

Portuguese biogas/biomethane market overview: The Portuguese Action Plan for Biomethane 2024-20240

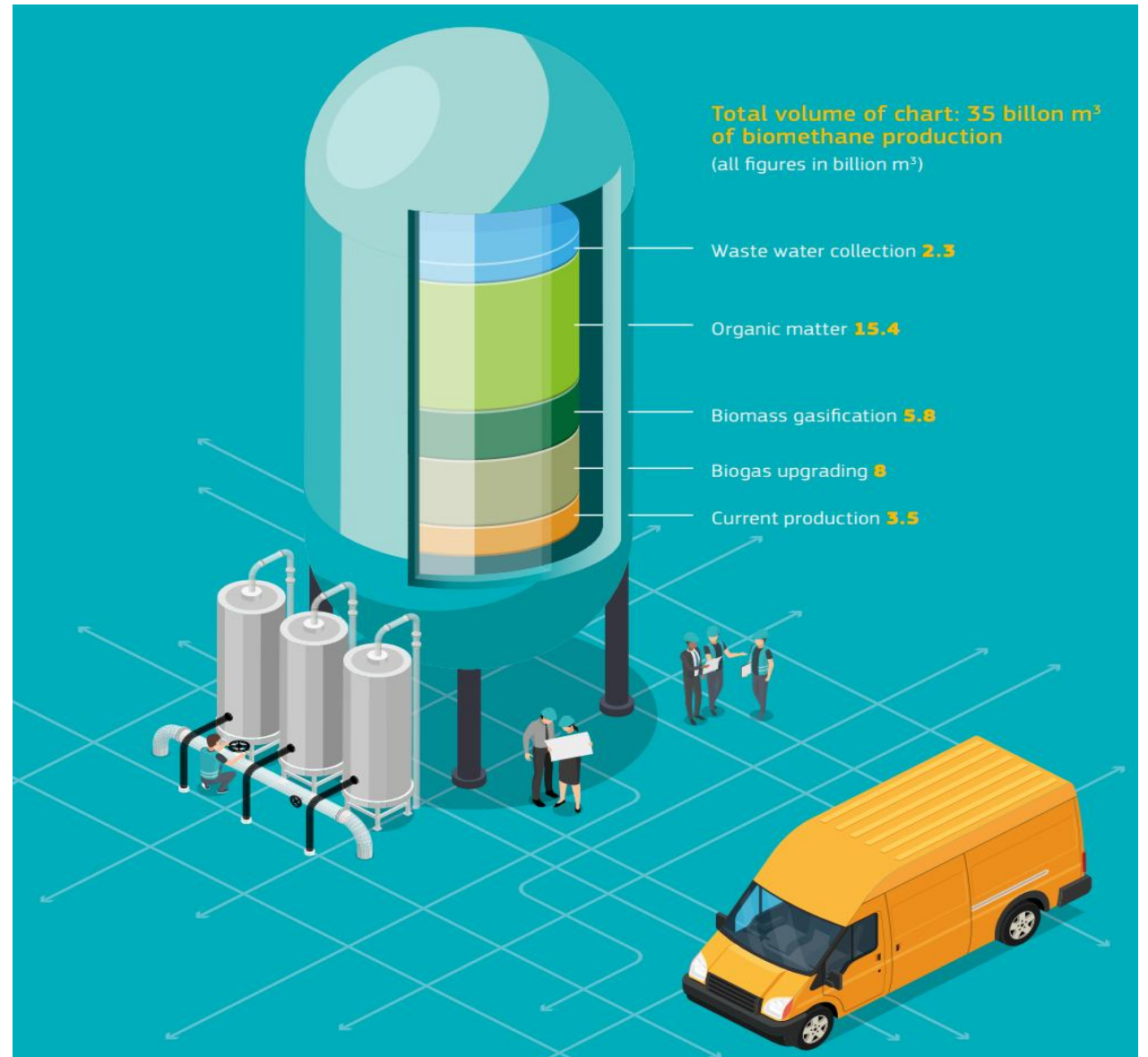
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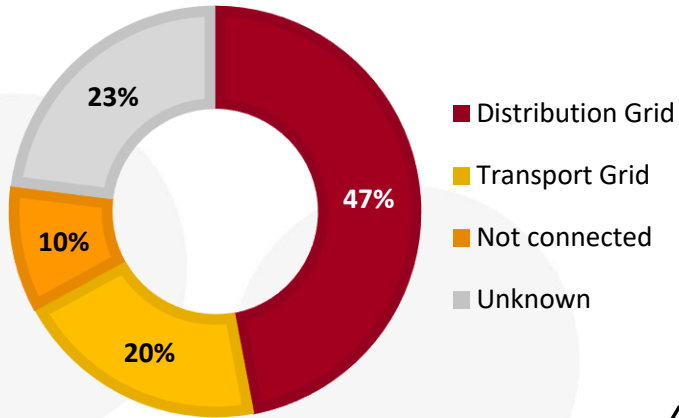
RePower EU initiative

- Target for Europe ´s biomethane industry
 - **35 bcm at 2030 (current: ~4.5 bcm)**
- Reducing the imports dependence on Russia fossil fuels (e.g., natural gas)
- **Goals:**
 1. Upgrading the existing biogas plants to biomethane
 2. Increasing the collection and processing of organic feedstocks, such as woody biomass, organic matter and waste waters and use both AD and gasification technologies.



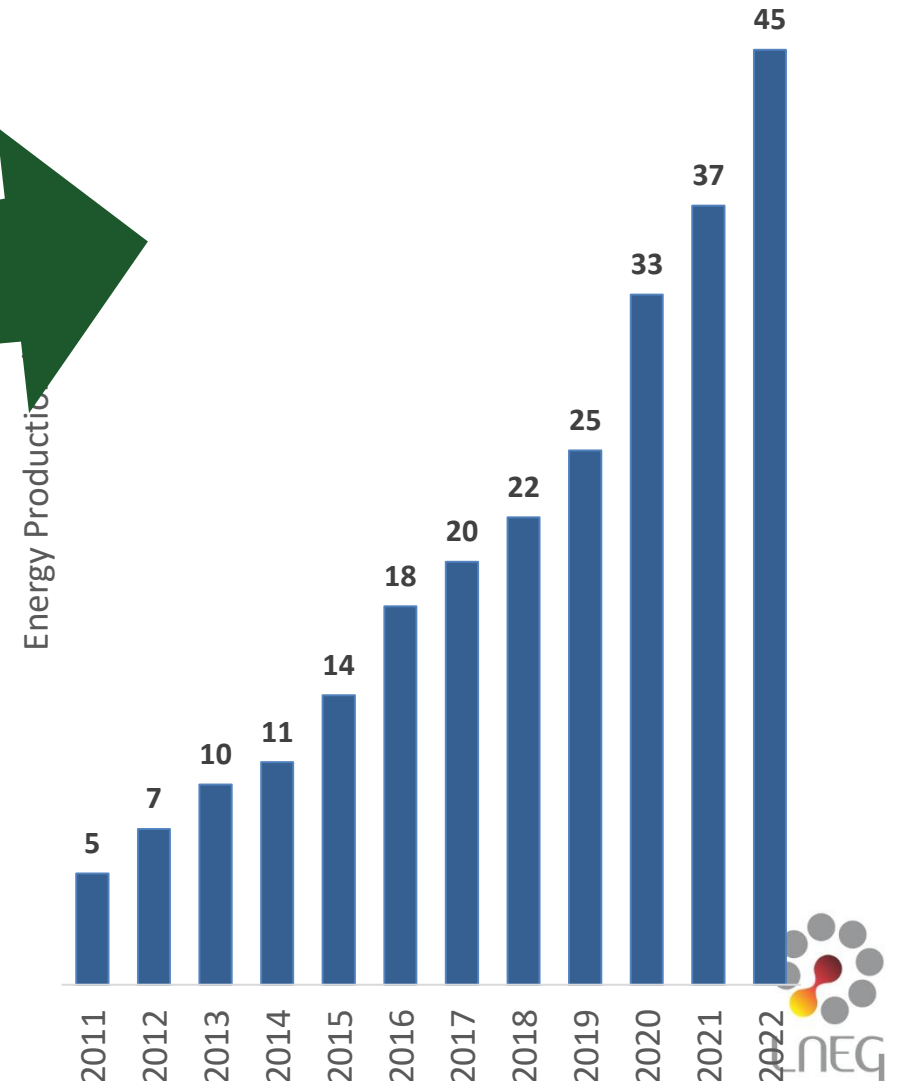
Snapshot of EU market

Biomethane plants overview (2020)



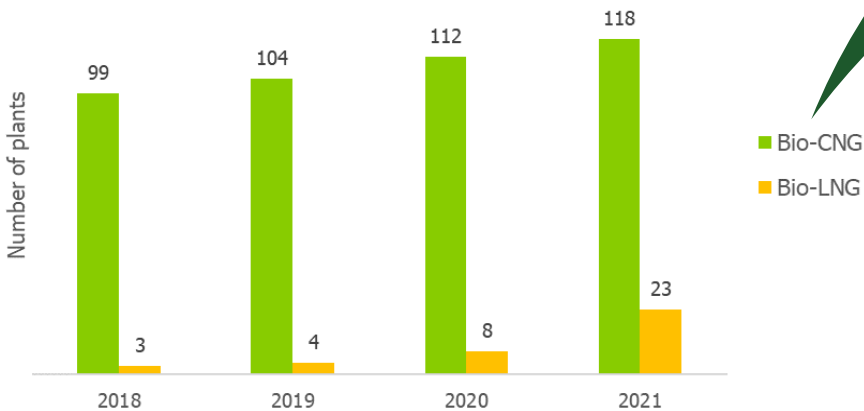
- 47% → NG distribution grid.
- 20% → NG transport network.
- 10% not connected

Biomethane production



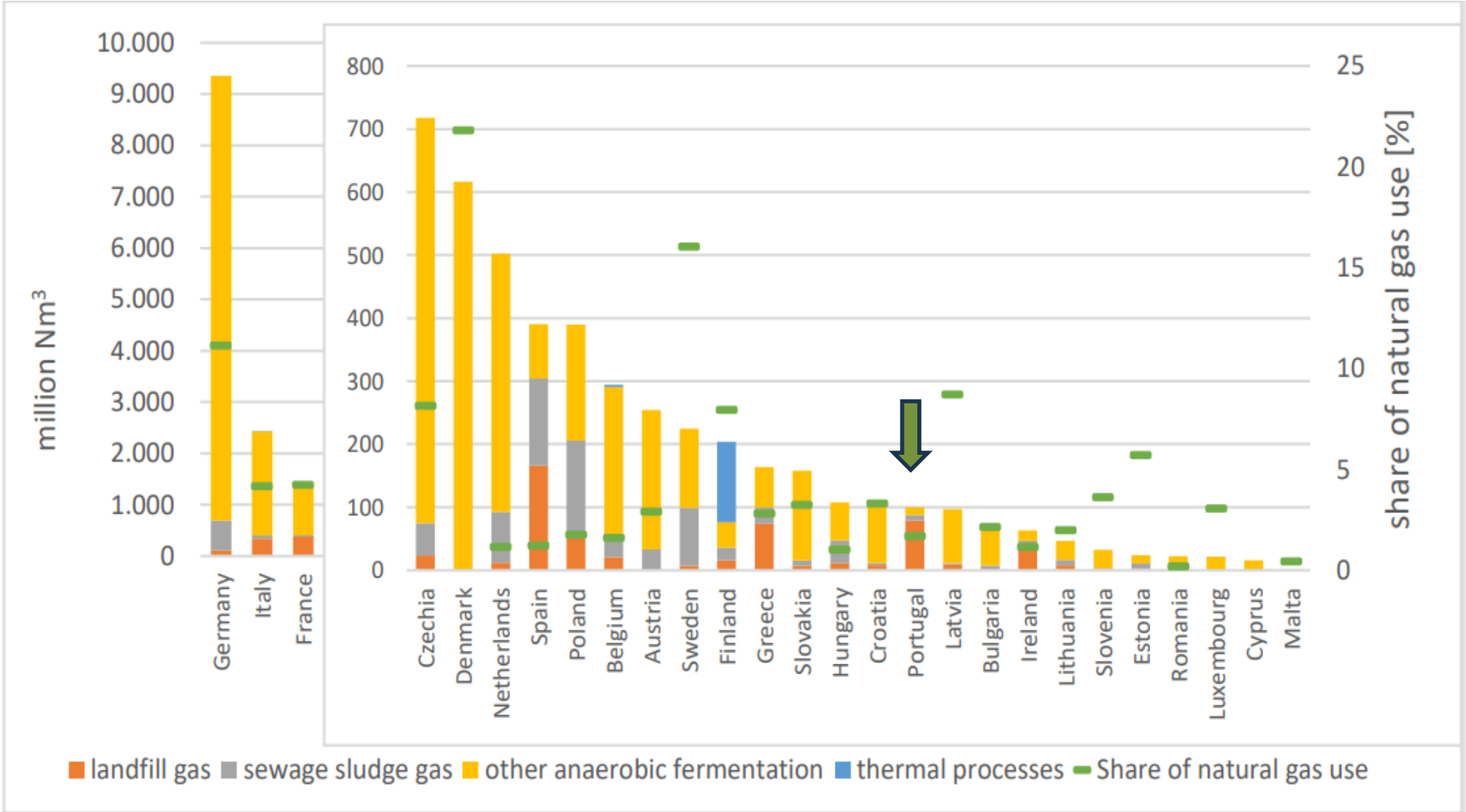
4.6% in 2020
 11% in 2030
 30 – 40% in 2050

Bio-CNG & Bio-LNG



- Sweden, Finland & Norway -larger Bio-CNG producers - HEAVY DUTY ROAD TRANSPORTATION
- Germany, Italy & the Netherlands dominate the Bio-LNG market. – MARITIME SECTOR

Biogas: From where we start... Portugal



Source: Eurostat, 2022



Why Biomethane now ?

- ✓ Energy security“Our” gas!...
- ✓ Helps Environment Ministry to solve a main problem: Organic wastes →→ landfill
- ✓ Helps Economy Ministry to decarbonize ...economy (e.g., energy-intensive industries)
- ✓ Helps Energy Ministry to...meet the ambitious EU Renewables targets (RED III Directive)
- ✓ Helps Agricultural Ministry...to increase farmers revenues (wastes are now valorised)



National Action Plan for Biomethane 2024-2040 (PAB)

2022/2023: BIOREF received a request from Ministry of Environment & Energy to draft the PAB on Biomethane

2023: BIOREF submit the final version of PAB to the Ministry of Environment & Energy

2023/2024: Launched a Public Consultation. PAB slightly amendment (by BIOREF).

2024: PAB is published as **CMR n° 41/2024**, March, 15th.

2025: Ordinance n° 1604/2025, Feb 4th (Economy, Environment and Energy, Agriculture and Fisheries) – Nominates **LNEG** as Coordinator of the **“WG Monitoring & Coordination”** for implementing the PAB on Biomethane. The WG is constituted by 26 entities, mostly from Government Cabinets, Main Governmental Offices, and representatives of private stakeholders.



NATIONAL ACTION PLAN FOR BIOMETHANE

2024-2026

2026-2040

Strategic vision



To create until 2026, the **biomethane market as a sustainable way to reduce natural gas imports** used in the industrial and domestic sectors, including its use in mobility, by taking full advantage of the **abundant endogenous residual biomass** existing in various sectors.

objectives

Implementing an internal market for biomethane

Consolidating the national biomethane market

Building a sustainable sector in Portugal

priorities

-Accelerating the development of an internal market
-Create an enabling regulatory framework

-Strengthening and consolidating the biomethane market
-Developing value chains at regional level
-Strengthening R&I

-Ensuring environmental sustainability in the sector
-Stimulating synergies between the actors in the value chain

Biogas – Current market in PT

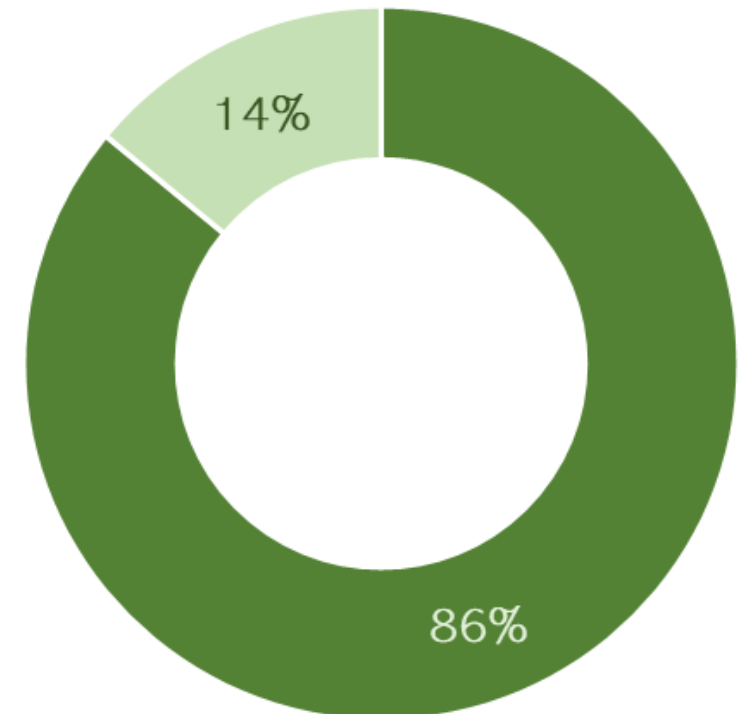
- **Current biogas production in Portugal is 145 Mm³/y;**
 - **Sewage sludge - 86%**
 - **OFMSW - 14%.**
- At present, there is **no biomethane production** in Portugal, but the potential for its production from existing **sewage sludge, livestock manure** and **OFMSW** feedstocks is large.



OFMSW



Sewage Sludge



Biogas & Biomethane implementation potential in Portugal

Feedstock	2030		2040	
	Biogas (TWh)	Biomethane (TWh)	Biogas (TWh)	Biomethane (TWh)
Biogas upgrading units	-	0.44	-	0.78
OFMSW	0.40	0.36	0.44	0.78
Sewage Sludge	0.05	0.05	0.05	0.05
Livestock Manure	1.04	0.94	1.04	0.94
Agroindustrial wastes	0.08	0.07	0.08	0.07
Agricultural wastes	0.62	0.56	0.92	0.83
Forest residues	-	0.01	-	0.48
Biogenic CO2 (+H2)	-	0.29	-	2.02
Total		2.72		5.75

Targets & expected number of biomethane plants

From **0 TWh/y** biomethane in 2024...

2024

2030

... up to **2,7 TWh/y** biomethane

2040

... up to **5,75 TWh/y** biomethane

~30 DA plants of total capacity of **1000 m³/h biometano** (90,2 GWh/y) **until 2030.**



Biomethane Portuguese Action Plan 2024-2040

Retrofitting of current Biogas plants → 0,4 TWh

+

Expanding capacity of current Biogas Plants → 0,2 TWh

Total: 0,6 TWh = 22% share for 2030

Brownfield



Capacity (m ³ /h)	Plants Number
250	28
500	14
750	9
1000	7

Biomethane Portuguese Action Plan 2024-2040

Greenfield

Manure → 0,9 TWh

OFMSW → 0,2 TWh

Agroindustrial wastes → 0,1 TWh

Agricultural wastes → 0,6 TWh

Total: 1,8 TWh = 67% share for 2030



Capacity (m ³ /h)	Plants number
250	83
500	41
750	28
1000	21

Biomethane Portuguese Action Plan 2024-2040

CO₂ valorization from AD plants

→ 0,25 TWh

Forest residues by gasification

→ 0,05 TWh

Total: 0,3 TWh = 11% share for 2030

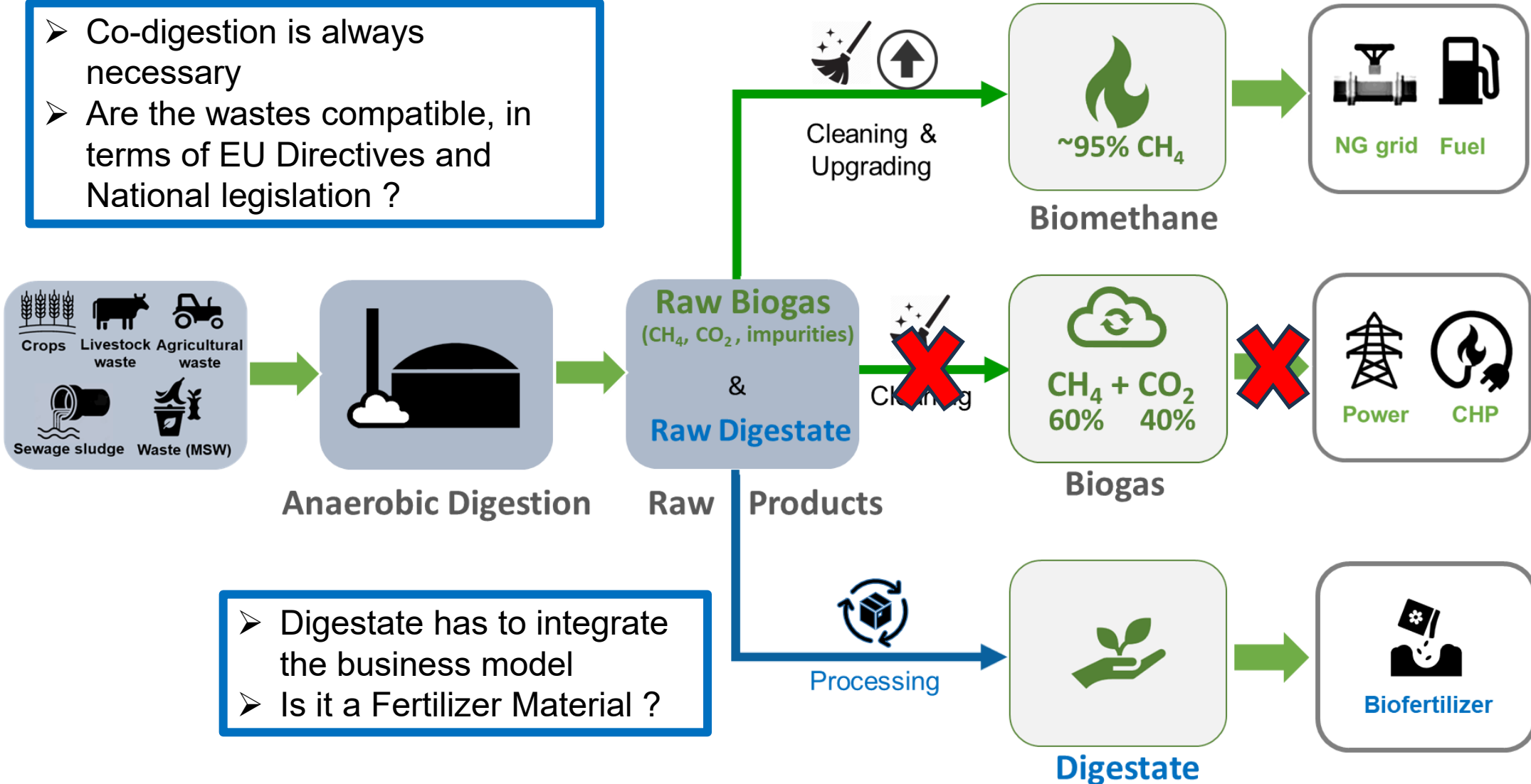


Is Biomethane worthy to be a business?

- Connection costs to NG grid
- Has the NG grid Regulator already defined the right-to-inject?

Yes, it is !...However any business model should account for:

- Co-digestion is always necessary
- Are the wastes compatible, in terms of EU Directives and National legislation ?



- Digestate has to integrate the business model
- Is it a Fertilizer Material ?

Portuguese Action Plan 2024-2040: Incentives

CAPEX Support:

2021 – total incentive - 102 M€; supported 3 projects

2023 – total incentive - 83 M€: supported 4 projects

2023 – total incentive - 70 M€: supported 10 projects

BIOMETHANE AUCTIONS (for public purchases)

2024 – max. 150 GWh/yr for a fixed price of 62 €/MWh

RED III:

GoO – for injection the gas grid or for UAG (autonomous units of gas storage)

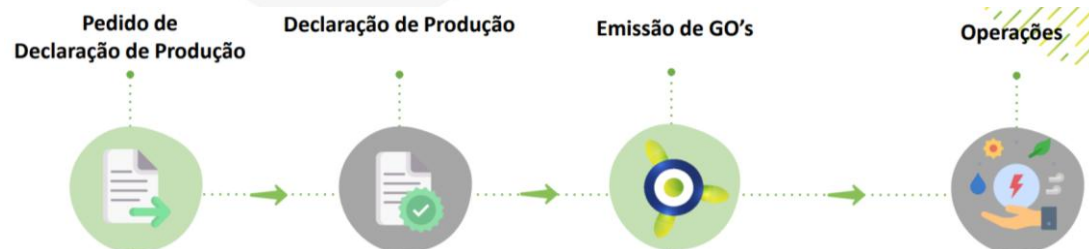
Biotickets – Double Biotickets per tep of biomethane from wastes

Governo lança leilão de gases renováveis de 140 milhões

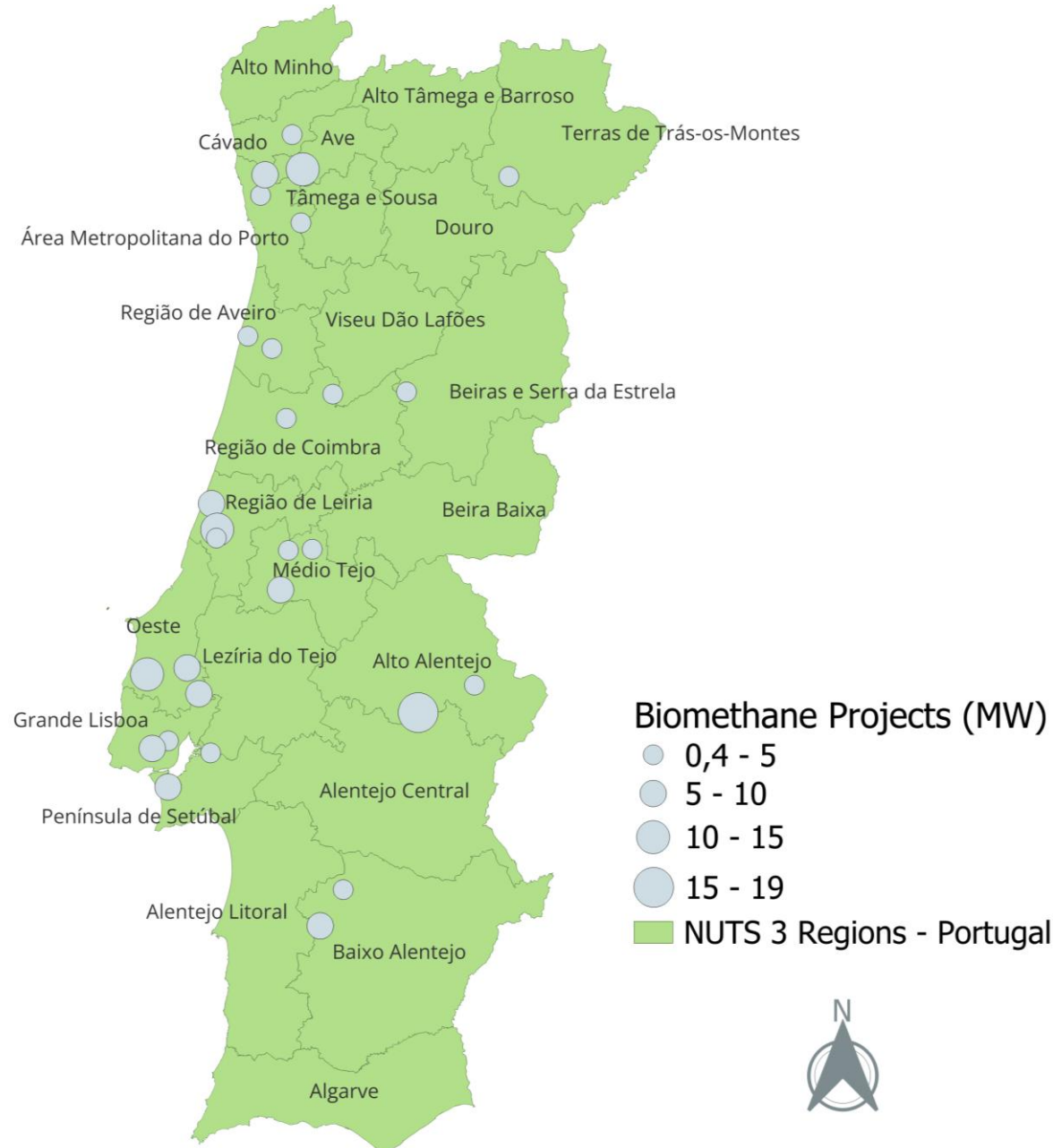


A ministra da Energia e do Ambiente, Maria da Graça Carvalho, anunciou que o Governo irá lançar esta segunda-feira um novo leilão de gases renováveis, com uma dotação de 140 milhões de euros. Estará aberto a projetos de hidrogénio verde e biometano. Em paralelo, avançou que espera ter concluídas as primeiras orientações para o leilão de energia eólica *offshore* antes do verão.

“Hoje lançamos um leilão de gases renováveis, no qual iremos injetar 140 milhões de euros, ao longo de um período de dez anos, financiado pelo Fundo Ambiental. Este montante deverá compensar os investidores pelas flutuações de preço”, indicou a ministra.



Portuguese Action Plan 2024-2040: Market



DGEG did already receive 28 Previous Requests for new Biogas/Biomethane Production Sites

Economic study for Portugal

Production costs (basis: 250 m³/h biomethane plant)

SCENARIO 1	COMPONENT	Cost
Brownfield plant	CAPEX DA*	35 €/MWh
	CAPEX Upgrading	+ 10 €/MWh
	OPEX Upgrading	+ 8 €/MWh
	CAPEX grid Injection	+ 7 €/MWh
	LCOB biomethane	60 €/MWh
	Taxes	+ 2 €/MWh
	Final Cost	62 €/MWh

SCENARIO 2	COMPONENT	Cost
Greenfield plant	CAPEX DA	54 €/MWh
	OPEX DA	+ 36 €/MWh
	LCOE biogás	90 €/MWh
	CAPEX Upgrading	+ 11 €/MWh
	OPEX Upgrading	+ 8 €/MWh
	CAPEX grid injection	+ 7 €/MWh
	LCOB biomethane	116 €/MWh
	Taxes	+ 9 €/MWh
	Final Cost	125 €/MWh

Lessons learned sofar for market creation in Portugal

Regulatories

- New biogas plants licencing needs to be less bureaucratic - “need a green way”
- **Right-to-inject needs:**
 - Injection tariffs model
 - Cost sharing (grid conection) between producers and TSO/DSO
 - Compression costs at point of injection (grid)
 - Grid planning and reverse flow costs

Business / Market

- Biomethane “demand market” needs to be created through mandatory quotes of incorporation and public purchase auctions
- TSO/DSO should plan all NG grid for injection of this new renewable gas
- Virtual pipelines should be planned also
- Transportation costs of bio-CNG incentives
- Wastes: Consider Biogas Production Hubs
- Digestates should be marketed as fertilizer material

BIOREF* accept discussing Partnerships with Danish private companies

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* BIOREF is a private association for non-profit, led by LNEG, with 23 associates (Academia and public and private companies)

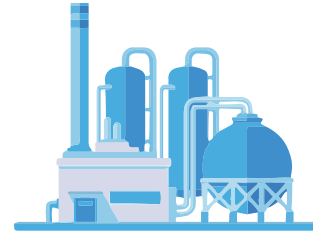
OUR B2B SERVICES

Contact: philippe-ramos@bioref-colab.pt



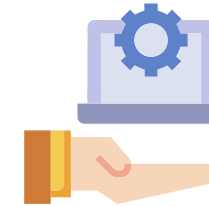
Biogas & Renewable Gas Services

- ❖ Biogas and biomethane potential determination for all type of feedstocks and co-digestion processes
- ❖ Biogas testing Pilot plant
- ❖ Business modelling for biogas plant projects in Portugal
- ❖ AI-based algorithms construction for digital twin control of AD process



Modelling, simulation , process integration and basic engineering for biorefineries

- ❖ Tailor-made Aspen Plus modelling for any biorefinery process
- ❖ AI-based algorithms, digitalization, machine learning, digital twins for single operation units or full process integration



Biomass mapping and Techno-economic modelling

- ❖ Biomass resources mapping
- ❖ Developing tailor-made business models for energy and bioproducts biorefineries
- ❖ Gasification plants scouting and TEA assessment
- ❖ Methanation plants scouting and provided

Acknowledgments

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Thank you !

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