

# Portuguese Action Plan for Biomethane

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# LNEG – NATIONAL LABORATORY OF ENERGY AND GEOLOGY

**Mission:** to promote and carry out research, demonstration and knowledge transfer actions, technical and technological assistance and laboratory support for companies, in the domains of **Energy and Geology**.

**Vision:** to be a **reference institution** capable of contributing with excellent solutions for a **decarbonized economy**.

**Values:** Excellence, Commitment, People and Innovation.



Materials for Energy



Integration of Renewable Energies in the Energy System



Energy in the Built Environment



Bioenergy and Biorefineries



Resource Economics



Renewable Energies



Geo-Information



Geology and Geological Risk



Mineral Technology



Geological Resources



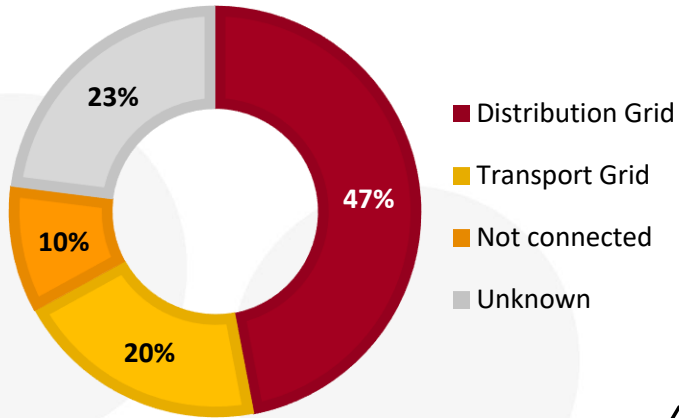
# RePower EU initiative

- 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.



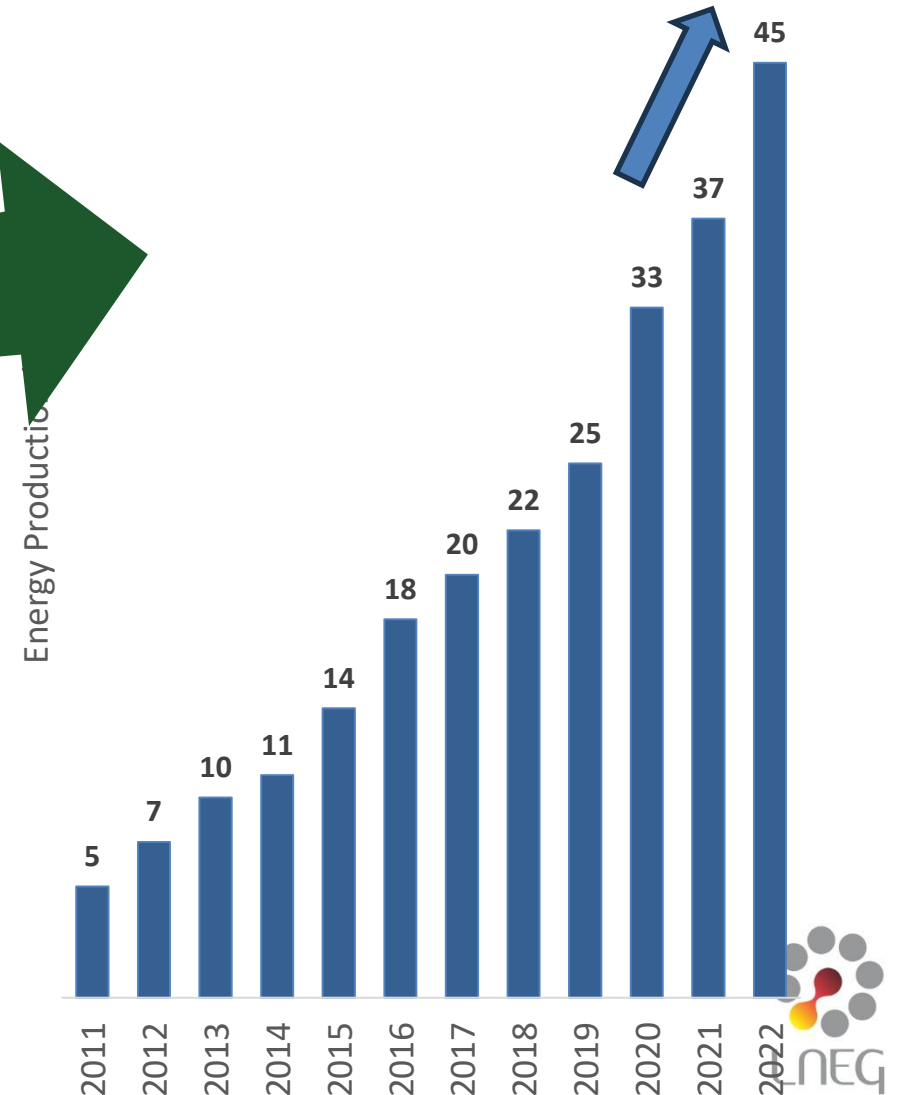
# Snapshot of EU market

## Biomethane plants overview (2020)



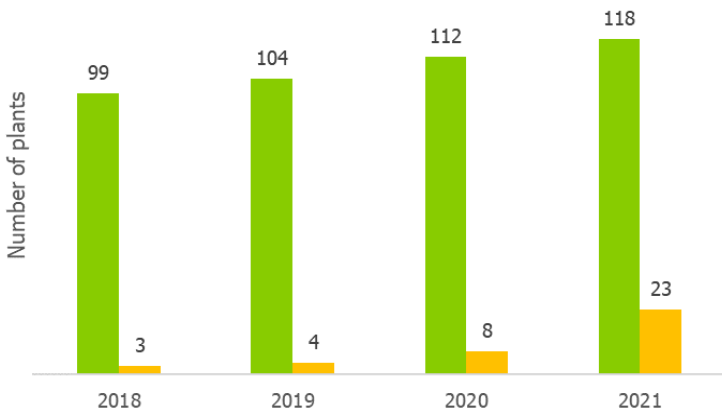
- 47% → NG distribution grid.
- 20% → NG transport network.
- 10% not connected

## Biomethane production



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

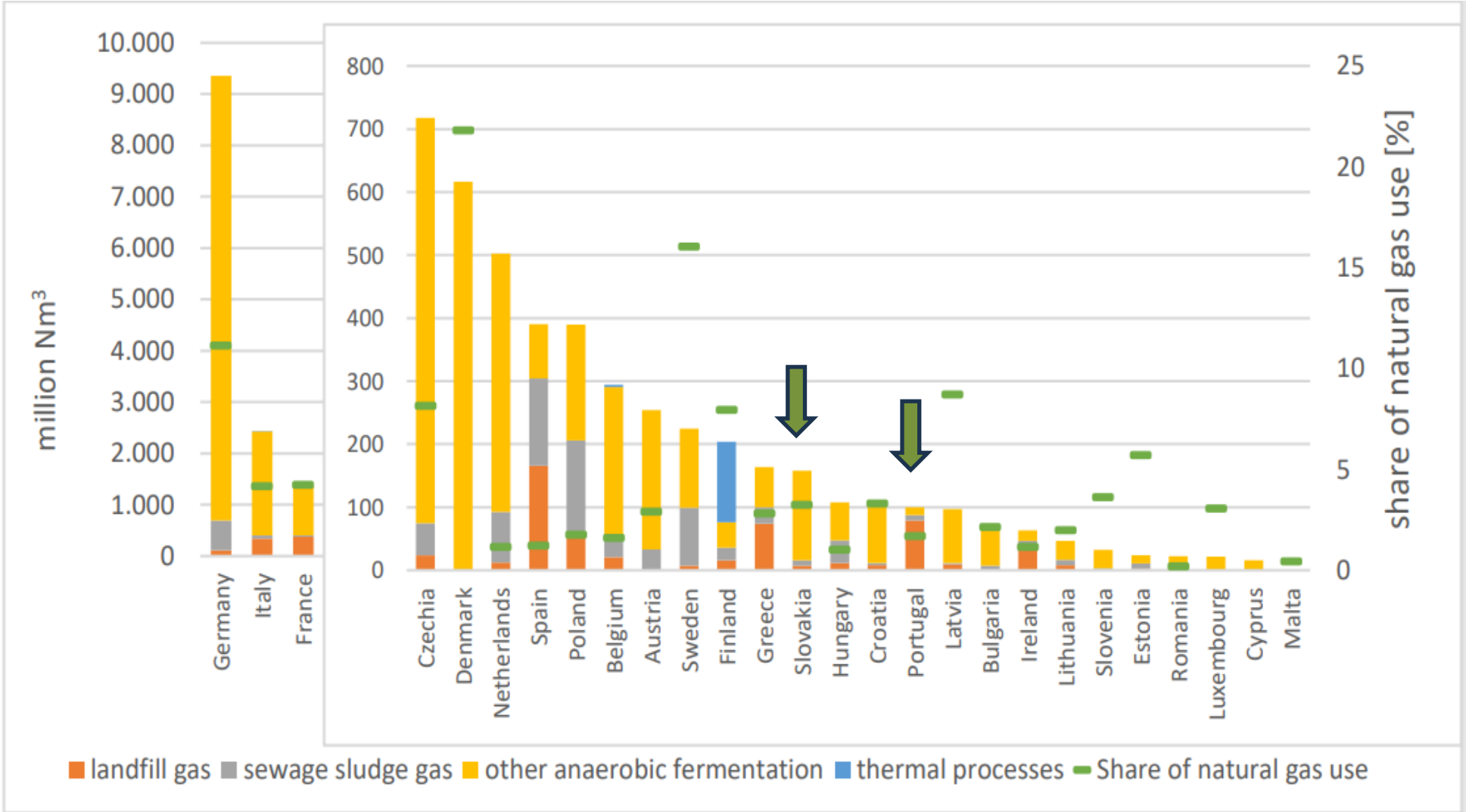
## Bio-CNG & Bio-LNG



- 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... Slovakia & Portugal



Source: Eurostat, 2022

# Why Biomethane now ?

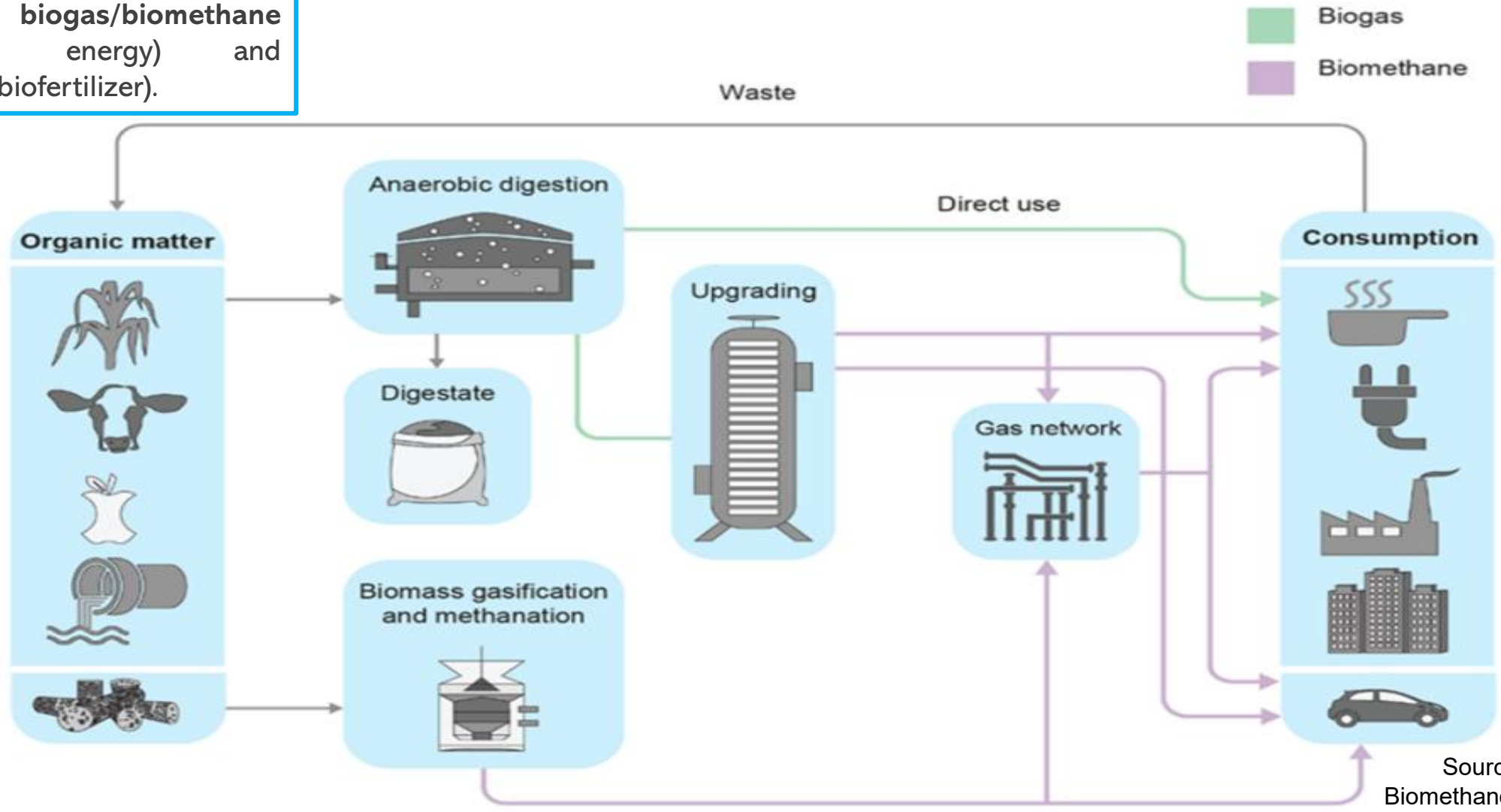
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- ✓ Energy security .....“Our” gas!...
- ✓ Helps Environment Ministry to solve a main problem: Organic wastes  landfill
- ✓ Helps Economy Ministry to decarbonize ...economy (e.g., energy-intensive industries)
- ✓ Helps Energy Ministry to...meet the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

# Biogas/Syngas & Biomethane

AD is a biotechnological process in which microorganisms break down **organic matter**, generating two valuable products, **biogas/biomethane** (renewable energy) and **digestate** (biofertilizer).

Biogas and biomethane production pathways



Source: IEA (2022)-  
Biomethane background paper

# Portuguese Action Plan for Biomethane 2024-2040

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

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

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

**2024: PAP** 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 NAP on Biomethane. The WG is constituted by 26 entities, mostly from Government Cabinets, Main Governamental Offices, and representatives of private stakeholders.



# BIOMETHANE PORTUGUESE ACTION PLAN

2024-2026


2026-2040


## Strategic vision




Promote, by 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

## phases

 **Creating** a value chain for biomethane  
**2024-2026**


 **Market strengthening** and consolidation  
**2026-2040**

 **Ensuring** social and environmental sustainability  
**2024-2040**

## 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

# PAP 2024-2040: Targets & expected number of Biomethane plants...in 2030

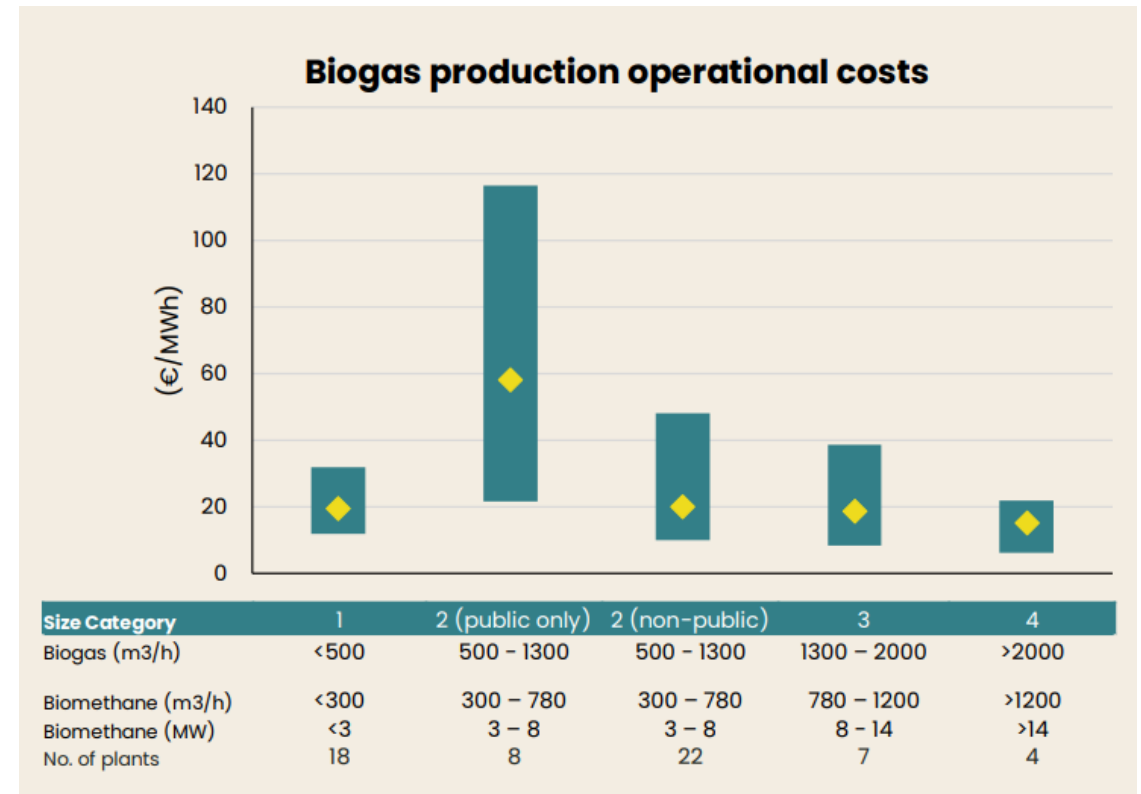
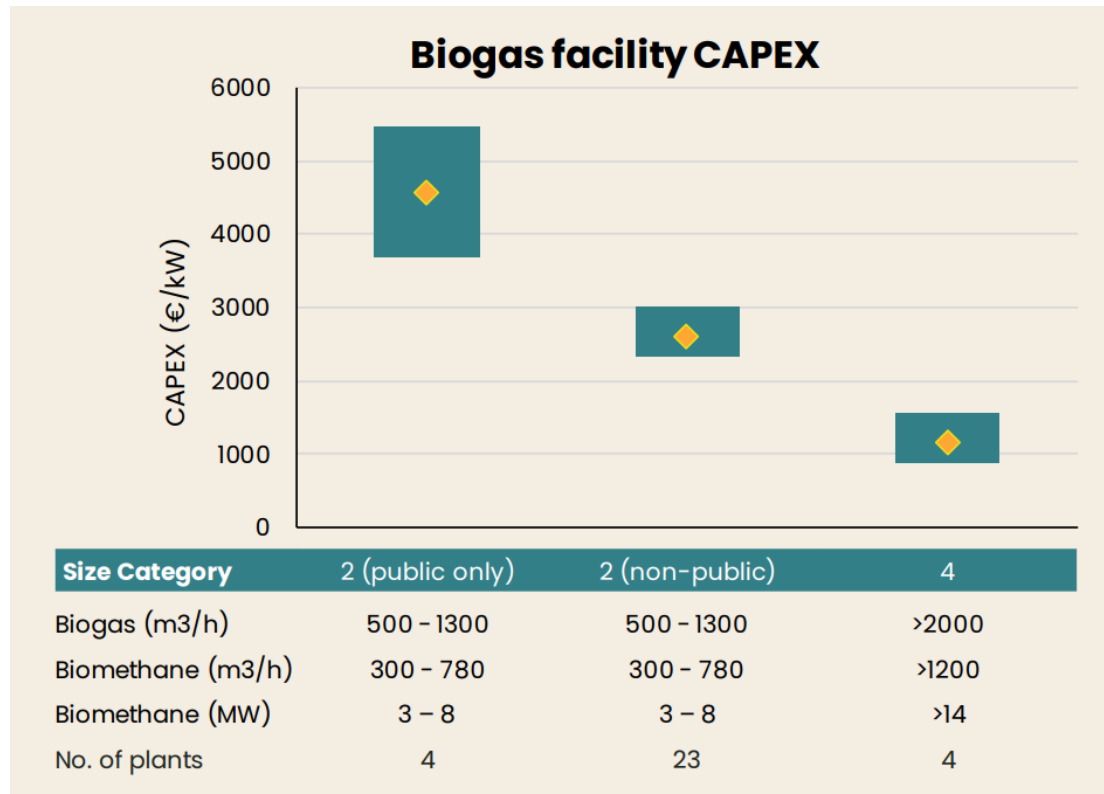


**30 DA plants** of total capacity of **1000 m<sup>3</sup>/h biometano** (90,2 GWh/y) **until 2030.**

# The Biogas economy

- Plant size is critical for lowering CapEX.
- Public wastes (OFMSW) requires higher CapEX

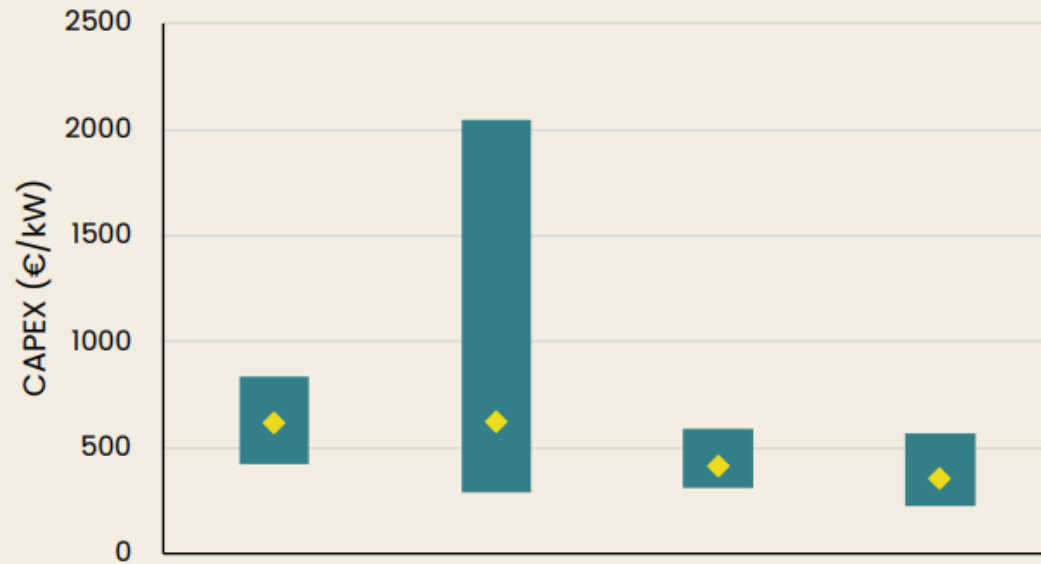
OpEX does not vary much with plant size but use of OFMSW could impact the operational costs



# Biogas upgrading to Biomethane (brownfield projects)

- CapEX is relatively insensitive with plant scale
- OpEX is more sensitive with plant scale

### Biogas upgrading capital costs



Size Category	1	2	3	4
Biogas (m3/h)	<500	500 - 1300	1300 - 2000	>2000
Biomethane (m3/h)	<300	300 - 780	780 - 1200	>1200
Biomethane (MW)	<3	3 - 8	8 - 14	>14
No. of plants	17	36	7	7

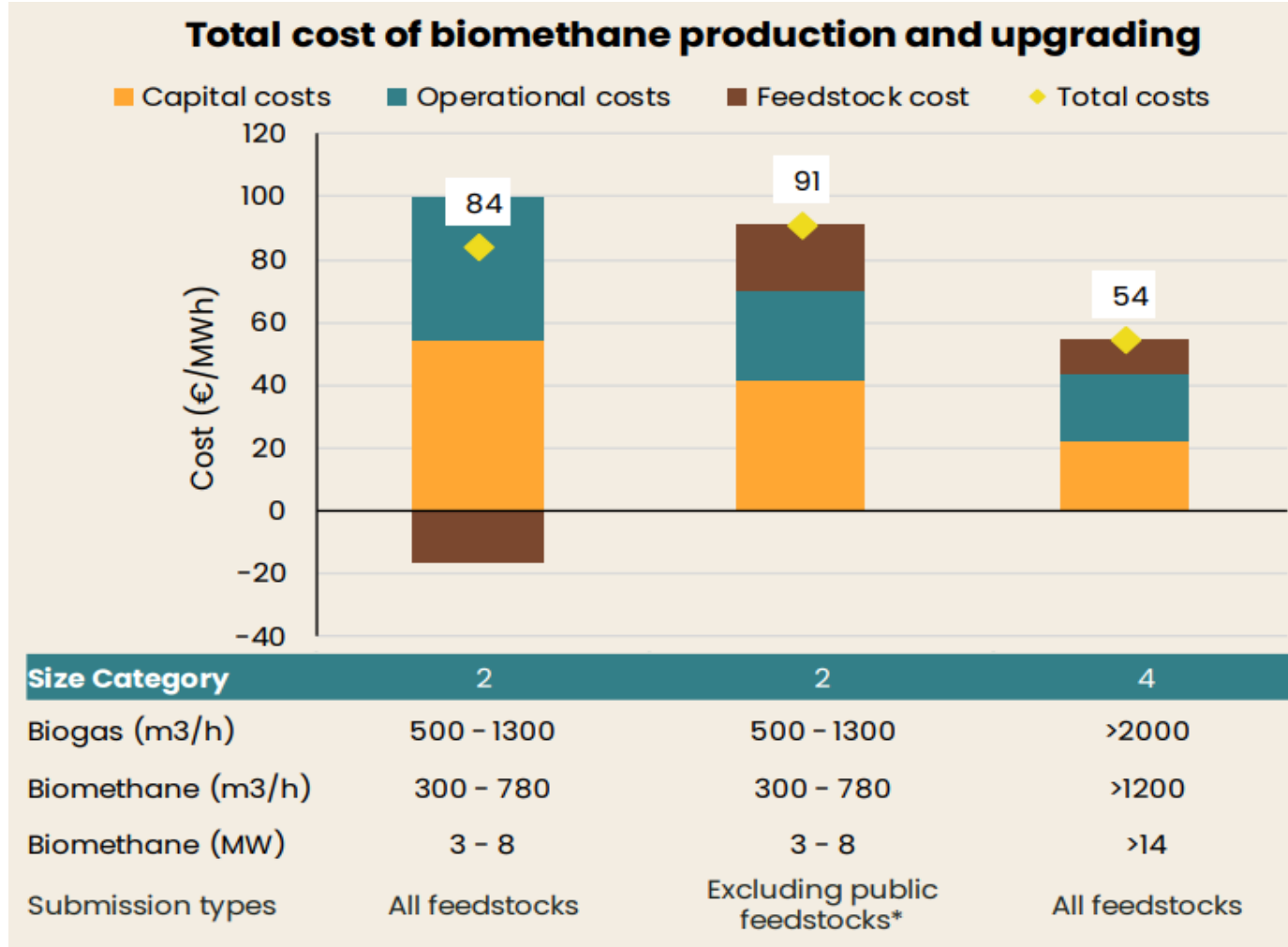
### Biogas upgrading operational costs



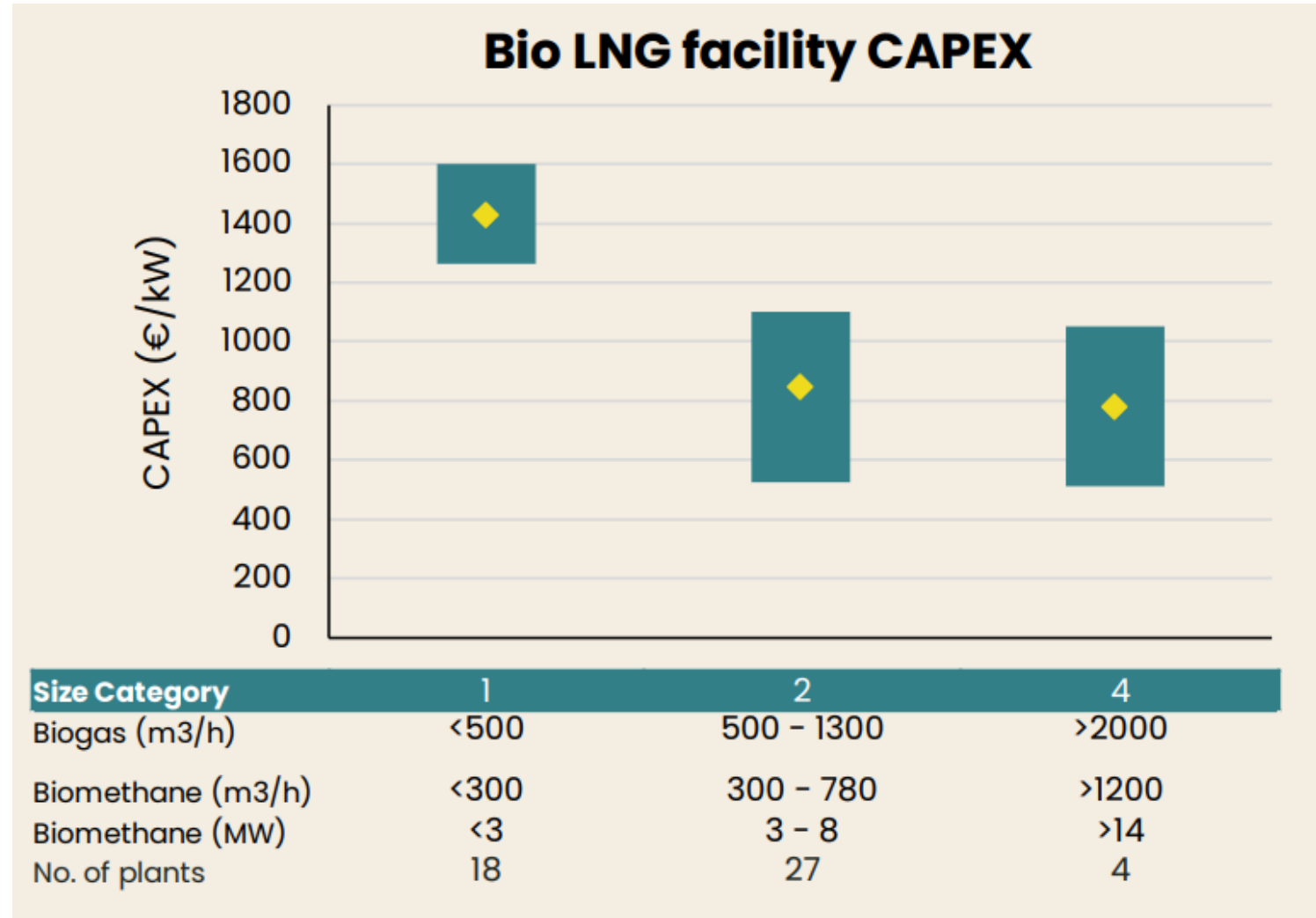
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# Biomethane economy (greenfield projects)

CAPEX is very sensitive to plant scale



- There is CapEX extracosts due to liquefaction.
- CapEX is very sensitive with plant size.



# Economic study for Portugal

## Production costs (basis: 250 m<sup>3</sup>/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
	<b>LCOB biomethane</b>	<b>60 €/MWh</b>
	Taxes	+ 2 €/MWh
	<b>Final Cost</b>	<b>62 €/MWh</b>

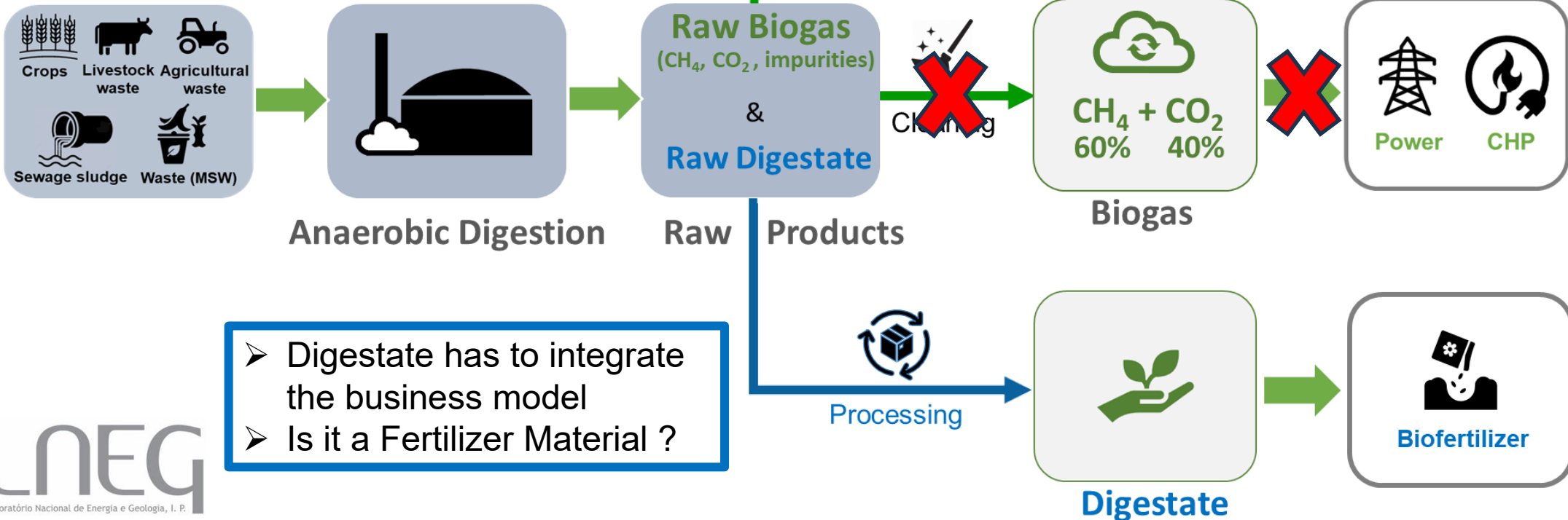
SCENARIO 2	COMPONENT	Cost
Greenfield plant	CAPEX DA	54 €/MWh
	OPEX DA	+ 36 €/MWh
	<b>LCOE biogás</b>	<b>90 €/MWh</b>
	CAPEX Upgrading	+ 11 €/MWh
	OPEX Upgrading	+ 8 €/MWh
	CAPEX grid injection	+ 7 €/MWh
	<b>LCOB biomethane</b>	<b>116 €/MWh</b>
	Taxes	+ 9 €/MWh
	<b>Final Cost</b>	<b>125 €/MWh</b>

# 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)

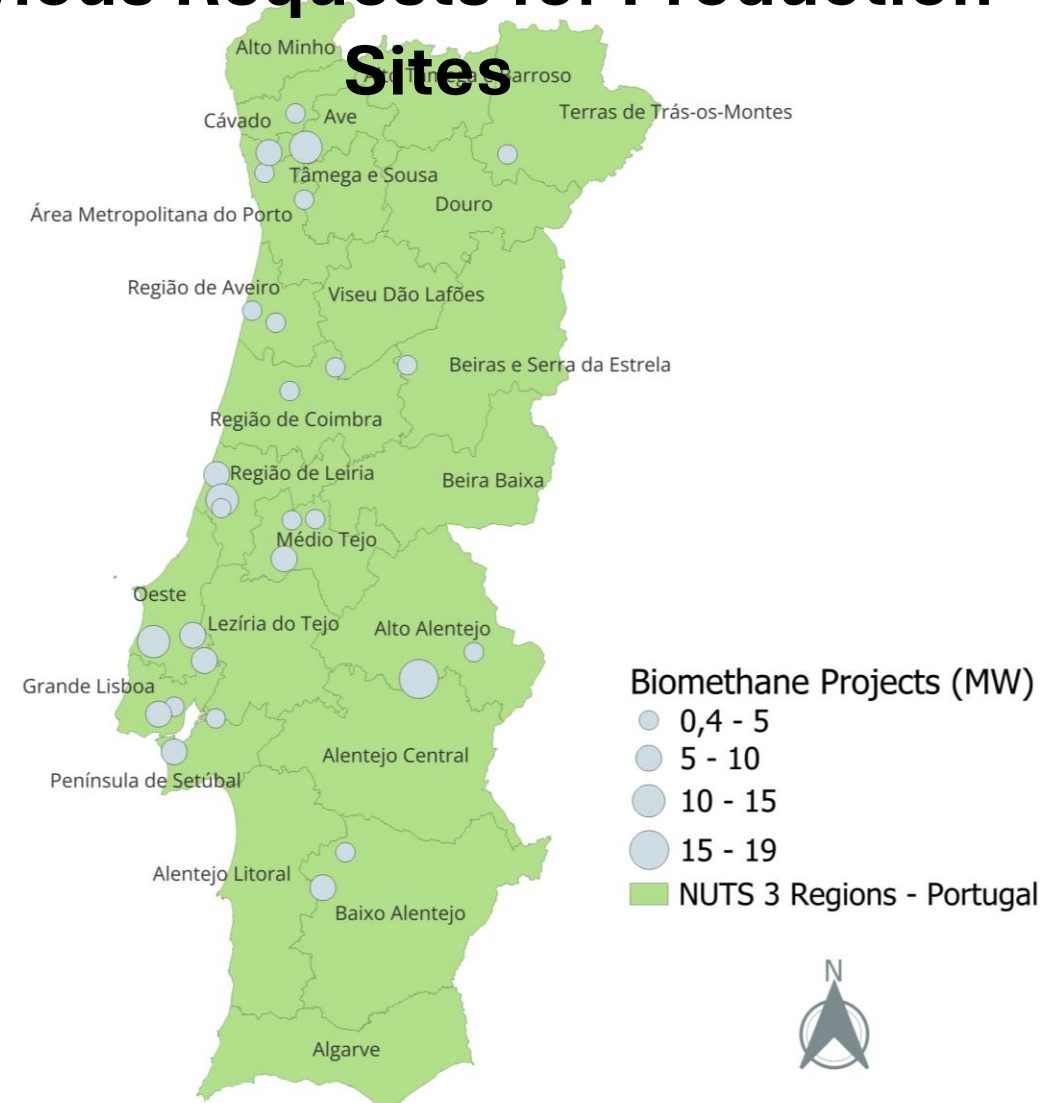
2024 – max. 150 GWh/yr for a fixed price of 62 €/MWh

## 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

## Up to now, ...we have 28 new Previous Requests for Production Sites



# Identified barriers for market creation in Portugal

## Regulatories

- Regulation are disperse and not friendly for the entrepreneurs
- Too much entities involved for Licensing
- Right-to-inject needs to be better regulated
- Environment & Energy & Agriculture have distinct views

## Tecnologicals

### Status:

- Quality of wastes and feedstocks are not assured
- Raw materials supply value chains under developed (e.g., manure)
- Lack of scientific knowledge in private sector for DA

## Economicals

- Lack of public incentives for new DA plants (offer market)
- Public auctions (demand market)
- FiT/FiP for biomethane
- Logistics – cost share between producers and TSO/DSO

## Social & Environmental

- Value chain sustainability
- Lack of knowledge in the Agricultural sector and,
- Lack of public awareness for the advantages of biogas & biomethane



# 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

Laboratório Colaborativo para as Biorrefinarias

Gonçalo Lourinho  
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Joana Bernardo



**Thank You !**  
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