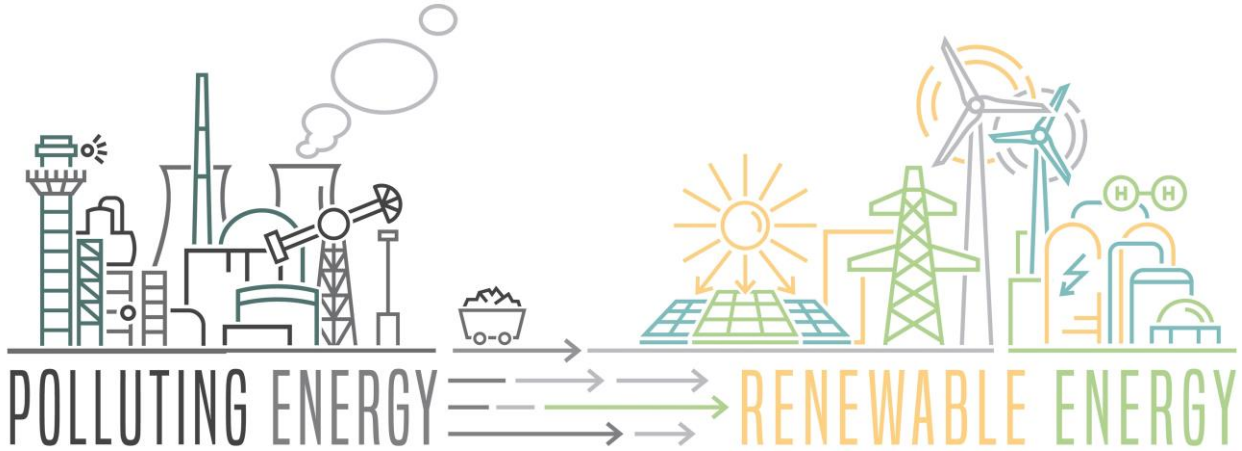
Υδρογόνο – HERO NET ZERO ή ANTIHERO?

ΙΩΑΝΝΗΣ ΜΩΡΑΪΤΗΣ
Project Manager ΥΔΡΟΓΟΝΟΥ
Επικεφαλής Βιώσιμης Ανάπτυξης

ΔΕΠΑ Εμπορίας Α.Ε.

Ενεργειακή μετάβαση/Energiewende



ΔΕΠΑ Εμπορίας Α.Ε.

Αστάθεια σε παγκόσμιο επίπεδο

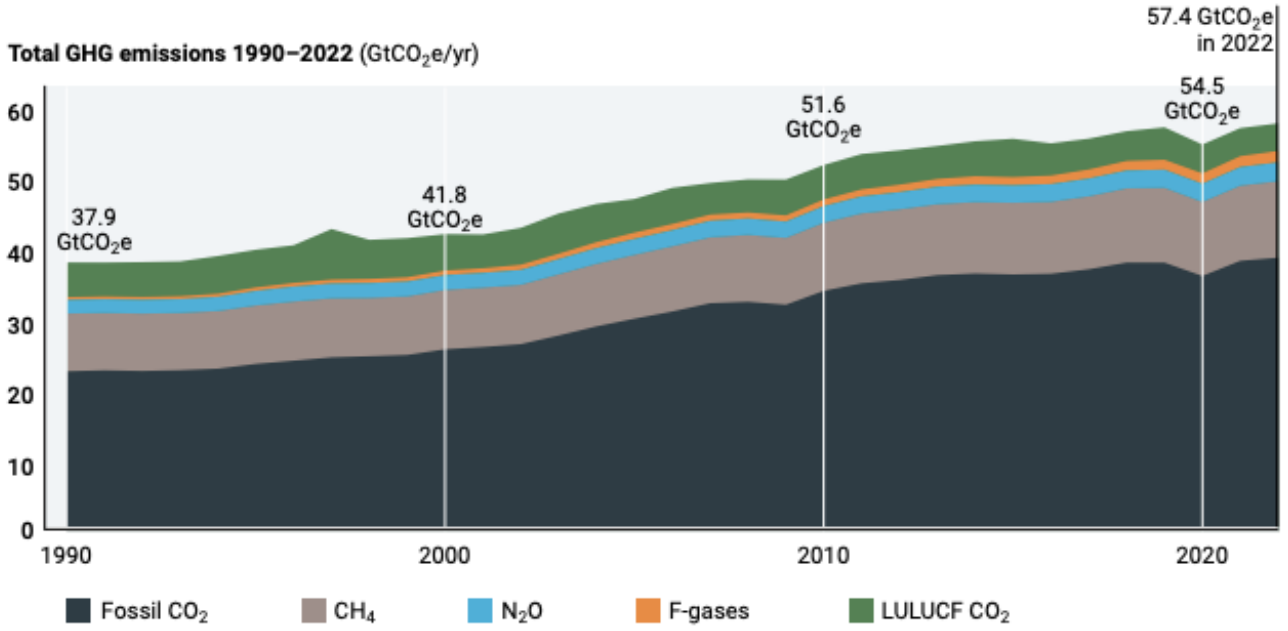
From now on, all this will be yours !

ΔΕΠΑ Εμπορίας Α.Ε.

Άνοδος εκπομπών

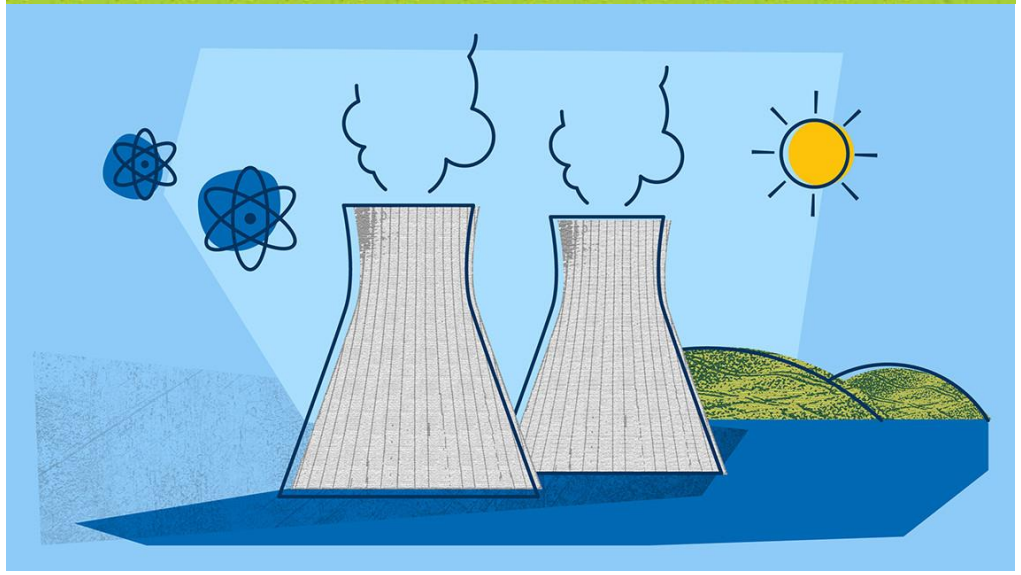
- Energy production amounts for 26%
- New record of 57.4 gigatons of CO2 equivalent
- Global GHG emissions increased by 1.3 %

Figure ES.1 Total net anthropogenic GHG emissions, 1990–2022



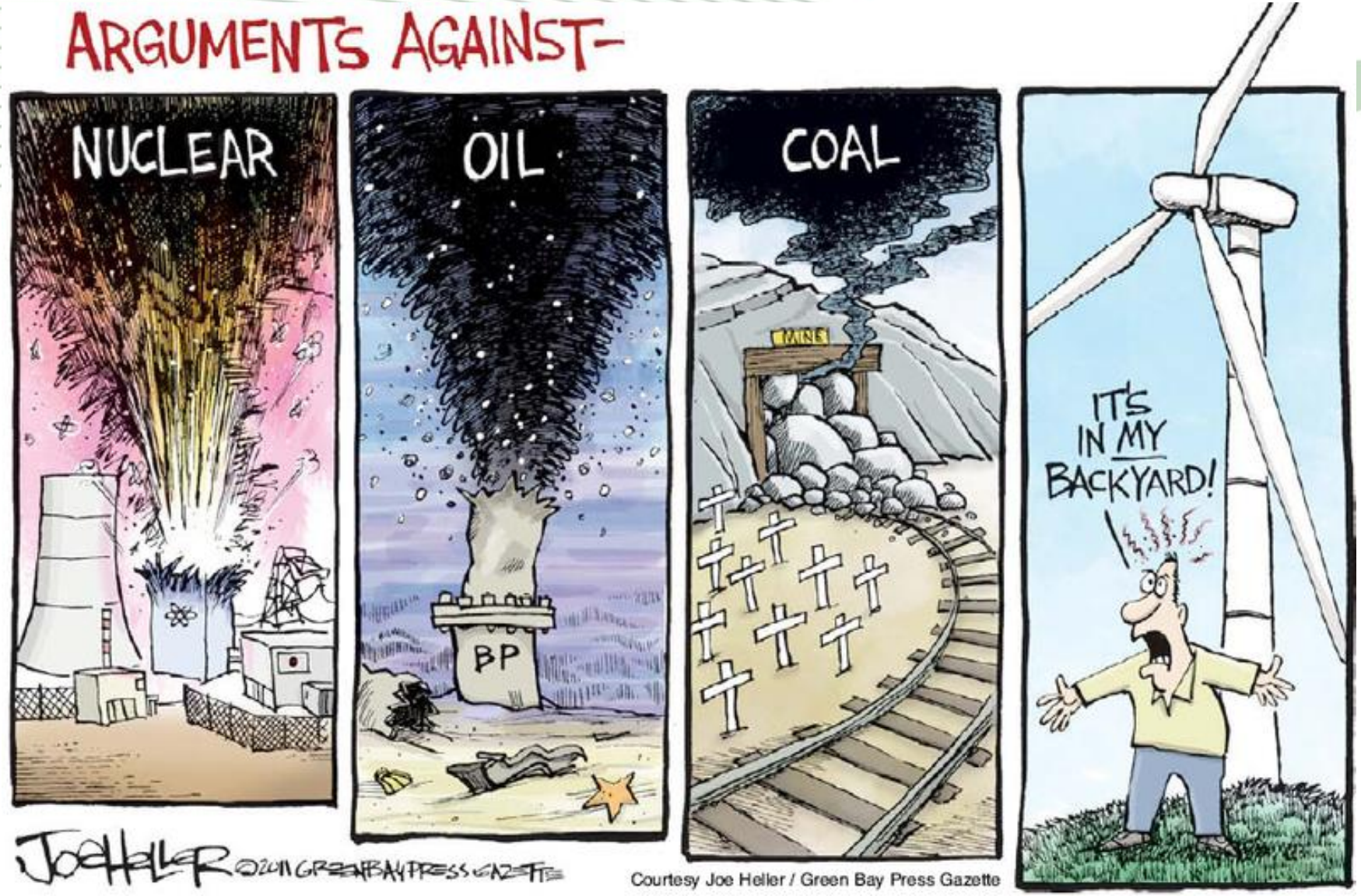
ΔΕΠΑ Εμπορίας Α.Ε.

Ενέργεια – αλλά τι ενέργεια



ΔΕΠΑ Εμπορίας Α.Ε.

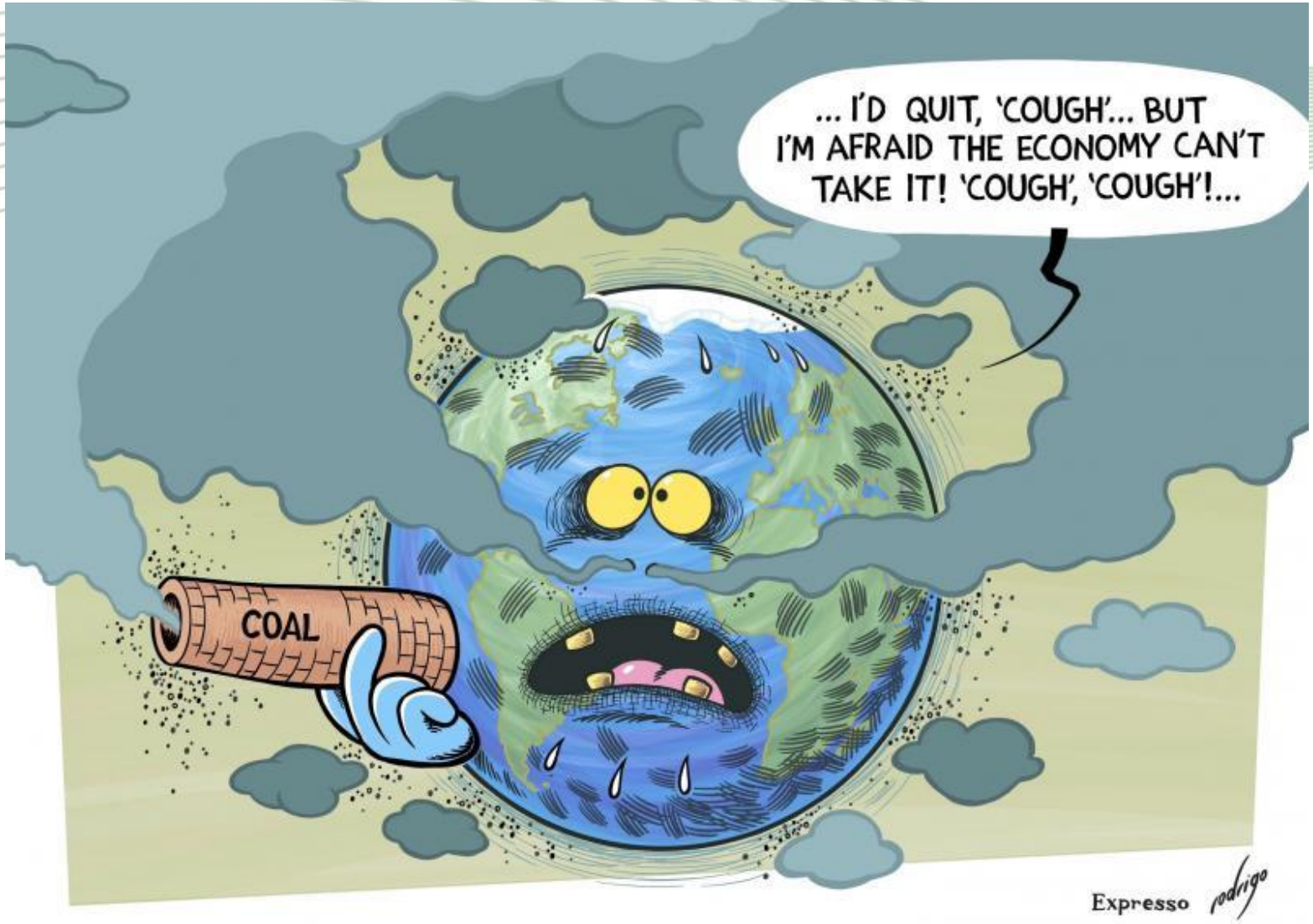
Ενέργεια – αλλά τι ενέργεια



Courtesy Joe Heller / Green Bay Press Gazette

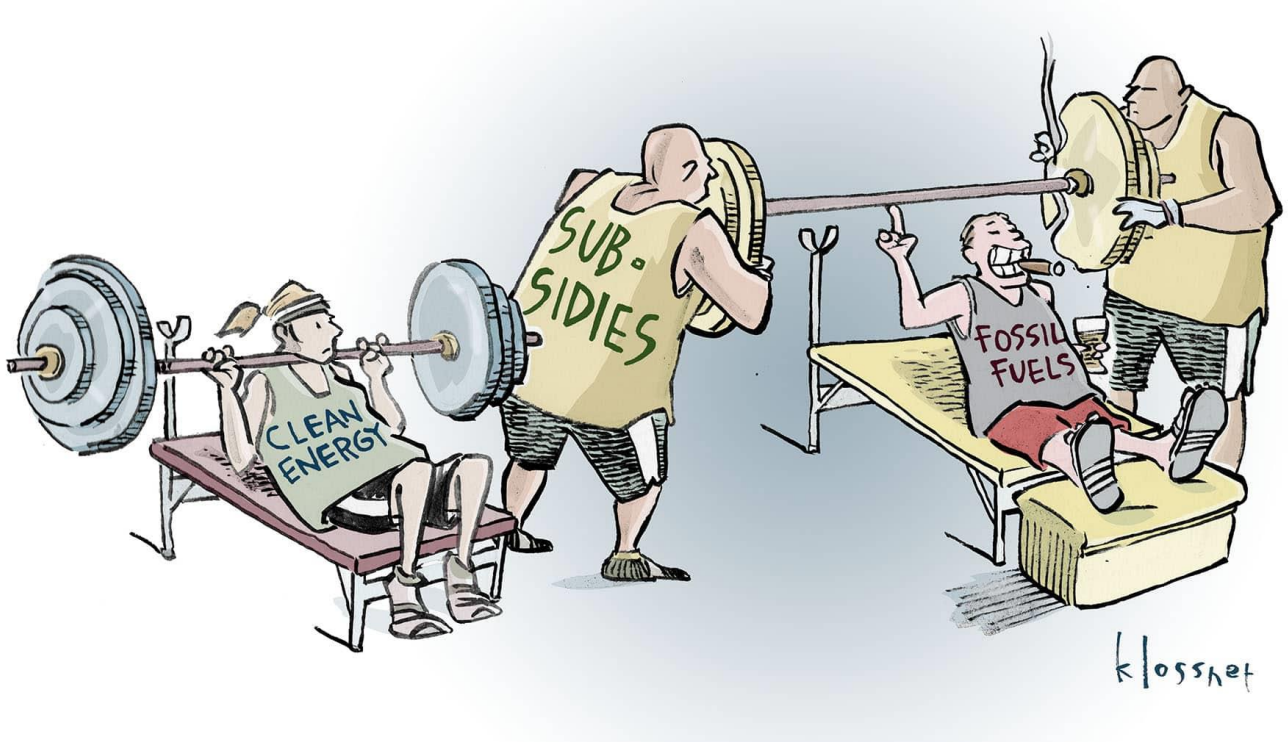
ΔΕΠΑ Εμπορίας Α.Ε.

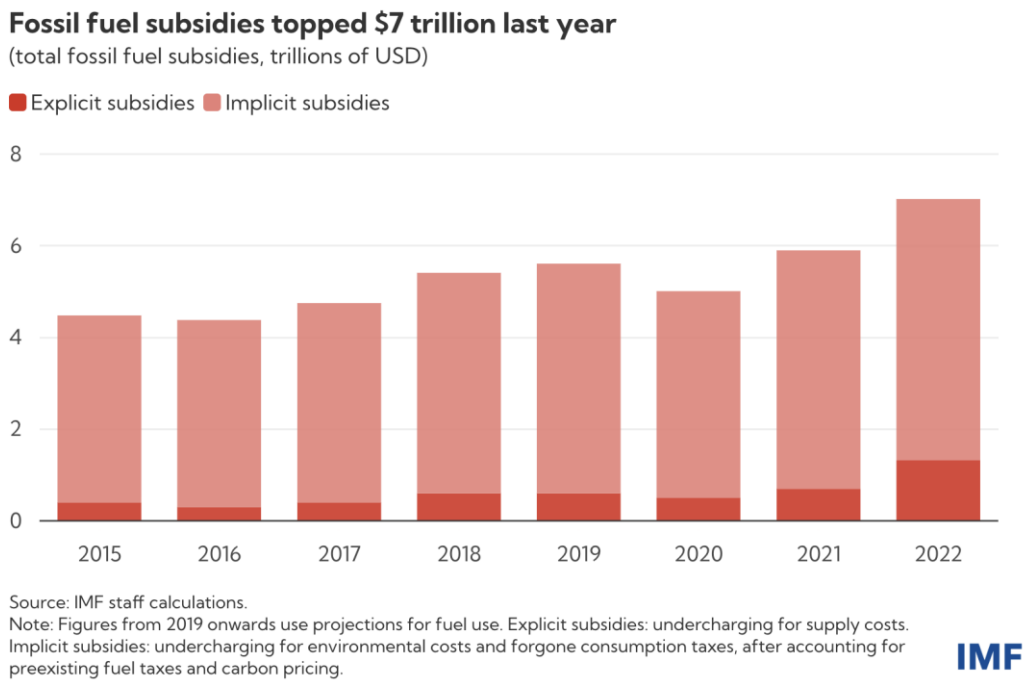
Φτηνή ενέργεια



ΔΕΠΑ Εμπορίας Α.Ε.

Επιδοτήσεις ορυκτών καυσίμων



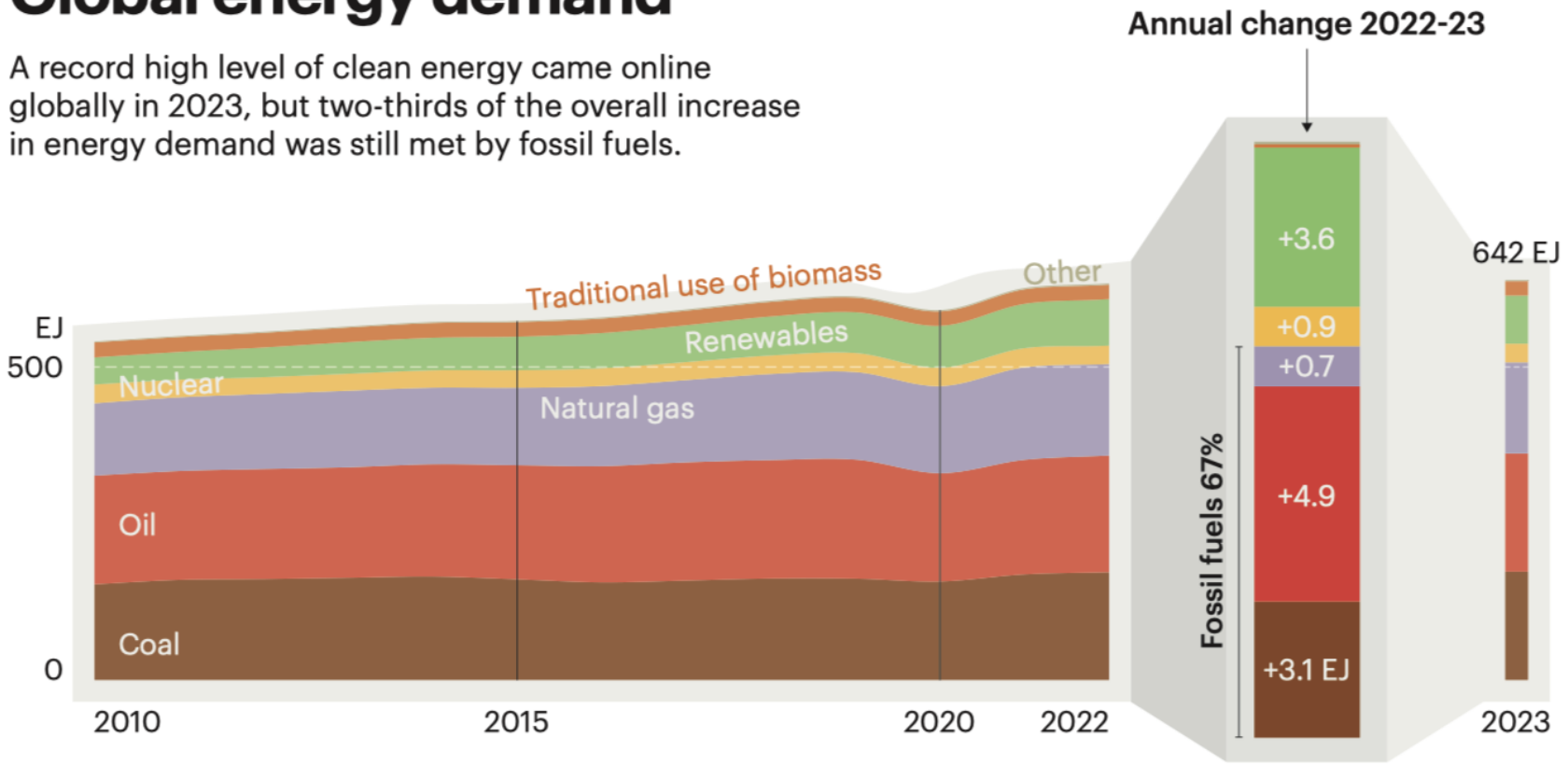


ΔΕΠΑ Εμπορίας Α.Ε.

Ζήτηση ενέργειας

Global energy demand

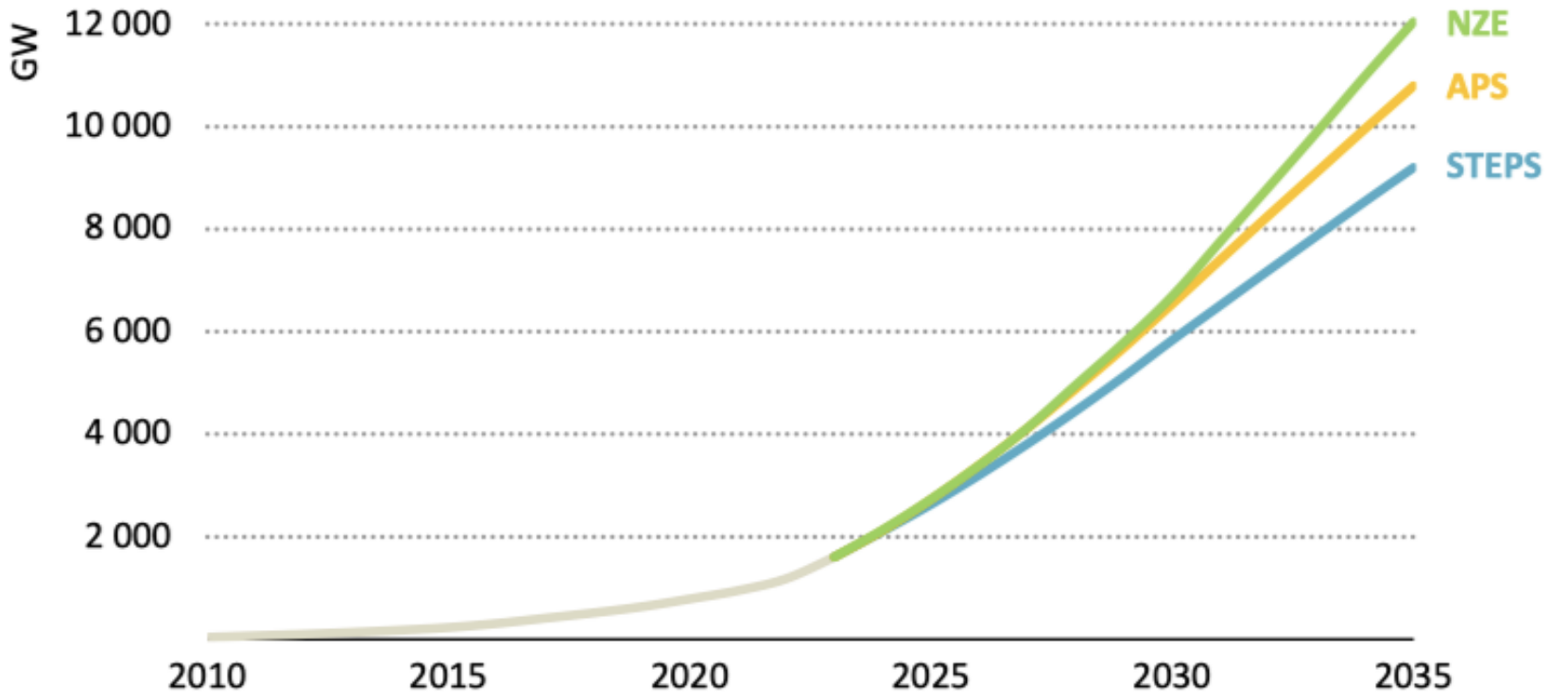
A record high level of clean energy came online globally in 2023, but two-thirds of the overall increase in energy demand was still met by fossil fuels.



ΔΕΠΑ Εμπορίας Α.Ε.

Αύξηση ΑΠΕ

Figure 3.43 ▷ Solar PV capacity by scenario, 2010-2035



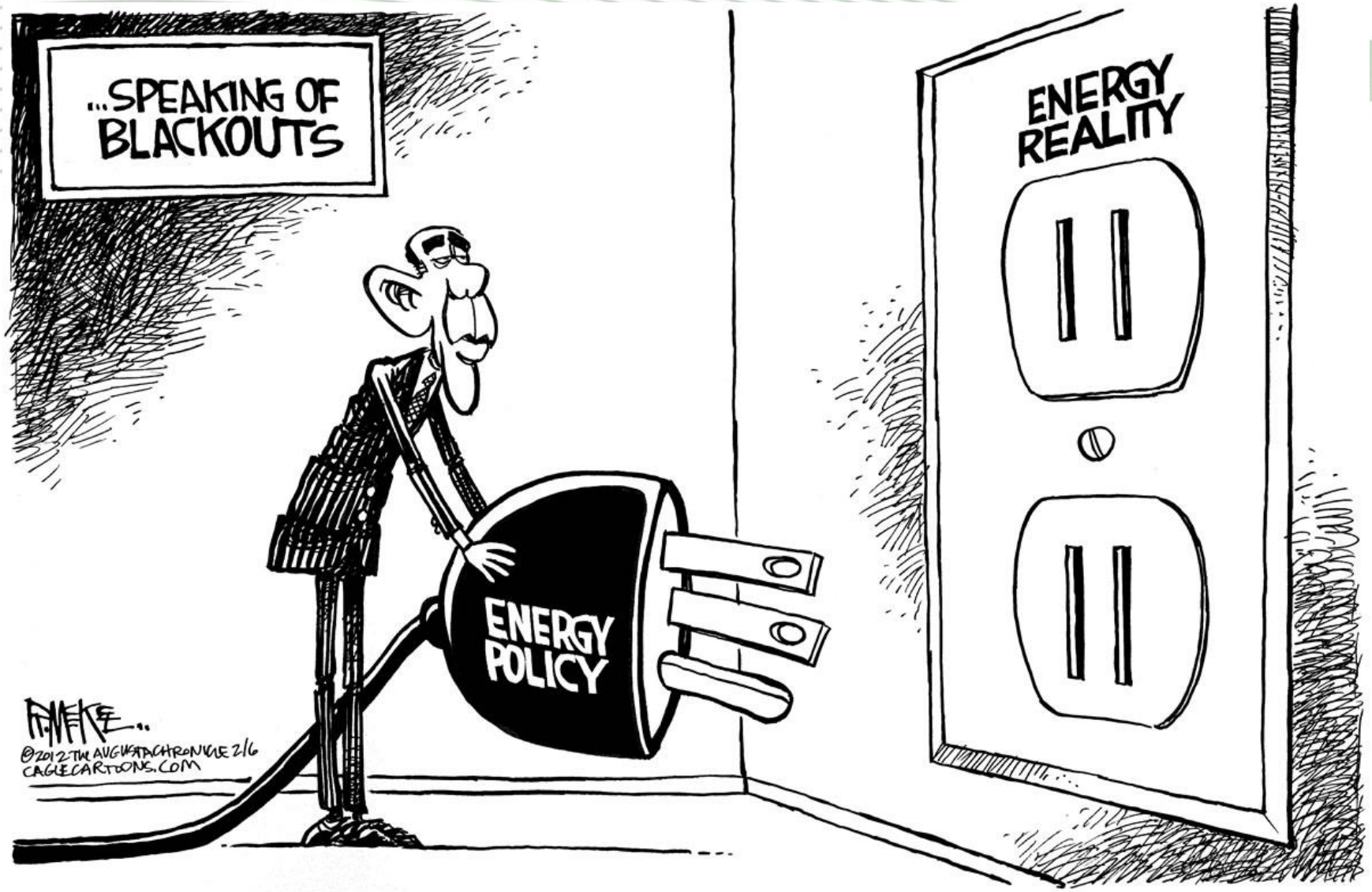
Solar PV capacity additions increase dramatically by 2030 in each scenario, and by far become the fastest growing source of electricity over the next decade

ΔΕΠΑ Εμπορίας Α.Ε.

Εξηλεκτρισμός μόνο?

ΔΕΠΑ Εμπορίας Α.Ε.

Σταθερότητα δικτύων



ΔΕΠΑ Εμπορίας Α.Ε.

Υδρογόνο

GREY HYDROGEN
Generated through SMR* using natural gas or fossil fuels

BLUE HYDROGEN
Generated through SMR with carbon capture using natural gas or fossil fuels

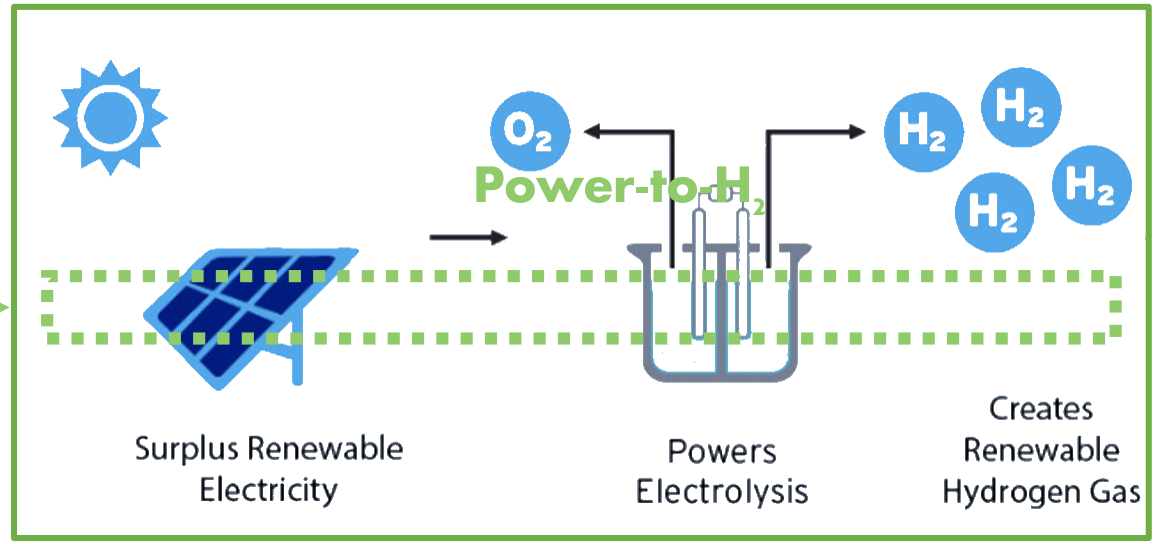
GREEN HYDROGEN
Generated through electrolysis using renewable el ity

YELLOW HYDROGEN
Generated through electrolysis using solar power, specifically

PINK HYDROGEN
Generated through electrolysis using nuclear energy

H_2

RES excess energy storage



ΔΕΠΑ Εμπορίας Α.Ε.

Υδρογόνο

Industry

- Decarbonizing “hard to abate” industrial sectors

Transport

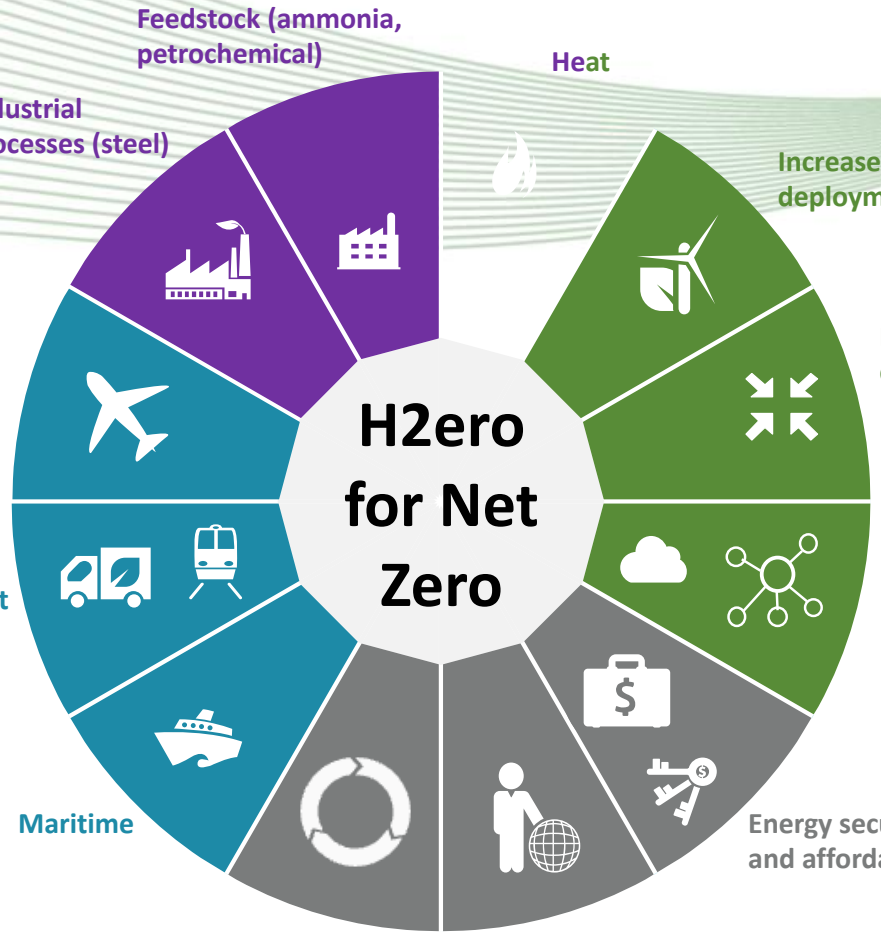
- No transport mode left behind
- No compromise (range, refuel time)
- No consumer segments left behind (fleets, long-distance travelers)

Energy

- Making a net-zero energy system possible

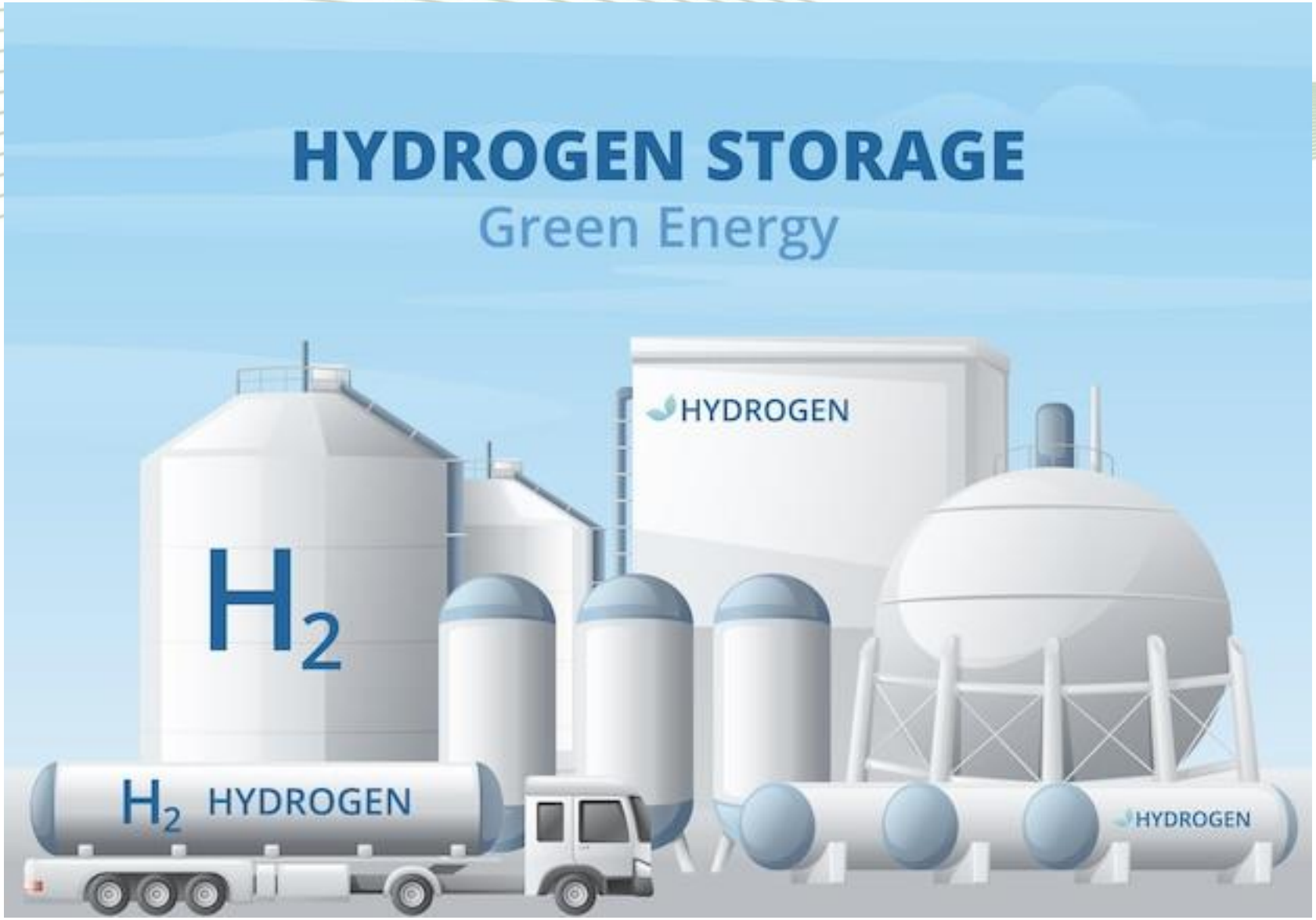
Societal

- Ensuring prosperity
- Reducing waste



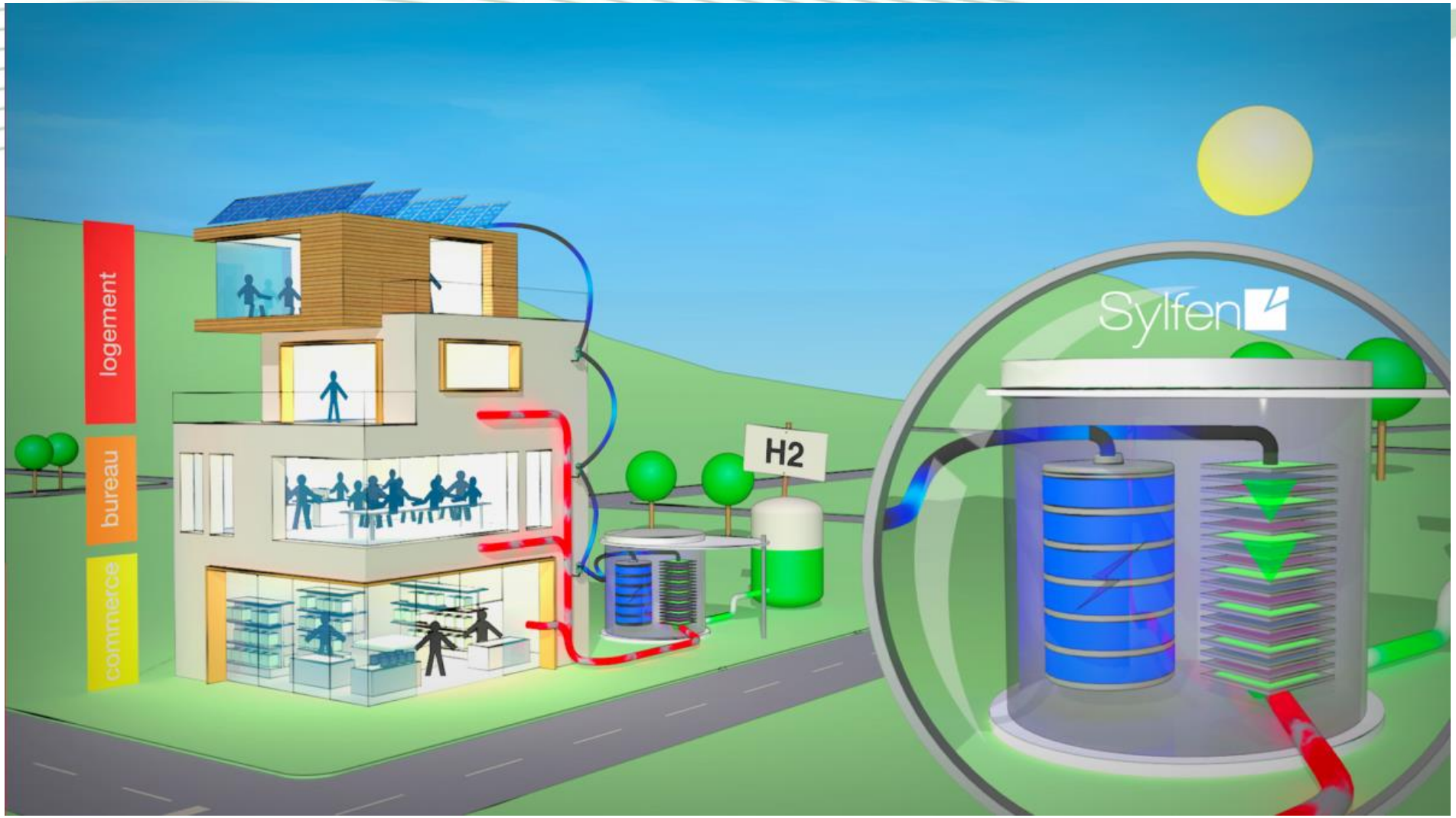
ΔΕΠΑ Εμπορίας Α.Ε.

Αποθήκευση



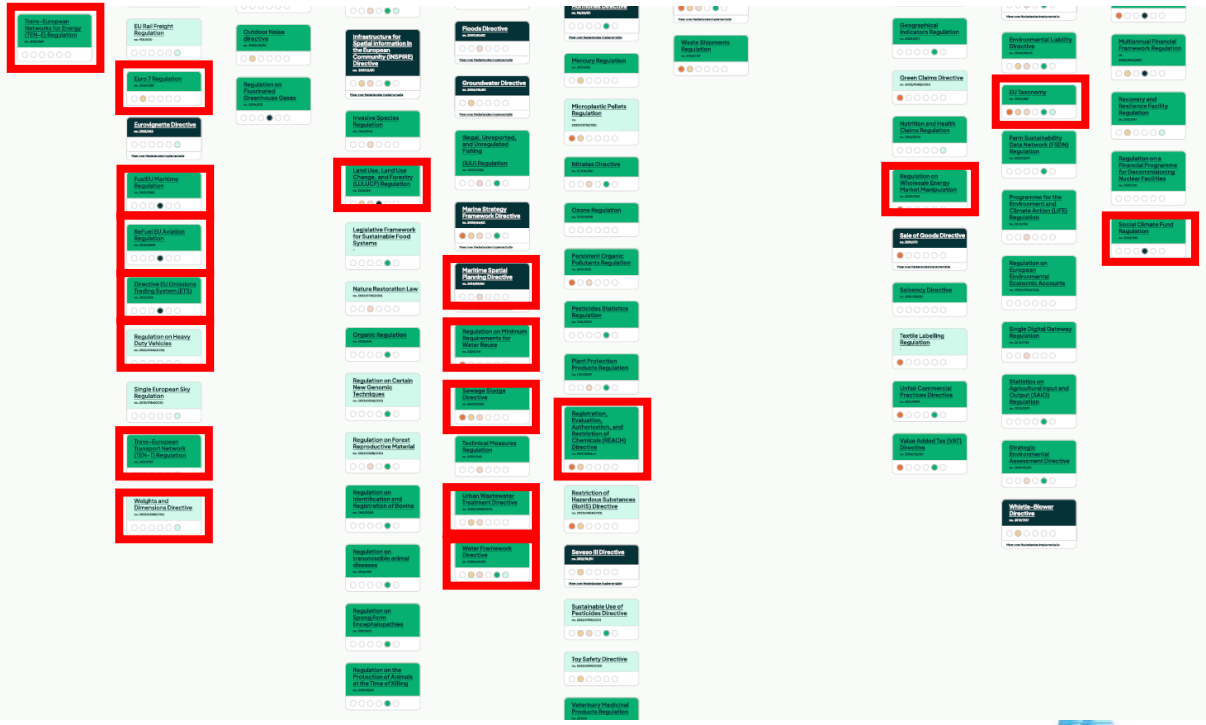
ΔΕΠΑ Εμπορίας Α.Ε.

Υβριδικά συστήματα



ΔΕΠΑ Εμπορίας Α.Ε.

Fit-4-55



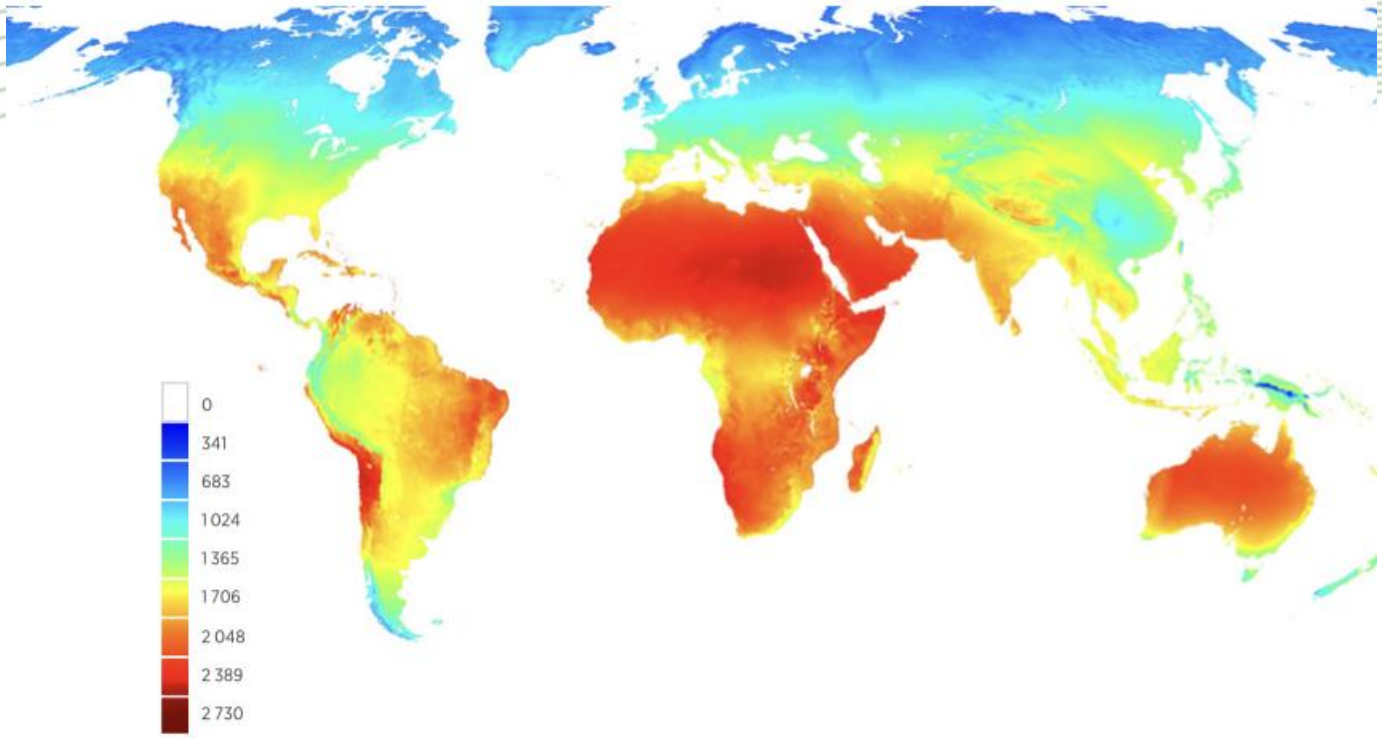
ΔΕΠΑ Εμπορίας Α.Ε.

Ευρωπαϊκή τράπεζα υδρογόνου

ΔΕΠΑ Εμπορίας Α.Ε.

Ηλιακή ενέργεια

Figure 2.6 **World solar technical potential**



© IRENA (2022), Source: Vortex (2021)

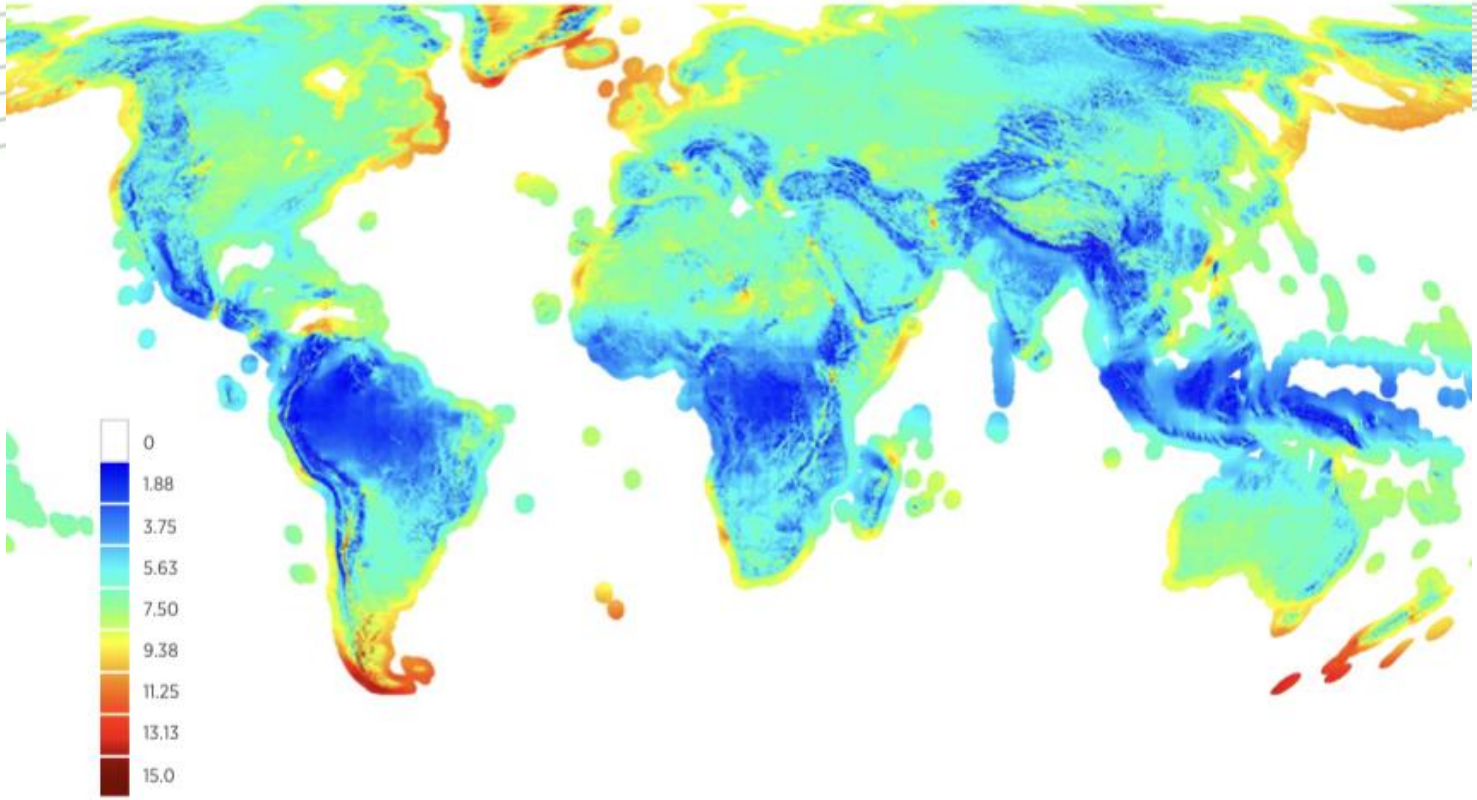
Note: Annual average global horizontal irradiation (kWh/m²). Also available on the IRENA Global Atlas for Renewable Energy web platform.

Disclaimer: This map is provided for illustration purposes only. Boundaries shown on this map do not imply any endorsement or acceptance by IRENA.

ΔΕΠΑ Εμπορίας Α.Ε.

Αιολική ενέργεια

Figure 2.7 **World wind technical potential**



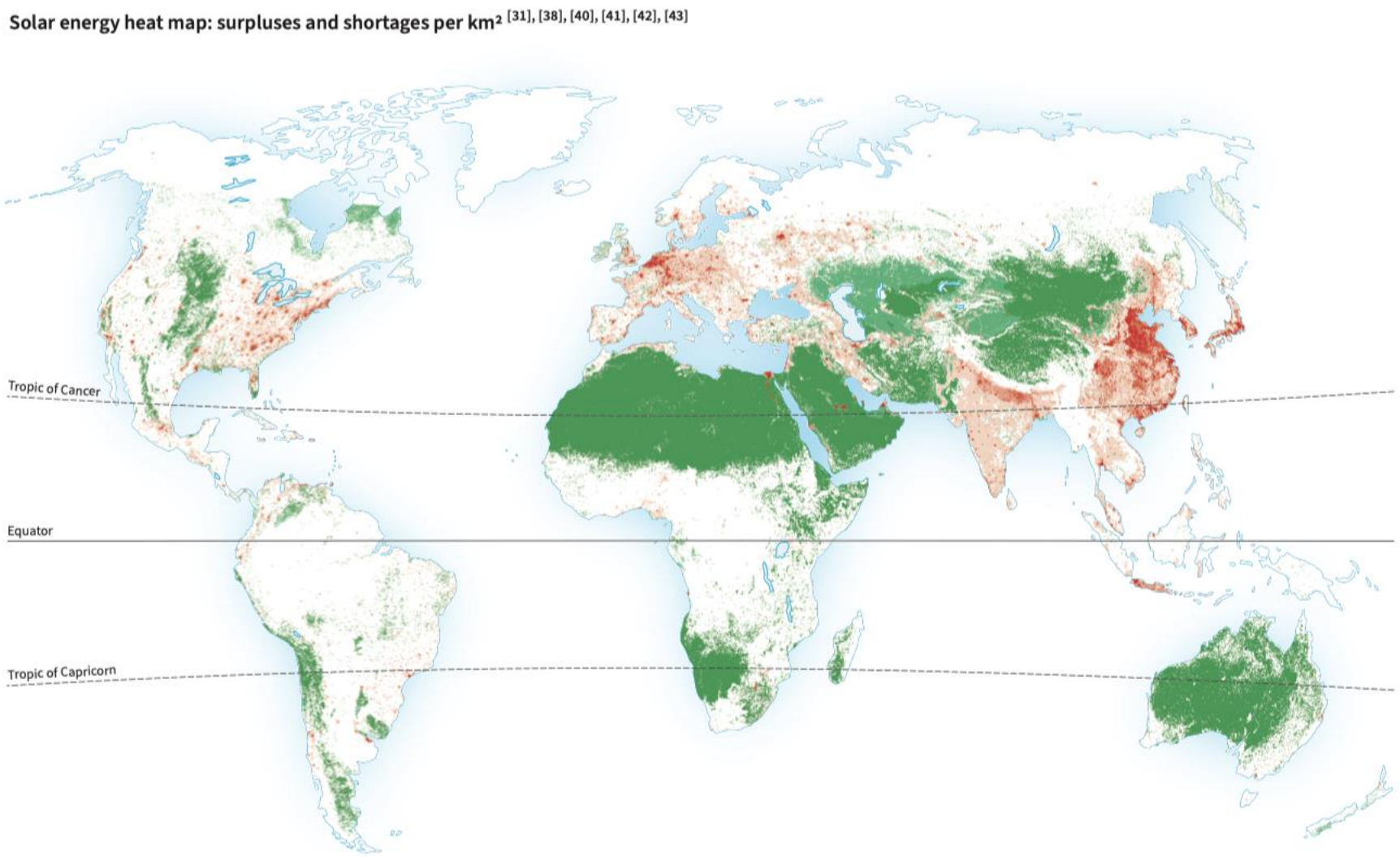
© IRENA (2022), Source: Vortex (2021)

Note: Annual average wind speed at 100 metres (m/s). Also available on the IRENA Global Atlas for Renewable Energy web platform.

Disclaimer: This map is provided for illustration purposes only. Boundaries shown on this map do not imply any endorsement or acceptance by IRENA.

ΔΕΠΑ Εμπορίας Α.Ε.

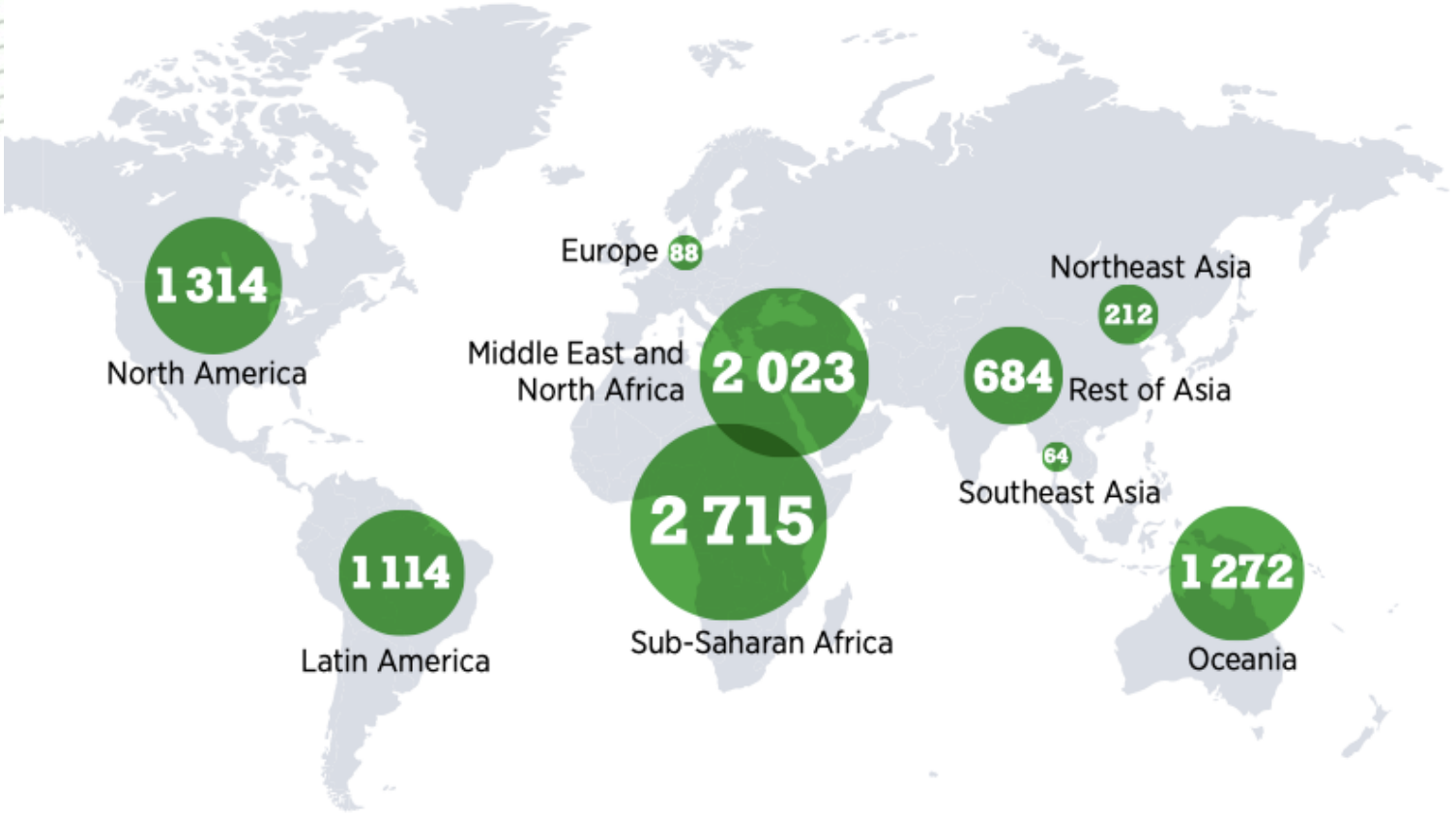
Φτηνό Υδρογόνο



ΔΕΠΑ Εμπορίας Α.Ε.

Φτηνό Υδρογόνο

Figure 3.4 **Technical potential for producing green hydrogen under USD 1.5/kg by 2050, in EJ**

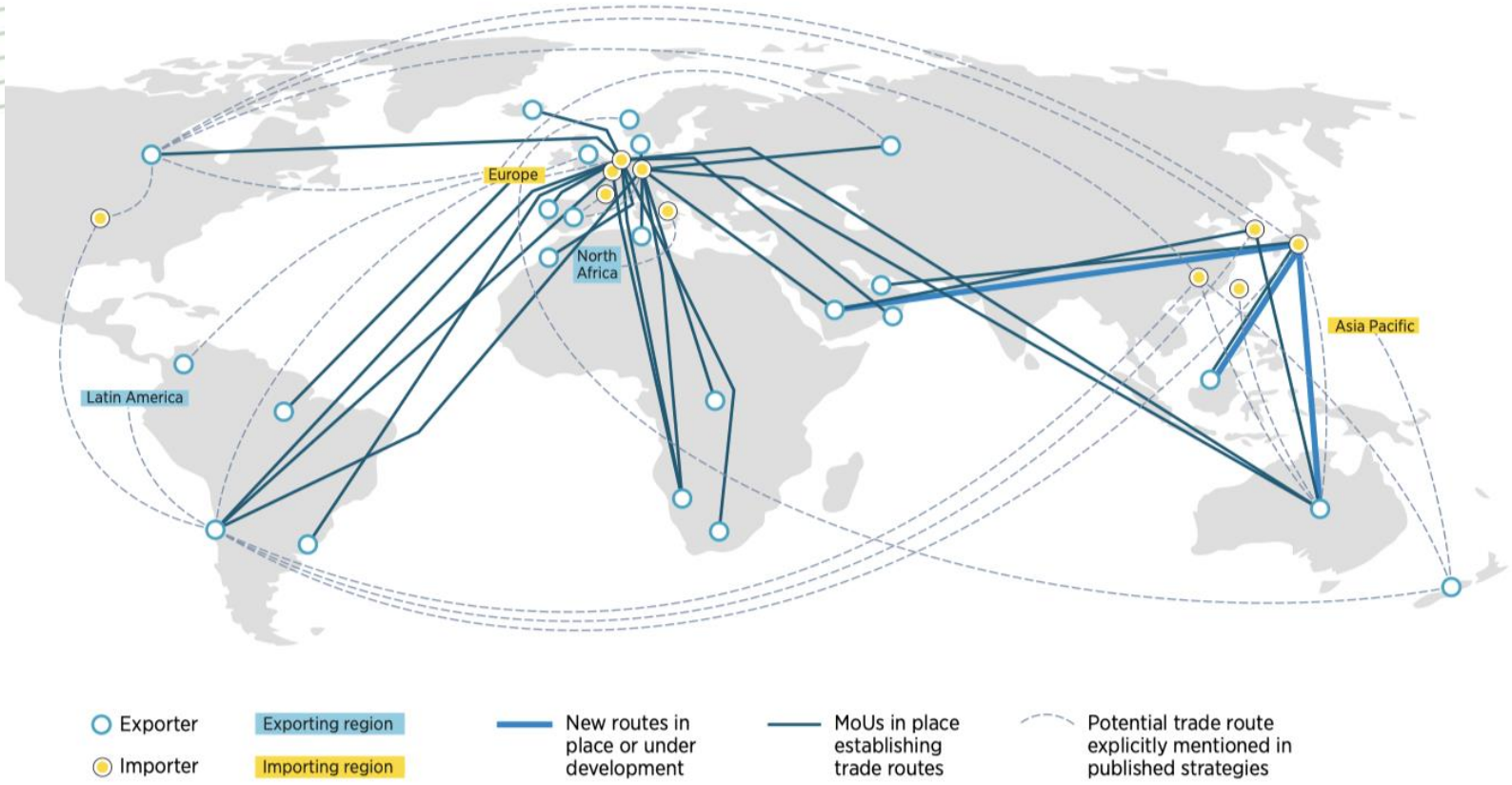


Source: IRENA (fothcoming-a). Map source: Natural Earth, 2021

ΔΕΠΑ Εμπορίας Α.Ε.

Φτηνό Υδρογόνο

Figure S.2 **An expanding network of hydrogen trade routes, plans and agreements**



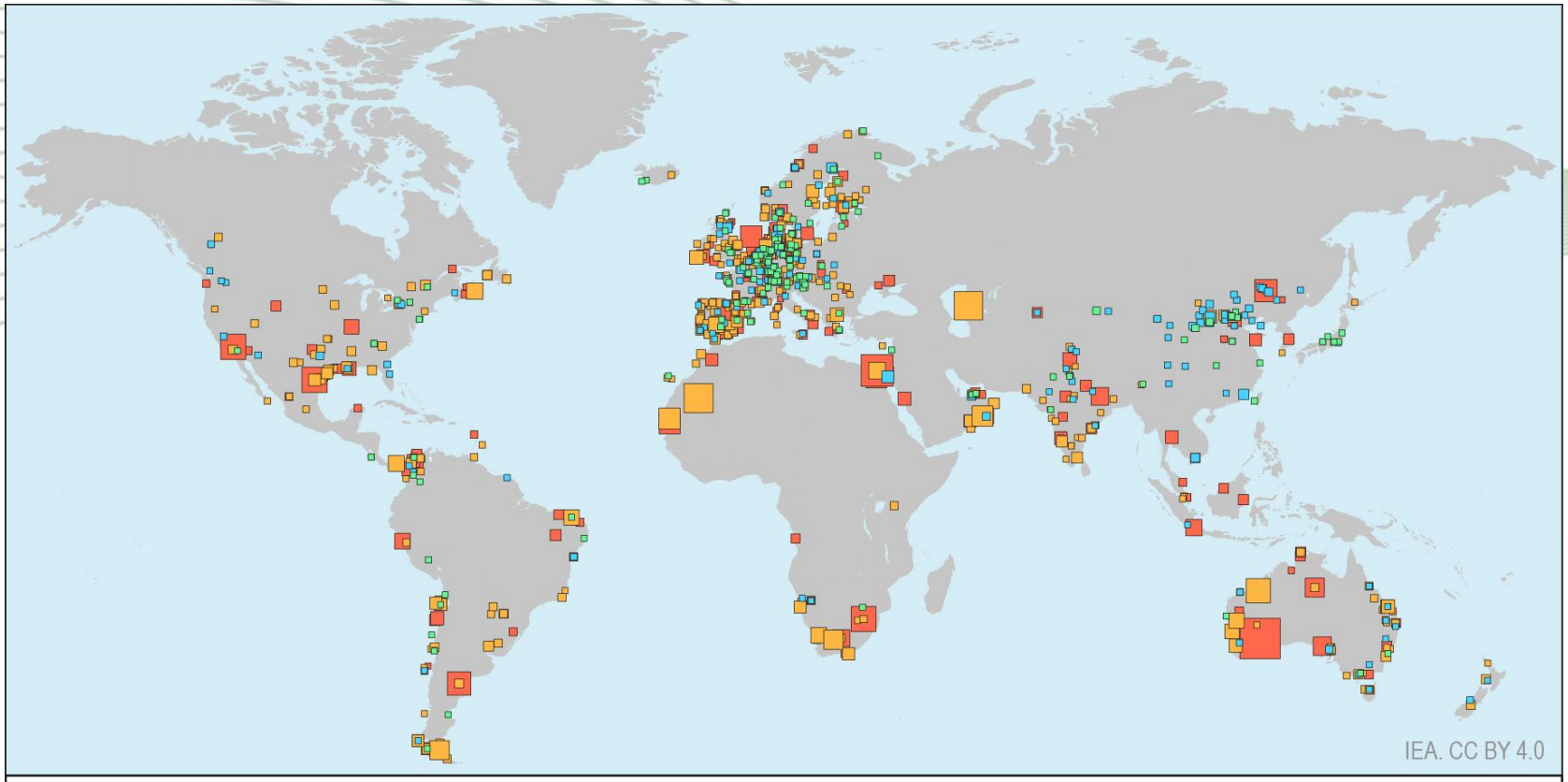
Map source: Natural Earth, 2021

Notes: Information on this figure is based on the information contained in government documents at the time of writing.

Disclaimer: This map is provided for illustration purposes only. Boundaries and names shown on this map do not imply any endorsement or acceptance by IRENA.

ΔΕΠΑ Εμπορίας Α.Ε.

Έργα Υδρογόνου



CCUS projects
- Early stage
- Feasibillity study
- FID/under construction
- Operational

Electrolyser projects
- Early stage
- Feasibillity study
- FID/under construction
- Operational

Capacity (kt H_2/yr)
- 50
- 150
- 250
- 500
- 1 000
- 5 000
- 15 000

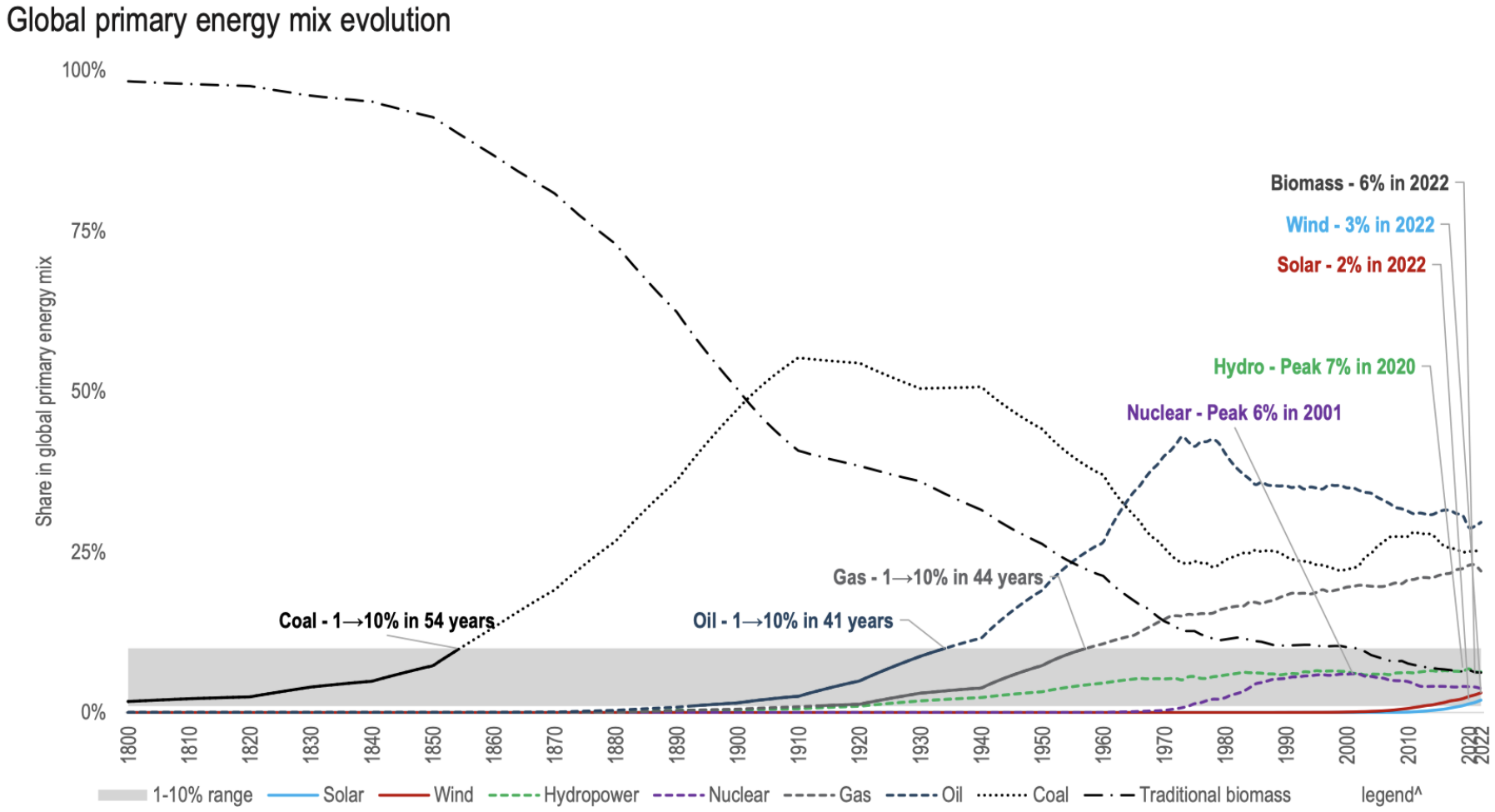
ΔΕΠΑ Εμπορίας Α.Ε.

Bottlenecks

	ISSUE:	
EU regulatory framework	**COMPLICATED OR MISSING REGULATORY FRAMEWORK FOR CLEAN HYDROGEN PRODUCTION**	Developers continue to delay or cancel projects due to regulatory uncertainty or regulatory compliance costs for producing renewable or low-carbon hydrogen. **Regulatory framework** – Create an investment friendly regulatory framework for all clean hydrogen production technologies that are aligned with the 2050 Climate targets. **Renewable fuels of non-biological origin (RFNBO) DA** – Review the definition of RFNBO by 2026 latest, making it a lot more pragmatic to spur deployment and scale-up the industry. **Low-carbon hydrogen DA** – Adopt a definition of low-carbon hydrogen that encompasses and enables all production pathways as long as they meet strict emissions criteria.
National implementation	**LACKING NATIONAL REGULATORY FRAMEWORKS**	National transposition of RED3 and Hydrogen and Decarbonised Gas Markets package creates uncertainty. Developers and offtakers are unsure whether and how should the targets be met, whether there will be obligations and penalties, which incentives are available and whether a hydrogen infrastructure will be in place to help deliver clean hydrogen. **Target structure** – Provide visibility on how the industry and transport targets will be transposed. **Penalties** – The Commission to clarify what penalties for Member States for non-compliance and encourage penalty uniformity if targets are implemented at company level. **Certification** – Attain Member State acknowledgment or adoption of certification schemes endorsed by the Commission. **Book and claim** – Get clarity on transferability of RFNBO credits and creation of a book and claim system for RED3 compliance (like for ReFuelEU Aviation).
Funding	**INADEQUATE FUNDING MECHANISMS AT EU AND NATIONAL LEVEL**	EU funding is limited and complex (Innovation Fund calls, EU Hydrogen Bank) while national level funding can be dispersed and not effectively supporting market uptake. Some countries still lack a clear funding scheme for clean hydrogen deployment. **European funding** – The EU Hydrogen Bank should evolve to further support offtaker risks and to include imports. Rules on accumulation need to be addressed to facilitate the funding of projects. **National funding** – Member States should develop mechanisms to address the cost gap between clean and conventional hydrogen. Mechanism to support production can be complemented with offtaker support in the form of CCfD. It is important to continue supporting innovation and industrialisation, with a reinforced focus on deployment through OPEX base schemes.
Infrastructure	**SLOW DEVELOPMENT OF HYDROGEN TRANSPORT, STORAGE, AND IMPORT INFRASTRUCTURE PREVENTING CONNECTING CLEAN HYDROGEN SUPPLIERS AND INDUSTRIAL CONSUMERS**	**Implementation** – Rapidly implement the Hydrogen and Decarbonised Gas Markets package at national level, designating a hydrogen network operator, clarifying the framework for third party access to infrastructure, and design a funding framework for infrastructure roll out. **Planning and modelling** – Incorporate energy storage into network development and strengthen cross-sectoral system planning via better scenarios and improved modelling tools. **Strategy** – Develop a European hydrogen grid and storage strategy that forms a fundamental pillar of the EU grid action plan.

ΔΕΠΑ Εμπορίας Α.Ε.

Χρόνος εδραίωσης



Source: Ourworldindata; Energy Institute - Statistical Review of World Energy (2023); Smil (2017) and J.P. Morgan Global Energy

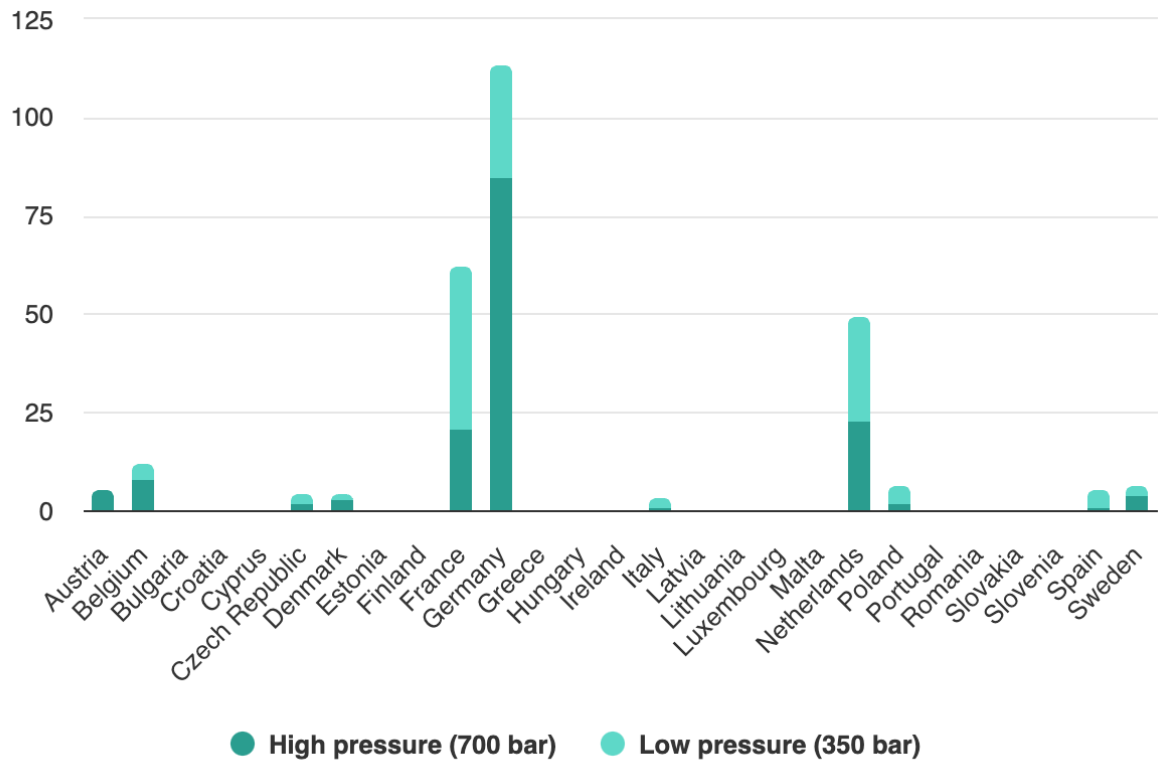
ΔΕΠΑ Εμπορίας Α.Ε.

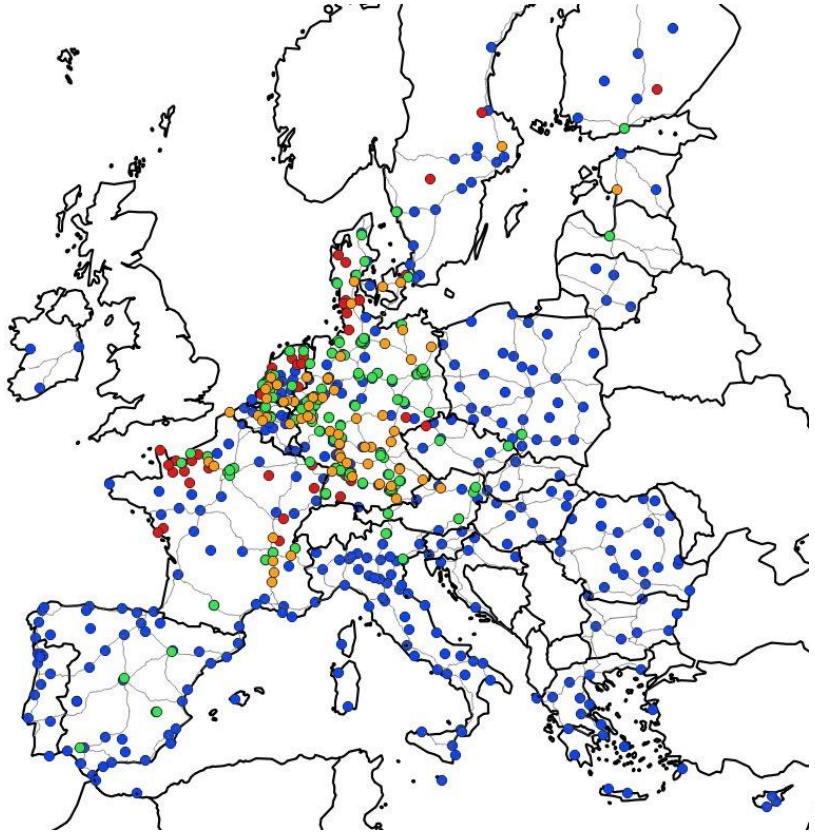
GreenH2orn

ΔΕΠΑ Εμπορίας Α.Ε.

Alternative Fuels Infrastructure Regulation AFIR

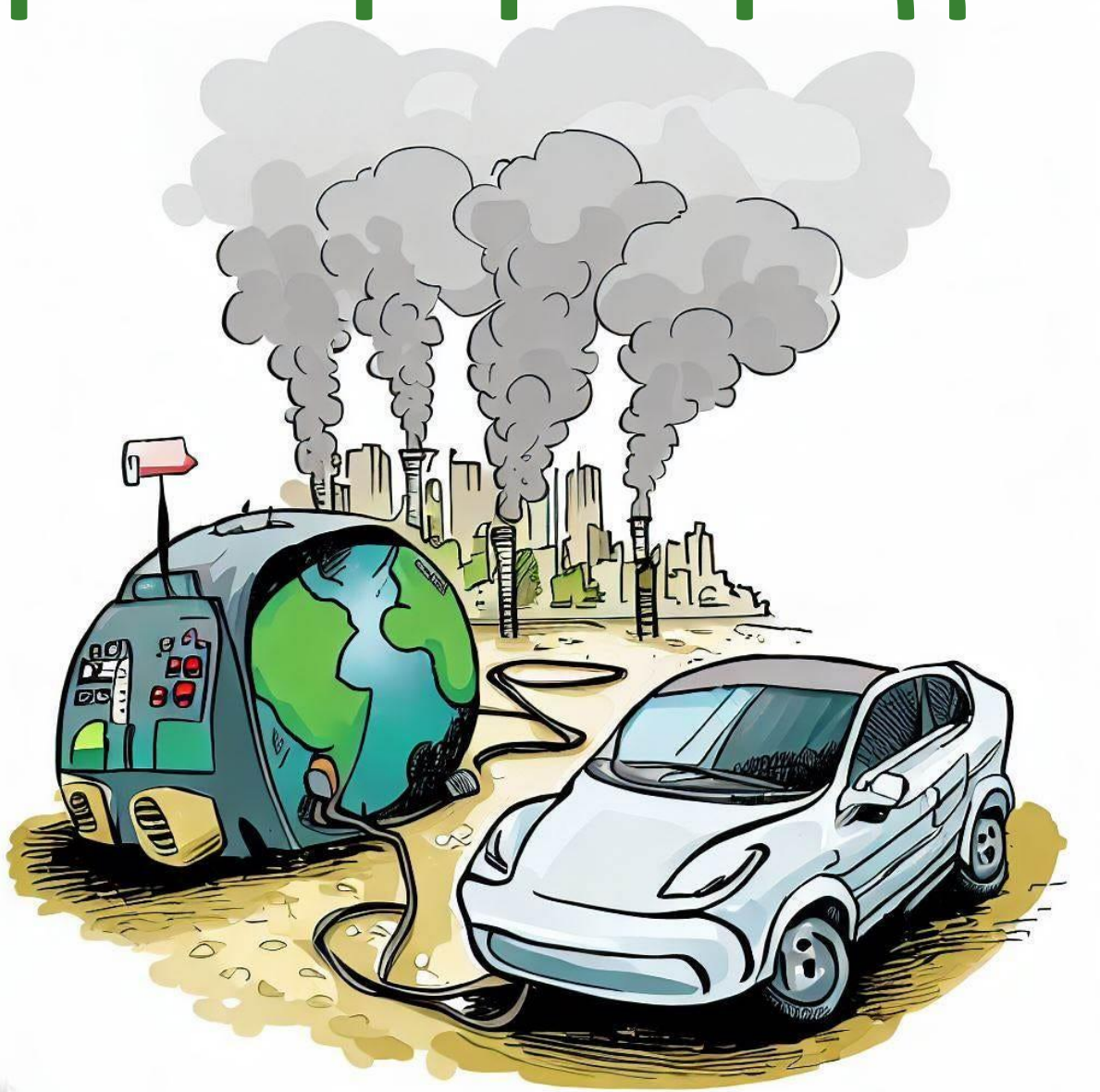
600 HRS in Europe





ΔΕΠΑ Εμπορίας Α.Ε.

Ηλεκτροκίνηση – πραγματική λύση?

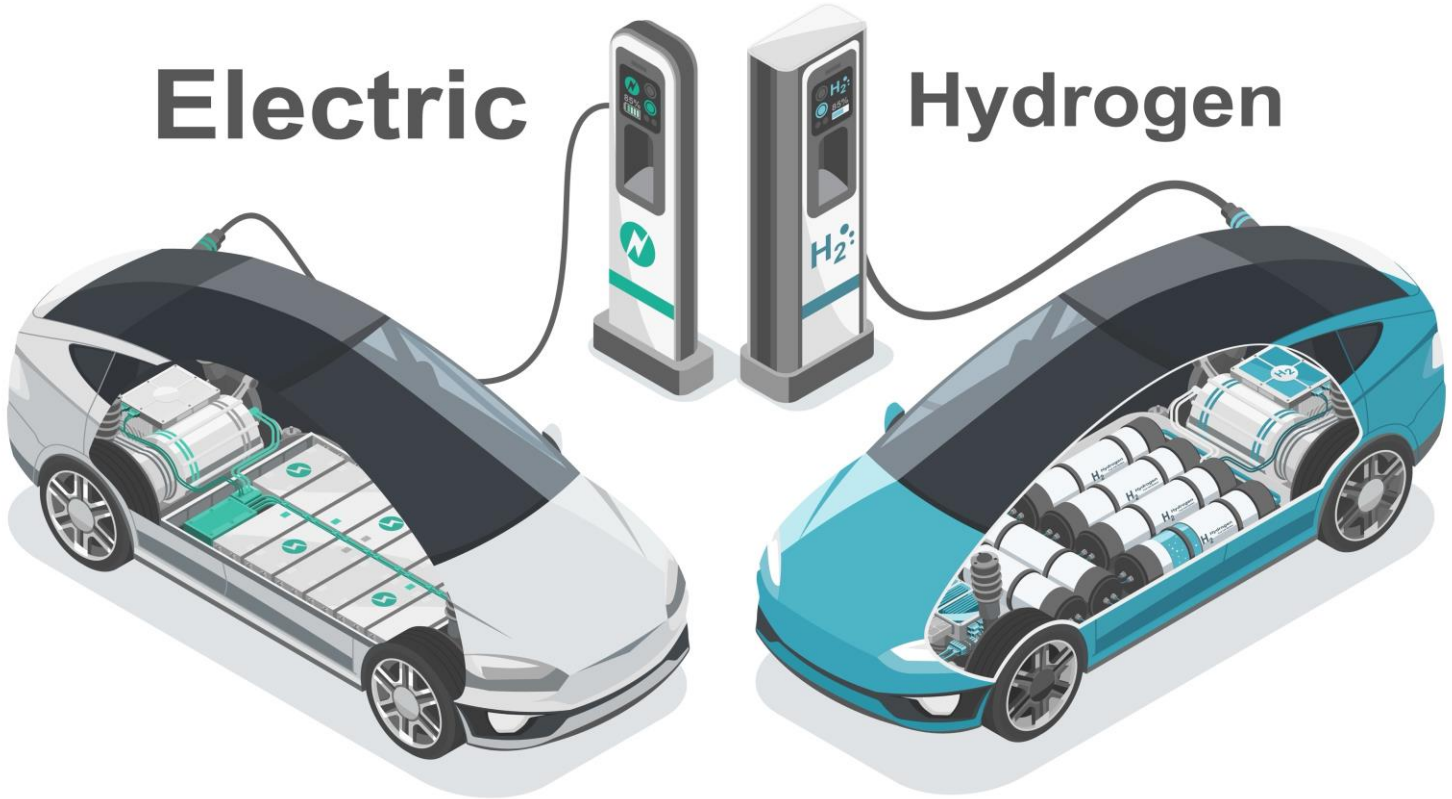


ΔΕΠΑ Εμπορίας Α.Ε.

Ουδέτερη προσέγγιση

ΔΕΠΑ Εμπορίας Α.Ε.

Αλληλοσυμπλήρωση

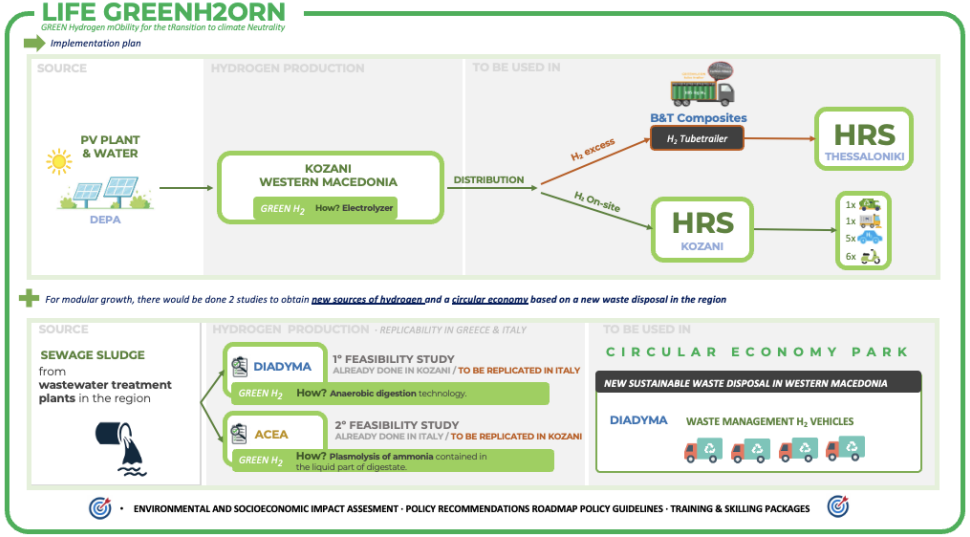


ΔΕΠΑ Εμπορίας Α.Ε.

GreenH2orn

- *The LIFE GREENH2ORN project will demonstrate the opportunities and feasibility for local urban production, distribution, and application of green hydrogen in road transport in the Municipality of Kozani, Western Macedonia Region, with a population of around 67.000 inhabitants.*

- Περιοχή: Κοζάνη



ΔΕΠΑ Εμπορίας Α.Ε.

LIFE GREENH2ORN

GREEN Hydrogen mObility for the tRansition to climate Neutrality

Implementation plan

SOURCE

PV PLANT & WATER

DEPA

HYDROGEN PRODUCTION

KOZANI
WESTERN MACEDONIA

GREEN H_2 **How? Electrolyzer**

TO BE USED IN

DISTRIBUTION

H_2 excess

B&T Composites

H_2 Tubetrailer

HRS
THESSALONIKI

H_2 On-site

HRS
KOZANI

1x
1x
5x
6x

*For modular growth, there would be done 2 studies to obtain **new sources of hydrogen and a circular economy based on a new waste disposal in the region***

SOURCE

SEWAGE SLUDGE
from
wastewater treatment plants in the region

HYDROGEN PRODUCTION · *REPLICABILITY IN GREECE & ITALY*

DIADYMA

1º FEASIBILITY STUDY
ALREADY DONE IN KOZANI / **TO BE REPLICATED IN ITALY**

GREEN H_2 **How? Anaerobic digestion** technology.

ACEA

2º FEASIBILITY STUDY
ALREADY DONE IN ITALY / **TO BE REPLICATED IN KOZANI**

GREEN H_2 **How? Plasmolysis of ammonia** contained in the liquid part of digestate.

TO BE USED IN

C I R C U L A R E C O N O M Y P A R K

NEW SUSTAINABLE WASTE DISPOSAL IN WESTERN MACEDONIA

DIADYMA

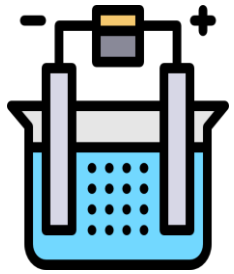
WASTE MANAGEMENT H_2 VEHICLES

• **ENVIRONMENTAL AND SOCIOECONOMIC IMPACT ASSESMENT · POLICY RECOMMENDATIONS ROADMAP POLICY GUIDELINES · TRAINING & SKILLING PACKAGES**

GreenH2orn

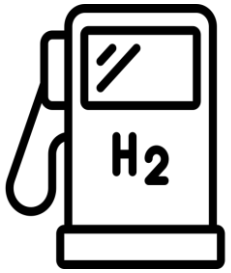
GREEN HYDROGEN PRODUCTION

ESTABLISH A 500-KW ELECTROLYZER POWERED BY A GREEN PPA



HYDROGEN REFUELING STATION

CREATE A 200/350/700 BAR HRS WITH A CAPACITY OF 210 KG H_2/DAY



SUSTAINABLE MOBILITY

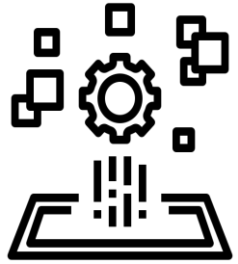
FUEL MUNICIPAL FLEETS*

1 GARBAGE TRUCK
1 ROAD SWEEPER
5 PASSENGER CAR
6 SCOOTERS

*FUNDED FROM THE PROJECT

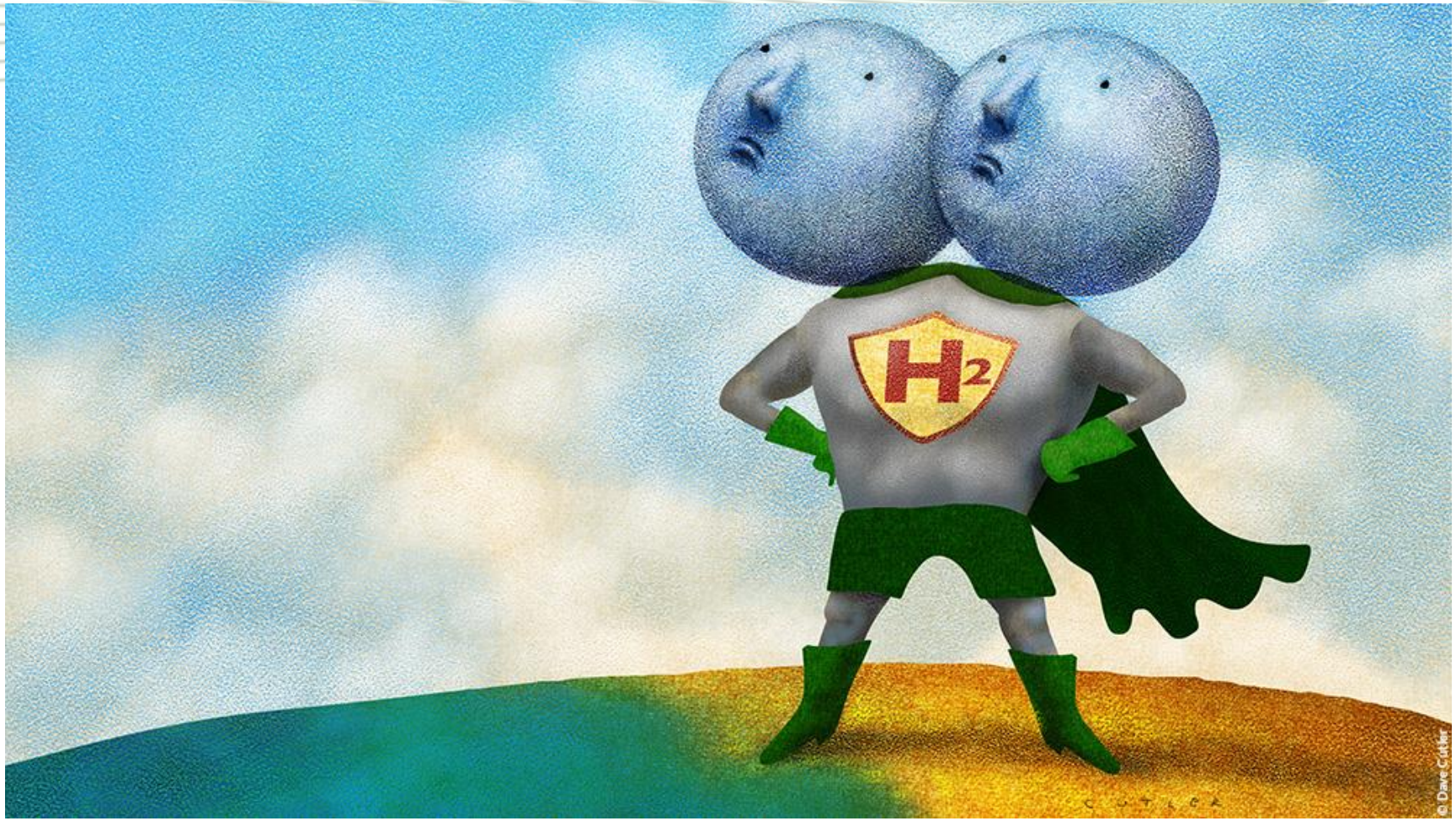
IT PLATFORM

DEVELOP AN IT PLATFORM FOR CENTRALIZED DATA MANAGEMENT TO OPTIMIZE OPERATIONS AND SUPPORT REPLICATION



ΔΕΠΑ Εμπορίας Α.Ε.

Ήρωας ή όχι



ΔΕΠΑ Εμπορίας Α.Ε.

Η ΔΕΠΑ Εμπορίας πρωτοστατεί στην ενεργειακή μετάβαση, επενδύοντας στην έρευνα και τις νέες τεχνολογίες και σε συνεργασία με Πανεπιστήμια και επιχειρήσεις, σχεδιάζει και υλοποιεί έργα με στόχο τη Βιώσιμη Ανάπτυξη και τη διαρκή συνεισφορά στο κοινωνικό σύνολο.

ΔΕΠΑ ΕΜΠΟΡΙΑΣ Α.Ε.
Μαρίνου Αντύπα 92, Ηράκλειο Αττικής, Τ.Κ.: 141 21
Τηλέφωνο: 210 270 10 00
FAX: 210 270 10 10

Ευχαριστώ για την προσοχή σας

ΔΕΠΑ Εμπορίας Α.Ε.