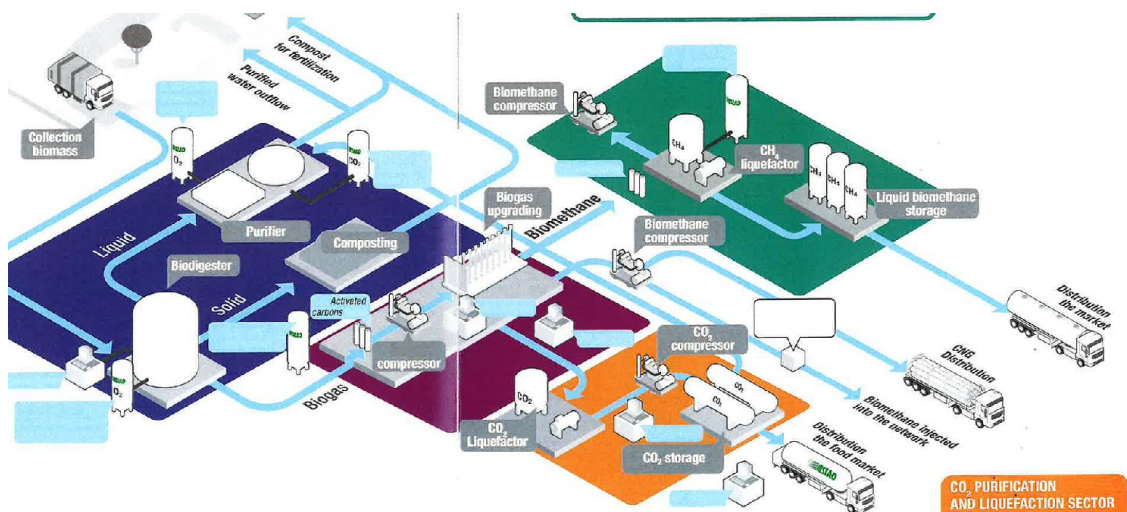




Προοπτική βιομεθανίου στην ελληνική αγορά και αξιοποίηση Bio-LNG στην διεθνή και ελληνική



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Υπεύθυνος Έργων Βιοαερίου &
Βιομεθανίου

Τμήμα Βιομάζας

3 ΕΠΕΝΔΥΤΙΚΟ-ΕΠΙΣΤΗΜΟΝΙΚΟ Forum Βιομάζα-Βιομεθάνιο
Divani Caravel Αθήνα 30.05.2025

Bio-LNG στην ΕΕ

DECODING BIOGASES: MADE IN EUROPE, SUSTAINABLE, AND AFFORDABLE

22 bcm

of biogases produced in Europe, more than the entire inland natural gas consumption of Belgium, Denmark and Ireland combined.

4.9 bcm

of biomethane produced in Europe, with 6.1 bcm/year of installed capacity

25

European countries are active in biomethane production

● New producing countries in 2022 and 2023

18%

increase in biomethane produced in Europe

29 Mton

of bio-CO₂ produced from biogas and biomethane production

Balanced distribution of biomethane across end-uses:

23%

in transport

17%

in buildings

15%

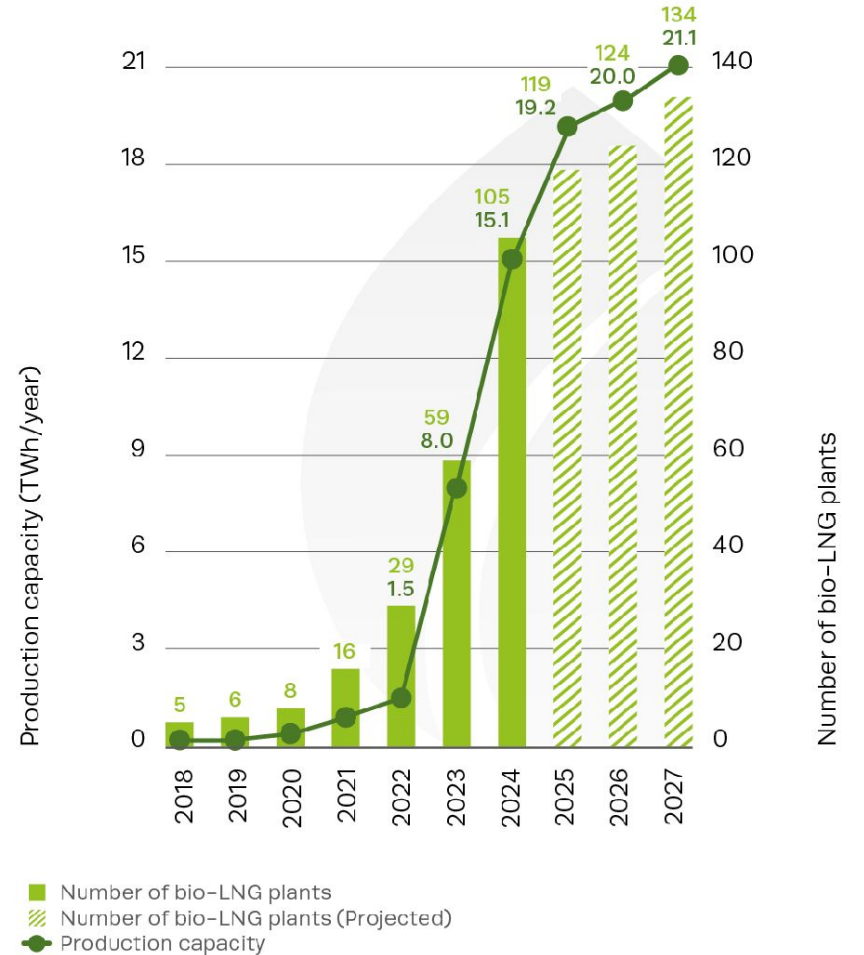
in power generation

13%

in industry

250,000

green jobs in Europe



*Figures for end of 2023

Δυναμικό βιομεθανίου: 111 bcm/year, για την Ελλάδα: 1,3 bcm/year

(2040)

Biogases towards 2040 and beyond

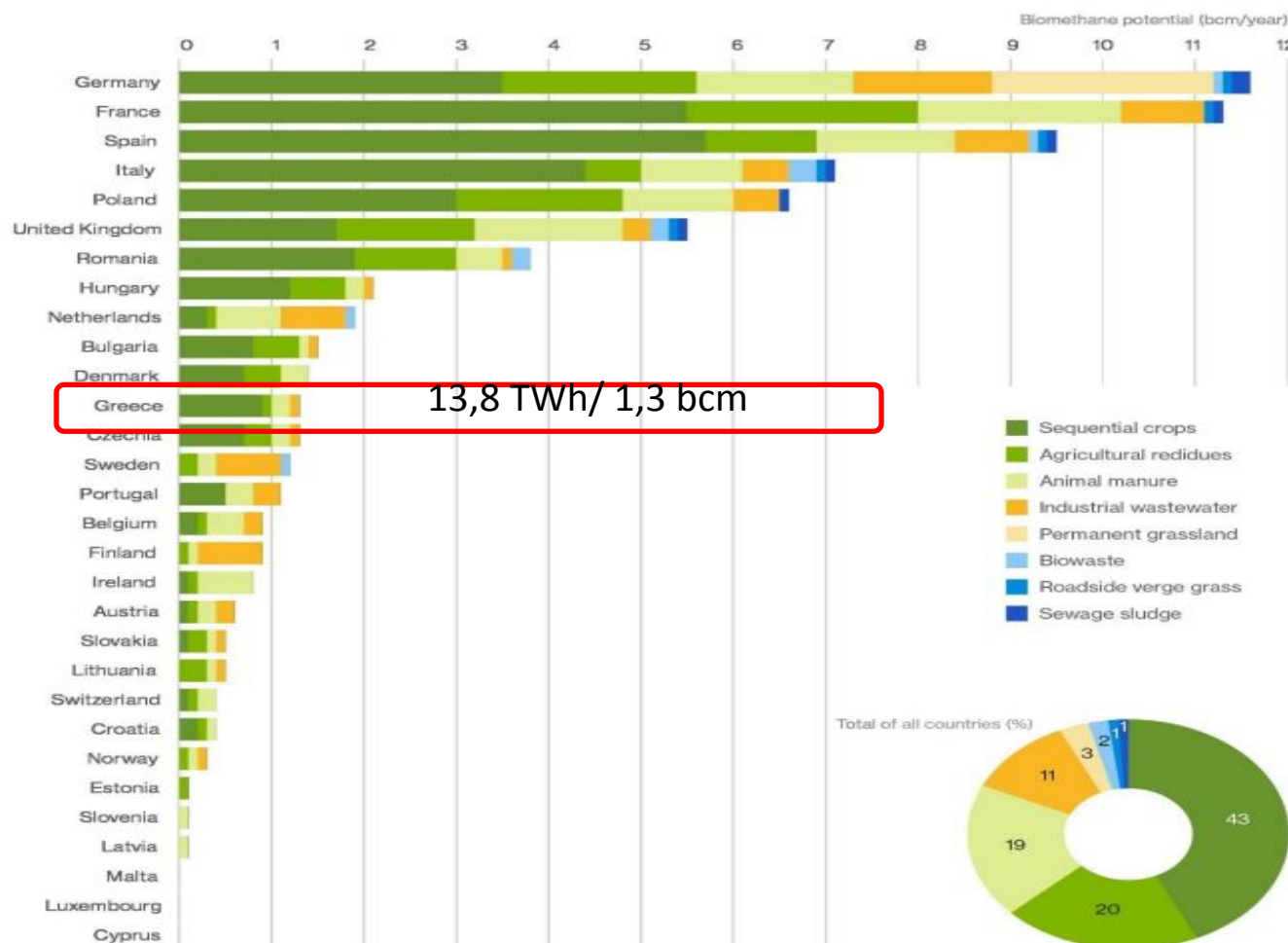
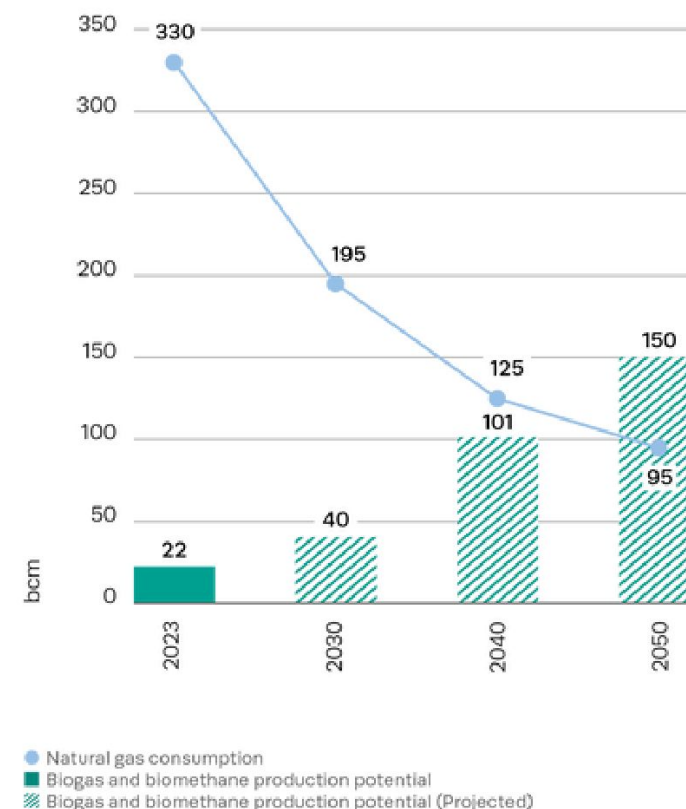


Figure 2. Biomethane potential (bcm/year) per country in 2040 for anaerobic digestion

Figure 3.7

Comparison of current biogas production and the EU-27 potential for 2030, 2040 and 2050 with the current and anticipated natural gas demand for 2030, 2040 and 2050 according to specific EU regulations



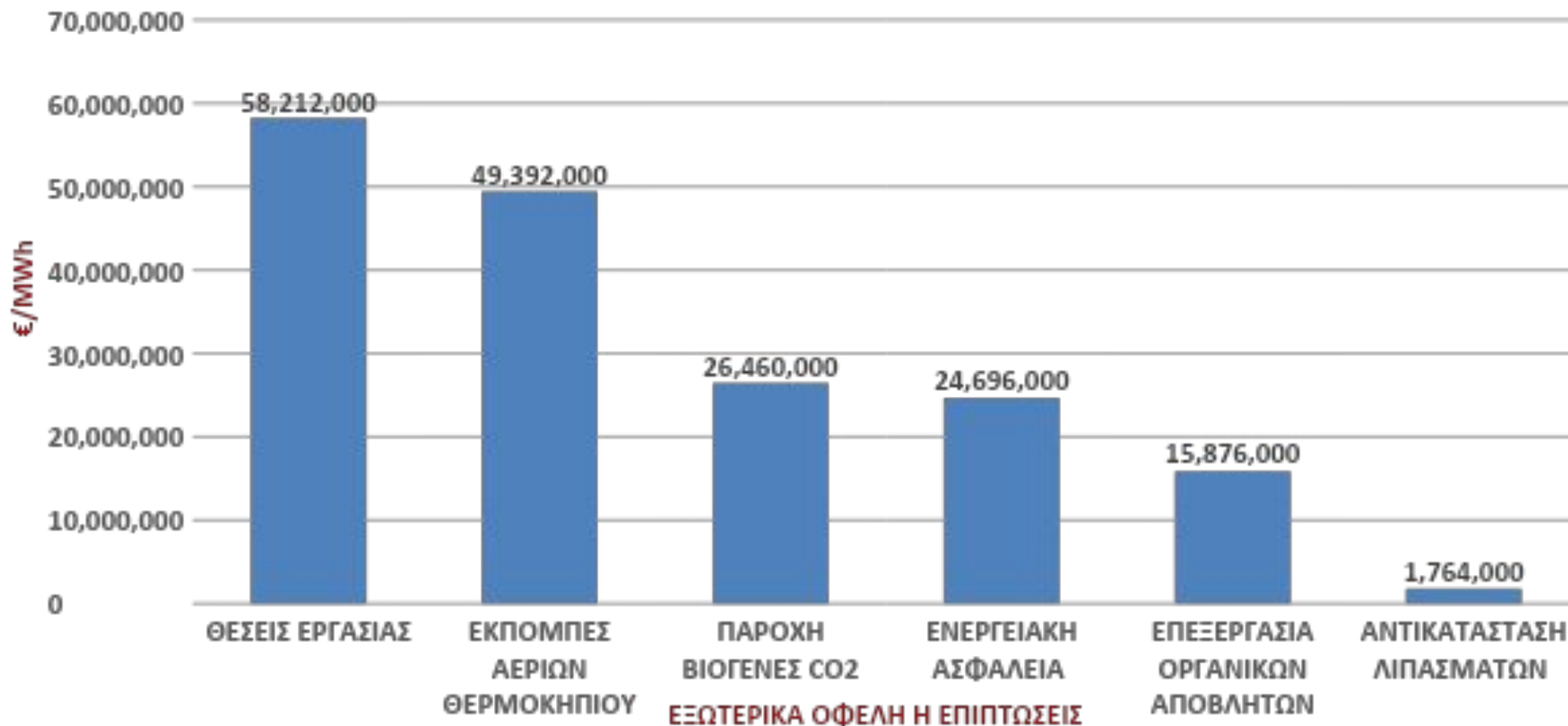
Για την παραγωγή βιοαερίου/βιομεθανίου στην Ελλάδα

Στην Ελλάδα υπάρχουν (2023)

- 6.012.239 στρ
σιτηρά και
- 1.522.027 στρ.
αγρανάπαυση
ς
- 900.457
βοοειδή

Βοοειδή	Έκταση	Ακατέργασ το βιοαέριο	Ισχύς καυσίμου	Έγχυση βιομεθανίου στο δίκτυο διανομής ΦΑ	Ενεργειακό περιεχόμενο βιομεθανίου
Ζώα	Στρ	m ³ /ώρα	MW	m ³ /έτος	MWh/έτος
3.300	1.550	240	1,3	1.202.247	11.592
6.590	3.100	400	2,2	2.003.745	19.320

176,4 εκ € ΑΠΟ ΤΑ ΕΞΩΤΕΡΙΚΑ ΟΦΕΛΗ ΠΑΡΑΓΩΓΗΣ ΒΙΟΜΕΘΑΝΙΟΥ 2,1 TWh



A Snapshot of the Current State of Energy Transition in International Shipping

ClassNK

Demand side

In service:

38,700 ships^{*1}



Conventional
fuel ships
37,200 ships
(96%)



Alternative
fuel ships^{*2}
1,500 ships
(4%)

A transition of 37,200 ships to alternative fuels is necessary. (Alternative fuel ships can use zero-emission fuels.)

^{*1} 5,000 gross tonnage and above (as of the end of December 2024, adjusted for fractions)

^{*2} LNG-fueled LNG carriers are included.

Fuel consumption:

216 mil. tons/year^{*3}



Conventional
fuel oil
200 mil. tons
(93%)



Alternative
fuel
16 mil. tons^{*4}
(7%)

The required amount for a full transition to zero-emission fuels would be...

For methanol **440 mil. tons/year**

For ammonia **470 mil. tons/year**

For methane/LNG **180 mil. tons/year**

For hydrogen **70 mil. tons/year**

^{*3} The annual fuel consumption for ships engaged in international voyages with 5,000 gross tonnage and above (abt. 30,000 ships subject to IMO DCS) in 2023 (conventional fuel oil equivalent)

^{*4} Conventional fuel oil equivalent (of which 98% is LNG fuel.)

Supply side

Shipyard

Newbuildings:

1,500 ships/year^{*5}



Conventional
fuel ships
1,200 ships/y
(80%)



Alternative
fuel ships
300 ships/y
(20%)

^{*5} 5,000 gross tonnage and above (2024, adjusted for fractions)

Green fuel producers

- ✓ Methanol **3.2 mil. tons/year^{*6}**
- ✓ Ammonia **6.4 mil. tons/year^{*6}**
- ✓ Methane **0.01 mil. tons/year^{*6}**
- ✓ Hydrogen **1.5 mil. tons/year^{*6}**



^{*6} Operational, construction, FID (for all sectors)

Other sectors

- ✓ **Methanol**
Chemical, etc.
- ✓ **Ammonia**
Electricity, Agriculture, Chemical, etc.
- ✓ **Hydrogen**
Electricity, Automobile, Steel, etc.

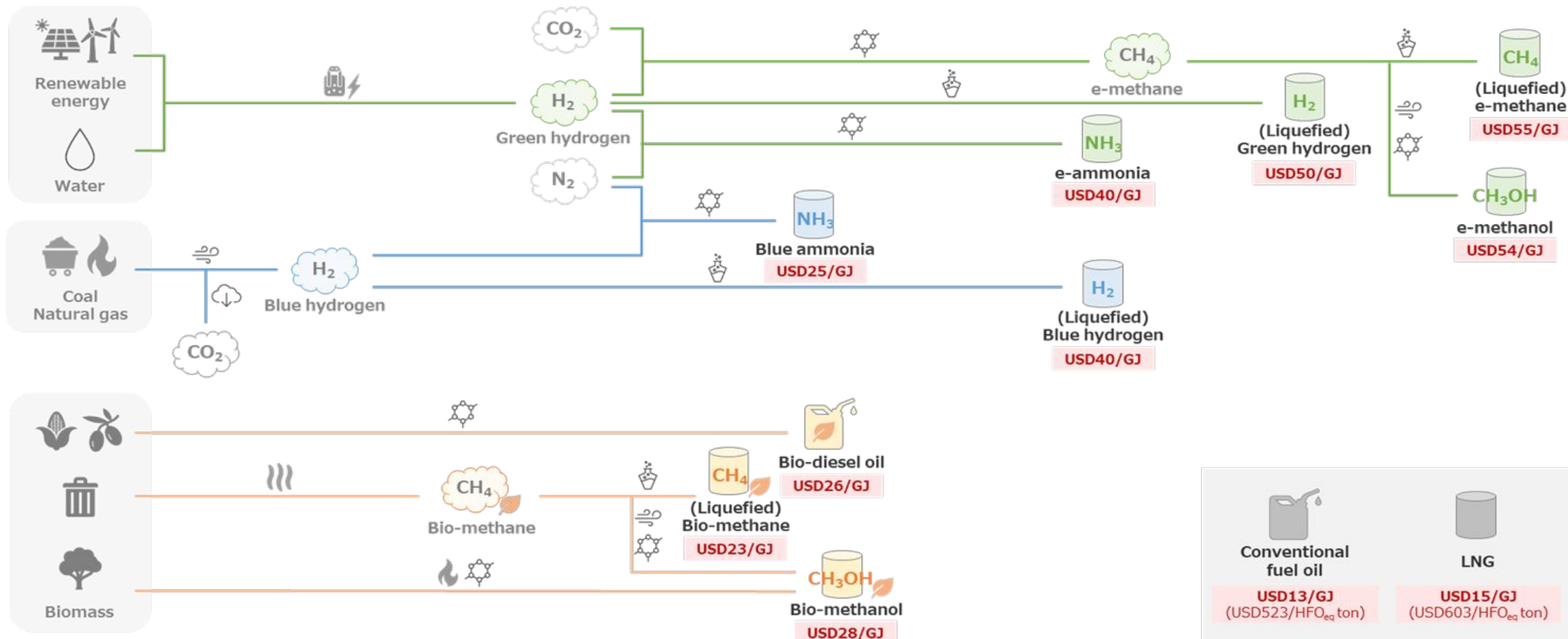


Much of the green fuels and green chemicals produced are expected to be directed towards demand from other sectors.

While biofuels contribute to GHG emission reductions, there are constraints on the resource availability of biomass, which serves as their raw material. Moreover, demand for biomass competes across sectors.

Production pathways and costs of alternative fuels

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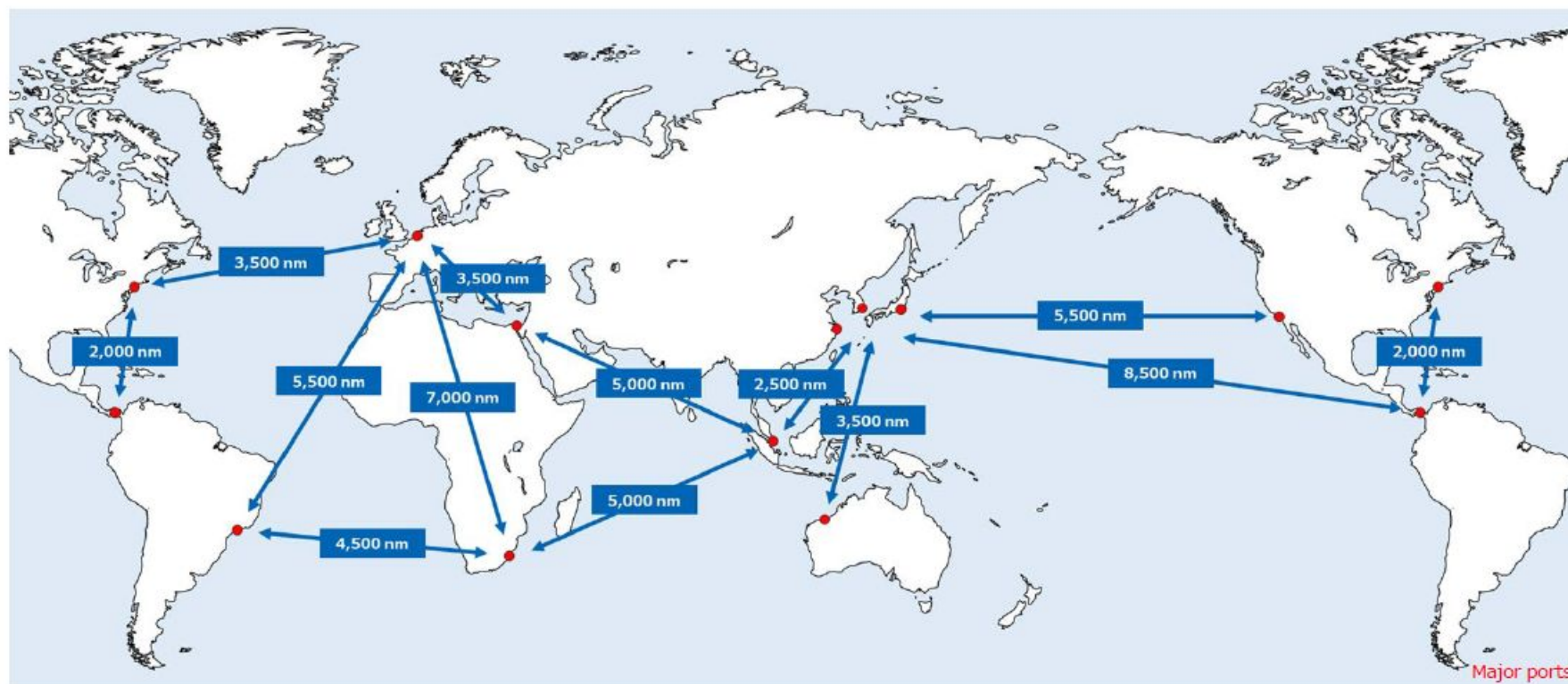
Understanding alternative fuels



Route selection

Alternative fuel ships cover shorter distances and require different fuel amounts (in tons) compared to conventional fuel ships, even with the same fuel tank capacity. When considering the adoption of alternative fuel ships, it is important to select routes considering the type of fuel and bunkering locations.

Voyage distance on major routes



The amount of fuel required for a 206,000 DWT bulk carrier to sail one way (laden) from Japan to Australia over a distance of 3,500 nm.

- Fuel oil :500 tons
- LNG :420 tons
- LPG :435 tons
- Methanol :1,010 tons
- Ammonia :1,080 tons
- Hydrogen :170 tons

bioLNG ΣΤΗΝ ΝΑΥΣΙΠΛΟΙΑ



Η Gasum, Νορβηγική εταιρεία παροχής ενέργειας με εξειδίκευση στις αγορές ΦΑ, LNG, βιοαερίου, bioLNG και ηλ. ενέργειας, διαθέτει και λειτουργεί 18 μονάδες βιοαερίου και ένα εκτεταμένο δίκτυο σταθμών ανεφοδιασμού αερίου στις σκανδιναβικές χώρες:

- ❑ Έβαλε ως στόχο την παροχή στη αγορά 7 TWh ανανεώσιμων αερίων ετησίως μέχρι το 2027, εξοικονομώντας 1,8 million tons εκπομπών CO₂
- ❑ Το 2022 παρέδωσε 1,7 TWh βιοαερίου στους πελάτες της εξοικονομώντας 444.000 t CO₂
- ❑ Το 2024 ξεκίνησε συνεργασία με Hapag-Lloyd να παρέχει bio-LNG στα πλοία που κάνουν δρομολόγια μεταξύ Singapore and Rotterdam για το 2025 and 2026.
- ❑ Η Hapag-Lloyd ανακοινώθηκε τον Απρίλιο του 2024 ως ο νικητής της πρώτης συμφωνίας αγοραστών από τη ZEMBA (Zero Emission Maritime Buyers Alliance). Η πρώτη στο είδος της συμμαχία αγοραστών ενώνει σημαντικούς μεταφορείς, συμπεριλαμβανομένων των Amazon, Patagonia, Bauhaus, New Balance, Nike, REI και άλλων που συμφώνησαν συλλογικά να αγοράσουν πάνω από ένα δισεκατομμύριο TEU* μίλια στη διαδρομή μεταξύ Σιγκαπούρης και Ρότερνταμ το 2025 και το 2026



*1 TEU = one 20-foot container

Παραγωγή βιομεθανίου- bioLNG –bioCO₂

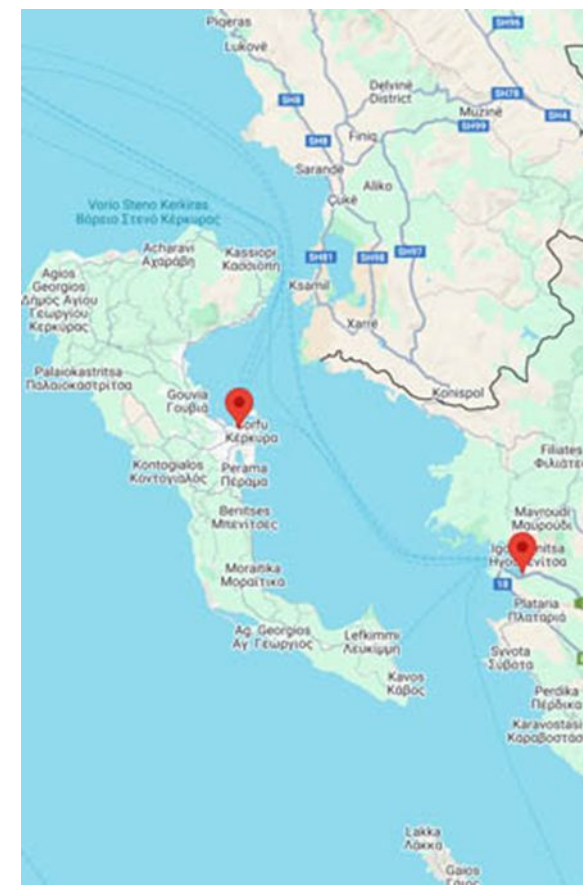
Ένα οχηματαγωγό 3000 τόνων καταναλώνει 0,09 τόνους bio-LNG/ναυτικό μίλι

Η διαδρομή Ηγουμενίτσα-Κέρκυρα:

□ 18 ναυτικά μίλια = 1,62 τόννοι bio-LNG

□ 6 τόννοι/ημέρα bioLNG για 2 πλοία both ways

- ✓ 640 Nm³/hour raw biogas (355 biomethane Nm³/hour)
 - Απαιτούνται 62.000 τόννοι βιομάζας
 - 15.000 τόννοι ενσίρωμα
 - 11.000 τόννοι κοπριάς αγελάδων
 - 19.000 τόννοι κοπριάς πτηνών και αιγοπροβάτων
 - 17.000 τόννοι τυρόγαλο
- ✓ 24.400 τόννοι στερεό λίπασμα
- ✓ 35.000 τόννοι υγρό λίπασμα
- ✓ 12.5 t/day bioCO₂



Green Biomethane Market Uptake



GreenMeUp enhances the uptake of biomethane in the European energy and transport sectors

- Bridging the gap between EU Member States within the biomethane Market sector
- Reducing reliance on natural gas imports and increasing renewable energy shares

Biomethane is a key renewable energy source for the decarbonisation of the EU

Only a limited number of EU Member States have significant deployment rates of biomethane

Approach

Evaluate **framework conditions** and **market dynamics** for EU countries with high production rates of biomethane and countries with low market development

Design a **country-tailored set of market uptake measures** that will refine existing policies on biomethane

Ensure active **stakeholder engagement** and high **societal acceptance** levels through science-based evidence



Impacts

- Contribute to the REPowerEU and EU Green Deal goals
- Facilitate the uptake of renewable energy systems in the energy, industrial and residential sectors
- Foster biomethane production and integration in hard to electrify sectors

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Website available soon

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Intelligent Energy Europe

REDUBAR

BBK ILK Dresden

Schmidt-Wottrich Dr. Harms Rechtsanwälte

FEE

EU-Project REDUBAR: Upgrading of Biogas to Biomethane and its Injection into the Grid. Experiences and Proposals to Surmount Non-technical Obstacles

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Strategic vision, obstacles and first proposals

Vision

"We should leave the oil, before the oil leaves us." Fatih Birol, Chief Economist of IEA [1] At the beginning of 2008 uncovered demand exceeded already 12.5 million barrels of oil per day of total worldwide daily production of about 84 million barrels of crude! [1] The European Union (EU) is committed to a long term vision to combat climate mitigation and improve energy security by binding targets of 20 % improvement of energy efficiency, 20 % higher application of renewable energy sources and 10 % share of biofuels by 2020. [2] Under idealized conditions would it be theoretically possible to substitute almost the complete amount of now imported natural gas to the EU by establishing biomethane and bio-SNG (substitute natural gas) plants in 25 km and 150 km corridors along the pipelines on both sides from Russia to Western Europe.[3]

Coordination & EU level expertise				
Trinomics				
Modelling				
E3 Modelling				
Belgium vito Trinomics	Cyprus The Cyprus Institute ideopsis	Czechia egu Brno	Estonia Tepsli Trinomics	Greece KAPE CRES
Spain NTT DATA	Finland AFRY	Croatia EIH APPLIED INSTITUTE INSTITUTE POLAR	Hungary ENERGIACLUB CLIMATE POLICY INSTITUTE GEOLOGICAL SOLUTIONS	Ireland GDG GAYN & BOHNET Trinomics
Italy ISINNOVA	Poland elt InnoEnergy	Portugal LNEG	Slovenia IRI UL	Slovakia egu Brno Trinomics

Ευχαριστώ πολύ για την προσοχή σας!



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CENTRE FOR RENEWABLE
ENERGY SOURCES AND SAVING

HYFUELUP

SHAPING A BETTER TOMORROW
WITH RENEWABLE NATURAL GAS

HYFUELUP (Hybrid Biomethane Production from Integrated Biomass Conversion) is a project funded by the European Union's Horizon Europe Research and Innovation Programme.

This ground-breaking project aims to develop and advance technology for biomethane production using gasification and methanation.

The biomethane produced will be liquefied and used for the decarbonization of long-distance road freight transport and maritime transportation.

THE MAIN GOALS OF THE HYFUELUP PROJECT ARE:

To demonstrate an innovative pathway for the efficient and cost-effective production of biomethane in an industrial environment through thermochemical technologies combined with renewable hydrogen.



To deploy a first-of-its-kind value chain for biomethane production using low-grade biomass residues and sludge digestate from anaerobic digestion plants, including biomethane offtake and distribution, for contributing to the penetration of biomethane in the transport and energy systems.

CONCEPT

HYFUELUP integrates a SEG/Oxy-SEG process to turn biomass into syngas or flue gas. Syngas with high H₂ content (>65%) and a CO₂-rich flue gas suitable for catalytic methanation are obtained as a result. The process takes place in a main demonstration site located in Tondela (Portugal).

