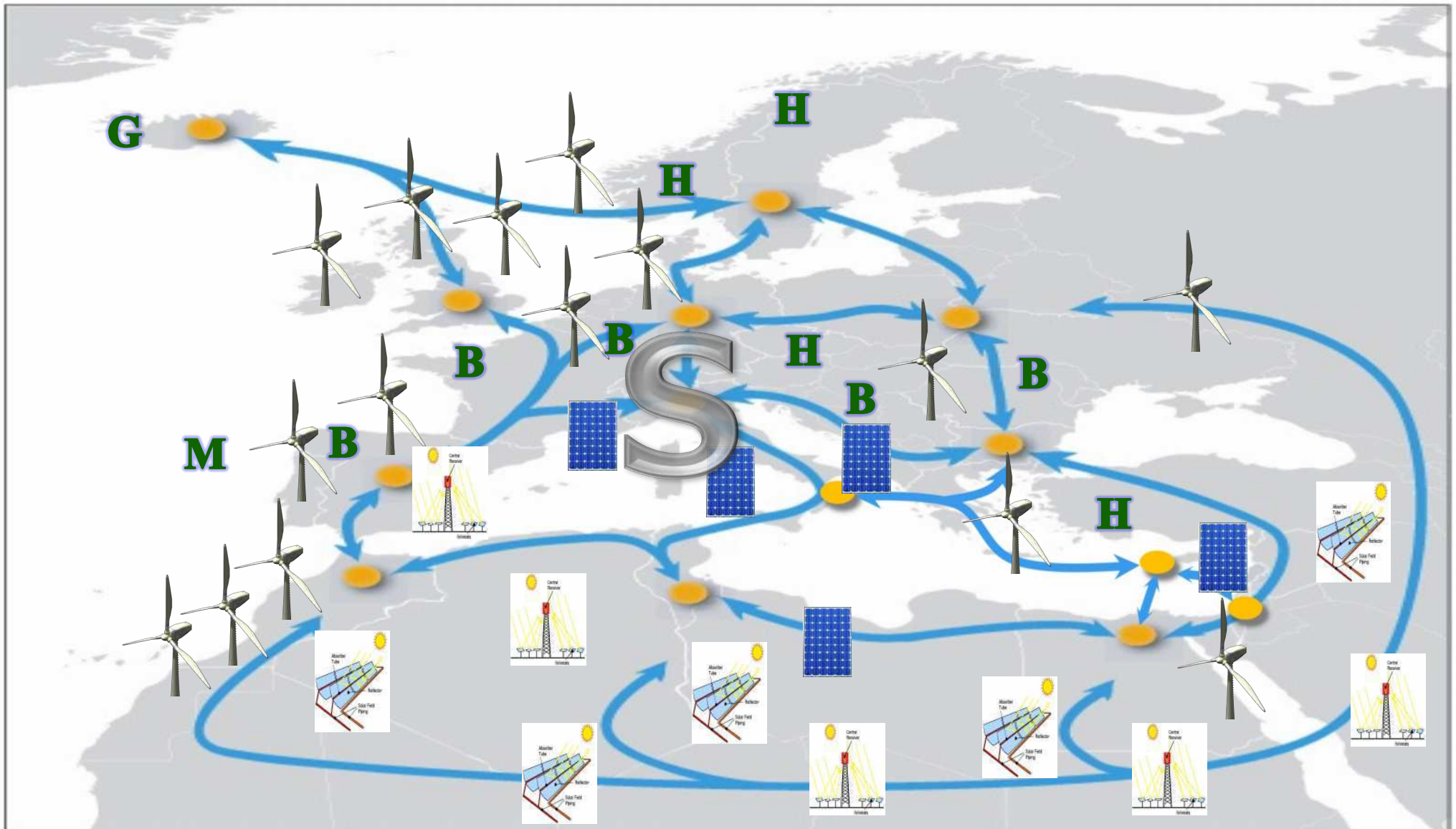
Future energy systems (optimistic scenario)

EU energy system in 2040-50*



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

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

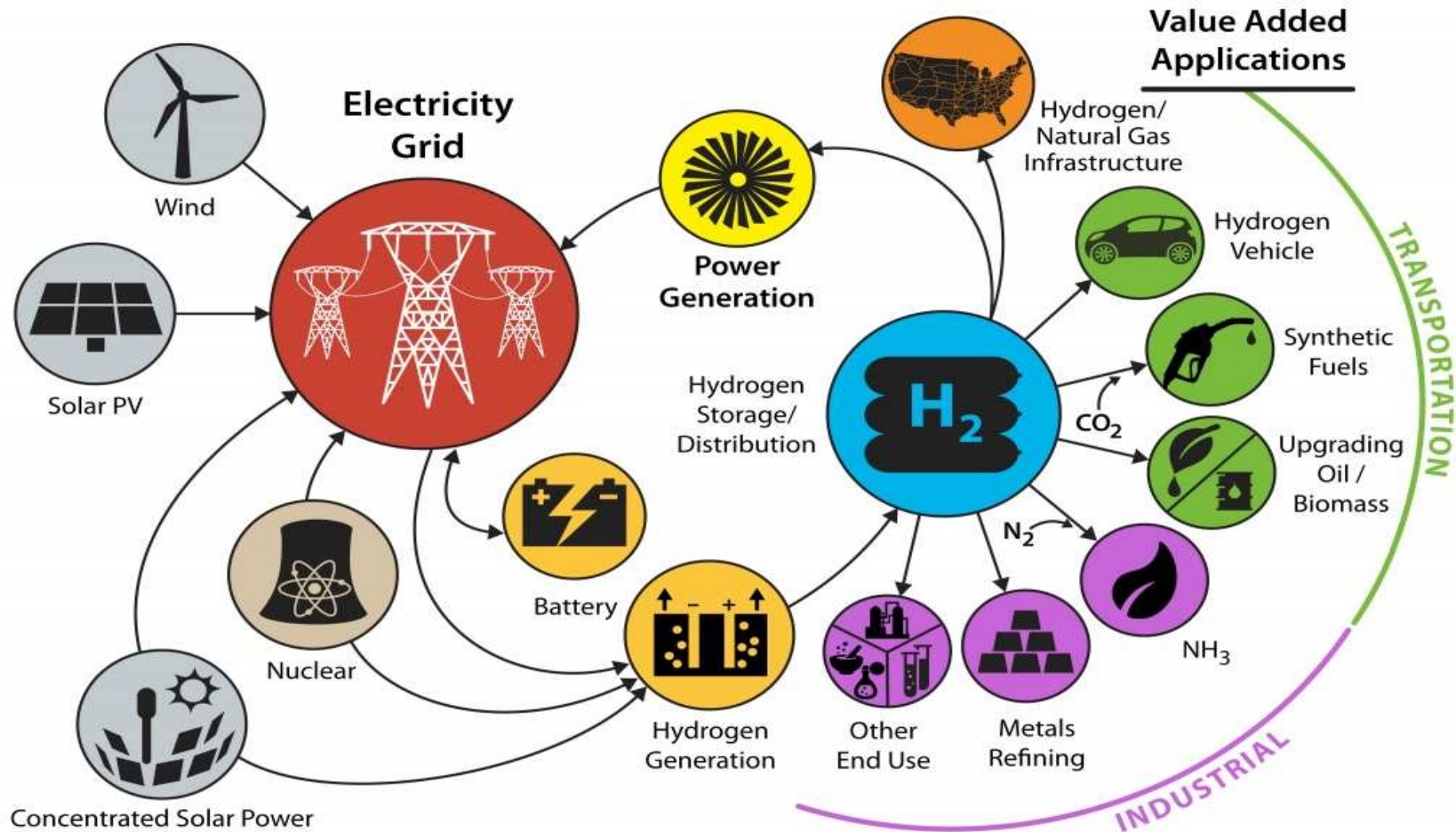


* Poullikkas A., 2013, *Sustainable Energy Development for Cyprus*, ISBN: 978-9963-7355-3-2

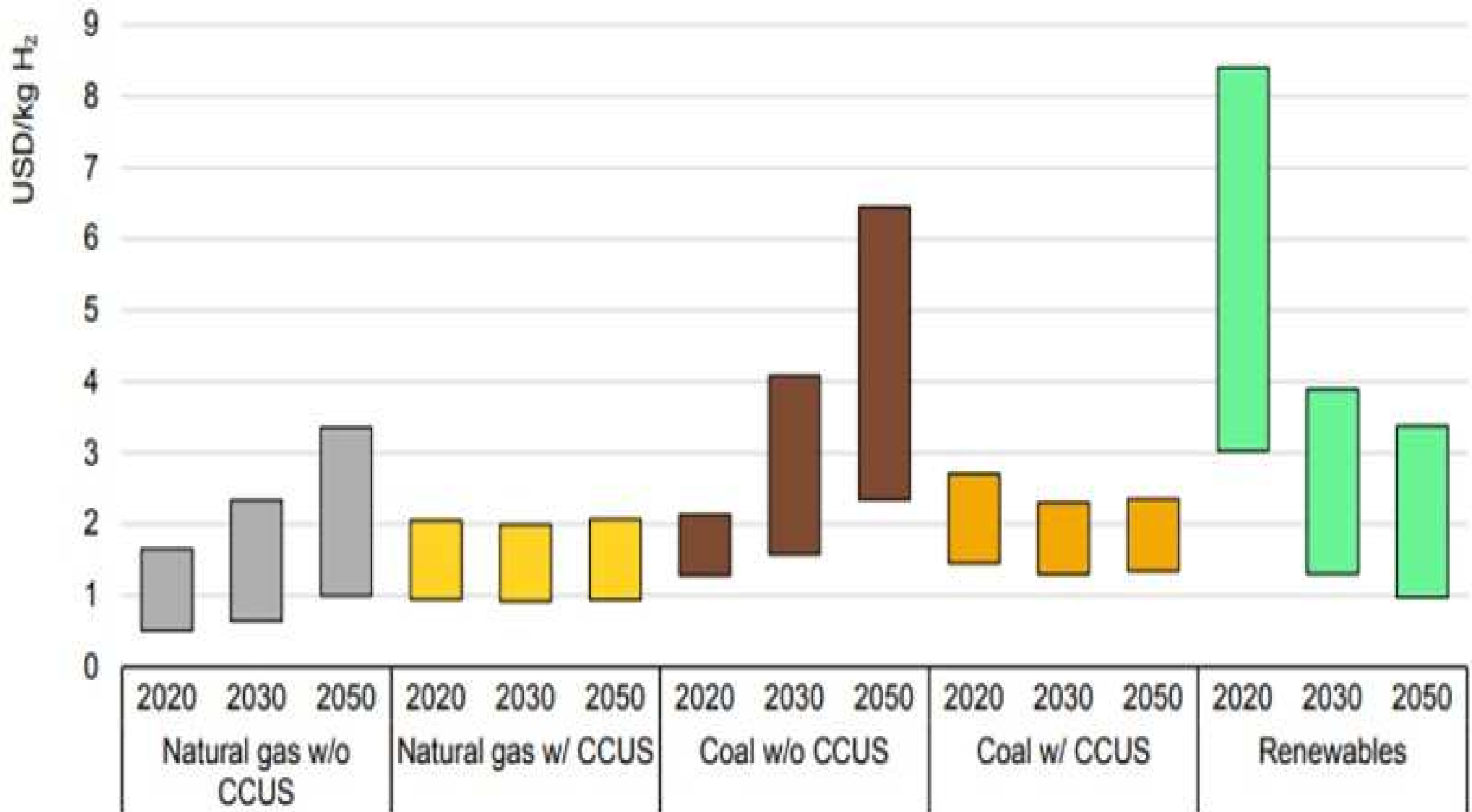
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Long term scenarios in Europe

Moving from **Carbon** economy to **Hydrogen** economy



H₂ production cost*



* *The Future of Hydrogen, International Energy Agency, 2019*

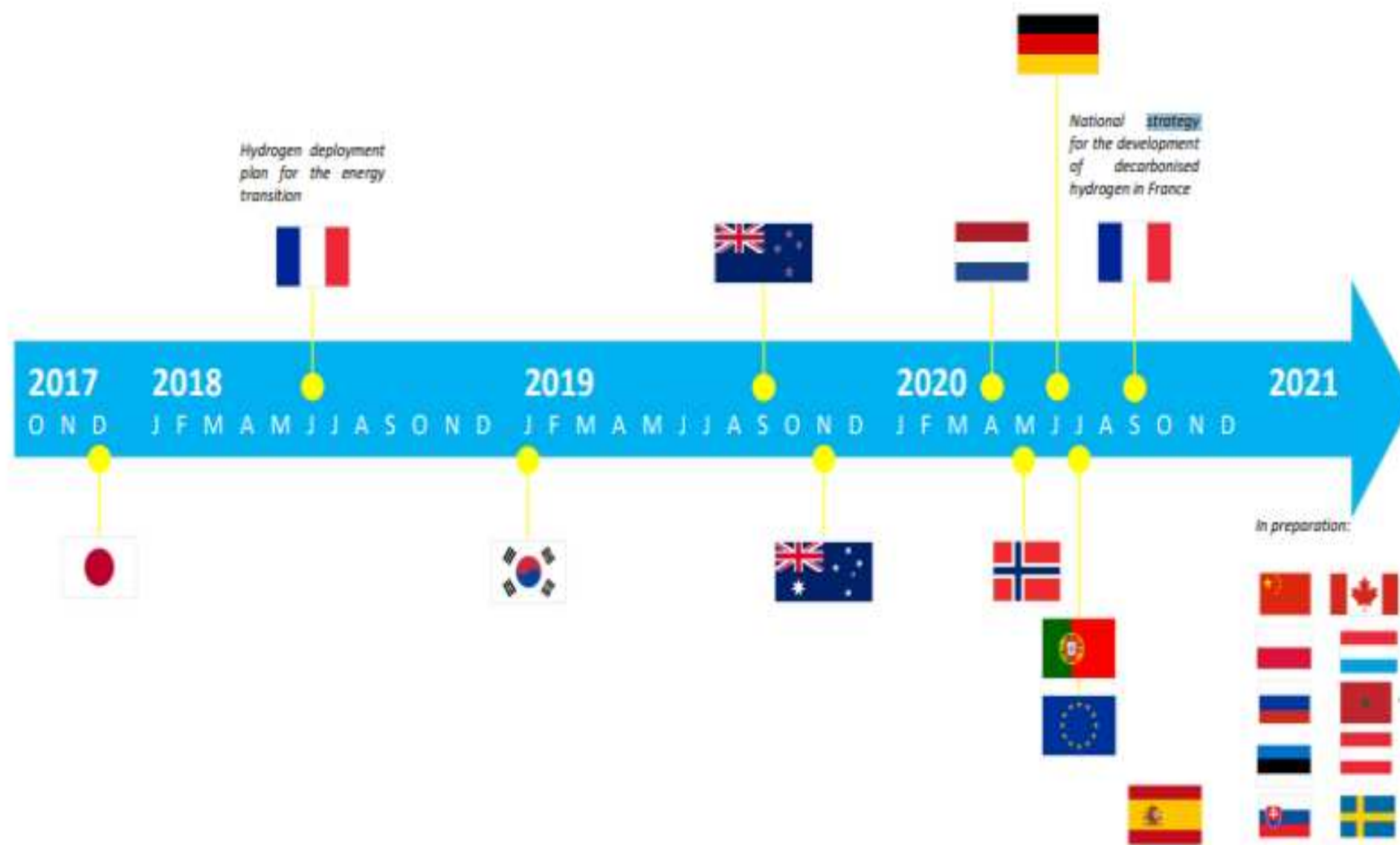
Saudi Arabia \$5bn Helios H2 project

- Desert area = Belgium
- 4GW of Wind and PVs
- Production of 650t/day of H₂
- Reduce of H₂ production from 5US\$/kg to 1.5US\$/kg
- Long-term: Saudi Arabia to become H₂ exporter



National hydrogen strategies towards 2030-2050

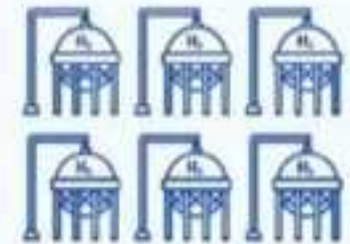
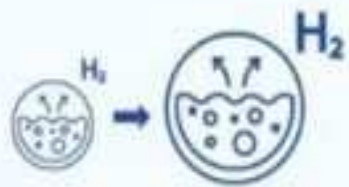
National Hydrogen Strategies*



* Possible regulation of hydrogen networks, ACER 2021

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EU H₂ strategy*



Today - 2024

- **Installation of Electrolysers: at least 6GW for green H₂ production**
- **Production of green H₂: up to 1mt**

2025-2030

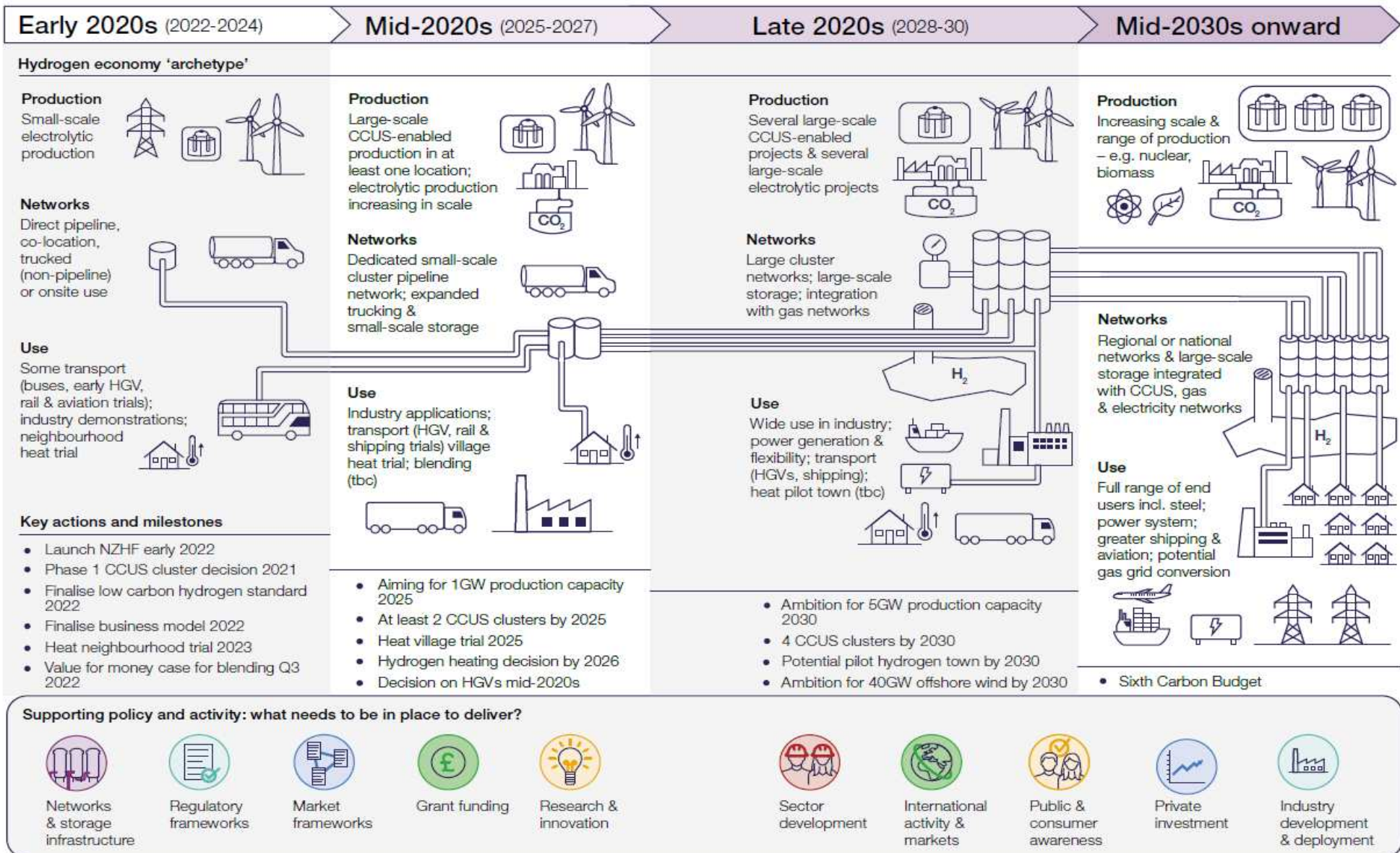
- **H₂ to become part of the integrated energy system**
- **Production of green H₂: more than 10mt**

2030

- **Large scale integration of green H₂**

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

UK H₂ roadmap



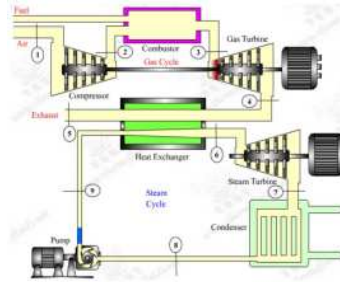
Additional Slides

Long-term H₂ strategies for SE Mediterranean region

Regional cooperation towards hydrogen economy

Main indigenous energy sources in SE Mediterranean region

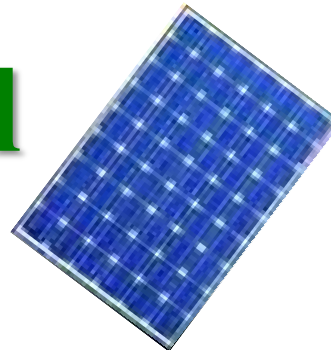
- **Natural gas**



- **Wind potential**



- **Solar potential**



H2 strategy?

- **Recognition of hydrogen as a key component of the energy mix for 2030 and up to 2050**
- **Creation of a long-term national energy strategy considering hydrogen**
- **Creation of a legislative framework - allow the introduction of participants in H₂ market**
- **Harmonization of national regulatory framework with the relevant European Directives**
- **Targeted measures to kick-start the hydrogen value chain: production; transport and storage; use in final consumption**

Target-setting for Cyprus' transition to hydrogen economy*

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

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Energy transition by 2050

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**

