



CBS FINANCE  
COMPETITION



2025

Case Material



# Content



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# Introduction



## Dear participants,

I am delighted to welcome you to this year's Copenhagen Business School Finance Competition, where TotalEnergies will be the focal point of our discussions and projects. As a global multi-energy company, TotalEnergies is dedicated to producing and providing energy that is more affordable, reliable, and clean. Our ambitious strategy to achieve net zero emissions by 2050 involves substantial investments in renewable energy sources, including solar, wind, and green gasses.

TotalEnergies is committed to expanding its green energy capacity and harnessing innovative technologies to enhance production efficiency and environmental benefits. Our multi-energy approach ensures a balanced and sustainable energy mix that supports the transition to a low-carbon future. We believe that the collective efforts of individuals and organizations are crucial in driving this energy transition.

In this competition, we invite you to explore and develop projects related to TotalEnergies' green energy initiatives. Your ideas and proposals have the potential to make a significant impact on our journey towards a sustainable future. We encourage you to think creatively and innovatively, considering how your contributions can align with TotalEnergies' overarching strategy and help position the company as a top 5 renewables developer globally by 2030.

Your participation in this competition is not only an opportunity to showcase your skills and knowledge but also a chance to contribute to a global mission that aims to create a better and more sustainable world. We value your insights and look forward to seeing the diverse and impactful solutions you will bring to the table.

Thank you for being a part of this exciting journey. Together, we can make a difference and support TotalEnergies' mission to drive the energy transition and build a sustainable future.



**Betina Jørgensen**  
Head of Renewables Business  
Development Denmark



## Introduction to the Market

The global energy market is undergoing a transformative shift driven by the urgent need for sustainable solutions to address climate change and reduce reliance on fossil fuels. As nations strive to meet ambitious carbon neutrality goals, the integration of renewable energy sources has become a central focus, with biogas emerging as a key player in the transition to a greener future.

Biogas, produced through the anaerobic digestion of organic waste, offers a circular

approach to energy production by converting agricultural, industrial, and household waste into a renewable resource. Beyond its ability to generate clean energy, biogas supports waste reduction, improves soil health through its byproducts, and helps reduce greenhouse gas emissions by capturing methane that would otherwise escape into the atmosphere.

In regions with advanced energy infrastructures, the biogas industry is growing rapidly, driven by policy incentives,

technological innovation, and an increasing demand for renewable alternatives. This evolution is not only addressing immediate energy needs but also fostering long-term resilience in the energy system by complementing solar and wind power. As the energy sector continues to innovate, biogas represents a critical solution at the intersection of sustainability, waste management, and energy security, making it an essential component of the transition toward a cleaner, more circular economy.



## Introducing TotalEnergies: A Partner in the Green Energy Transition

TotalEnergies is a global multi-energy company that has become a leader in the green energy transition. Operating in nearly 120 countries, TotalEnergies is committed to producing and delivering energy that is affordable, reliable, and sustainable. With its bold ambition to achieve net-zero emissions by 2050, the company is investing heavily in renewable energy technologies such as wind, solar, and biogas, while reducing emissions across its value chain.

Biogas has become a key element of TotalEnergies' sustainability strategy. The company recognizes the value of biogas as a renewable resource that aligns with circular economy principles by transforming organic waste into clean energy. By investing in biogas production facilities, TotalEnergies has positioned itself as a key player in the biogas industry, reducing methane emissions and contributing to energy diversification. These efforts not only address global sustainability challenges but also create economic

opportunities in the growing renewable energy market.

In Denmark, TotalEnergies is actively exploring opportunities in renewable energy, including biogas projects, which align with the country's leadership in sustainability and climate action. Denmark's advanced energy infrastructure and commitment to renewable solutions make it an ideal market for biogas investment, and TotalEnergies is eager to play a leading role in this space.

**Over 100.000 employees**  
in nearly 120 countries<sup>1</sup>

**2.5 Mboe/d of hydrocarbons**  
produced in 2023, including 44% from gas<sup>1</sup>

**World no. 3**  
in liquefied natural gas<sup>1</sup>

**28 GW of gross installed electricity capacity,**  
including 22.4 GW for renewable electricity<sup>1</sup>

**Nearly 14.600 service stations**  
and over **60.000 charge points**  
worldwide<sup>1</sup>

**331.000 tons**  
of biofuel produced<sup>1</sup>

**16.8 billion dollars invested,** including 35% for low-carbon energy<sup>1</sup>

<sup>1</sup> Note: figure at the end of 2023 source: <https://totalenergies.com/company/identity/totalenergies-at-a-glance>



## Case question

This case competition challenges participants to identify the ideal investment for TotalEnergies in Denmark. Acting as strategic advisors, participants will evaluate the Danish biogas market, analyze potential acquisition targets, and recommend the most suitable company for TotalEnergies to pursue.

The case material provides four potential targets as inspiration; however, participants are welcome to explore and propose alternative options. The goal is to align the acquisition with TotalEnergies' strategic priorities, such as financial sustainability, technological innovation, and a commitment to advancing Denmark's energy transition. Your presentation should encompass insights on the following topics, structured in a manner that aligns with your expertise and judgement:

### Commercial consideration

- A commercial strategy until 2030:
  - Business plan and strategy
  - Future technology and strategy
- Description of relevant risk

### Equity story

- The investment case, including in-depth analysis of the investment attractions of the company
- Your view on whether TotalEnergies should be sole owner, enter a joint venture, or not invest at all
  - This should include pros and cons for all options

### Valuation and financial consideration

- A valuation of the chosen investment in suitable methodologies

### Governance and legal considerations

- What are the key success factors and potential challenges for the potential investment, including:
  - A feasible timeline detailing key processes and milestones
  - Overview of legal considerations related to the purchase



## Case criteria

All submissions will be assessed based on five key criteria, each assigned indicative weightings. It is essential to adhere to the specified deliverables and deadlines.

### Evaluation Weightings

- |   |     |
|---|-----|
| 1. <b>Commercial Considerations</b>               | 25% |
| 2. <b>Equity Story</b>                            | 20% |
| 3. <b>Valuation and financial considerations</b>  | 20% |
| 4. <b>Governance and Legal Considerations</b>     | 20% |
| 5. <b>Quality of the Solution</b>                 | 15% |
| - Clear and compelling storyline                  |     |
| - Effective visual representation of the solution |     |

### Deliverables

- **Slide deck** presenting recommendations and supporting analysis
- **Maximum 15 slides** (excluding agenda, dividers, etc.) and up to **15 pages of appendices**
- **1-page memo** (A4) summarizing key conclusions, supporting arguments, and key observations

**Disclaimer:** This document is provided solely for educational purposes and does not aim to provide a comprehensive or precise depiction of the financial, legal, or commercial aspects related to TotalEnergies or other mentioned companies. The content is independent of TotalEnergies or any partner organizations, which bear no responsibility for its accuracy or relevance. The views and information presented in this document are for academic use only and should not be considered an official representation of any company involved. Reproduction, distribution, or publication beyond its intended educational purpose is strictly prohibited without prior authorization.

# Submission Timeline

**26TH OF APRIL  
AT 12:00**

Case Launch

**27TH OF APRIL  
AT 23:59**

Proposal  
Submission

**28TH OF APRIL  
AT 08:00**

Announcement  
of the Semifinalist  
Teams

**29TH OF APRIL  
AT 09:00**

Semifinalist  
Presentations

**29TH OF APRIL  
AT 12:00**

Announcement  
of the Final Three  
Teams

**29TH OF APRIL  
AT 12:00**

Grand Finale





## Glossary

Term	Definition
Anaerobic Digestion	A biological process where organic material (e.g., manure, food waste) is broken down by microorganisms in the absence of oxygen, producing biogas.
Biogas	A renewable gas primarily composed of methane (CH <sub>4</sub> ) and carbon dioxide (CO <sub>2</sub> ), produced from organic waste through anaerobic digestion.
Biogenic CO <sub>2</sub>	Carbon dioxide generated from biological sources such as plants or organic waste, rather than fossil fuels.
Biomethane	A purified form of biogas that has undergone upgrading to remove impurities, making it suitable for grid injection or transport fuel.
BioNGV (Bio Natural Gas for Vehicles)	A renewable fuel derived from biogas, used as a sustainable alternative for compressed natural gas (CNG) or liquefied natural gas (LNG) in transportation.
CCS	Carbon Capture and Storage, the process of capturing CO <sub>2</sub> emissions and storing them underground to prevent atmospheric release.
CCU	Carbon Capture and Utilization, the process of capturing CO <sub>2</sub> for commercial uses such as carbonation in the food and beverage industry.
CNG	Compressed Natural Gas, a gaseous fuel used in transportation, derived from natural gas or biomethane.
Digestate	A nutrient-rich byproduct of anaerobic digestion, used as an organic fertilizer.
E-fuels	Synthetic fuels produced using renewable electricity, hydrogen, and CO <sub>2</sub> , often used in aviation and shipping.
Feedstock	The raw organic material (e.g., manure, food waste) used in biogas production.
Fischer-Tropsch Process production of synthetic fuels.	A chemical process that converts hydrogen and carbon monoxide into liquid hydrocarbons, enabling the production of synthetic fuels.
Green Energy Certificates	Tradable certificates representing the environmental benefits of renewable energy production, allowing biogas producers to sell at a premium.

## Case Question



## Glossary

Term	Definition
Grid Injection	The process of upgrading biogas to biomethane and feeding it into natural gas networks.
Hydrogen Methanation	A Power-to-X process where hydrogen is combined with CO <sub>2</sub> to produce synthetic methane, integrating hydrogen into existing gas infrastructure.
LNG	Liquefied Natural Gas, a natural gas cooled to liquid form for storage and transport; when derived from biomethane, it is known as bioLNG.
Methanation	A chemical process where hydrogen reacts with CO <sub>2</sub> to create synthetic methane, enabling energy storage and transport.
Power-to-X (PtX)	Technologies that convert surplus renewable electricity into hydrogen, synthetic fuels, or synthetic methane for later use.
PSA	Pressure Swing Adsorption, a biogas upgrading technology that separates methane from CO <sub>2</sub> using pressure variations.
RNG	Renewable Natural Gas, another term for biomethane, emphasizing its role as a sustainable natural gas alternative.
SNG	Synthetic Natural Gas, a methane-based gas produced via methanation, chemically identical to natural gas but derived from renewable sources.
CHP	Combined heat and power, a system that simultaneously generates electricity and useful heat from the same energy source, improving overall efficiency.
GWh	Gigawatt-hour, a unit of energy equal to one billion (10 <sup>9</sup> ) watt-hours, commonly used to measure large-scale energy production or consumption.
TWh national or global scale.	Terawatt-hour, a unit of energy equal to one trillion (10 <sup>12</sup> ) watt-hours, used to quantify energy production on a national or global scale.
MW	Megawatt, a unit of power equal to one million watts. It is commonly used to measure the capacity of power plants or energy systems and serves as the basis for calculating energy production over time, where 1 MW of continuous output for one hour equals 1 MWh, and 1,000 MWh equals 1 GWh.



# Glossary

Term	Definition
NGV	Natural Gas Vehicle, a vehicle that runs on compressed natural gas (CNG) or liquefied natural gas (LNG) as an alternative to gasoline or diesel.
SAF	Sustainable Aviation Fuel, a renewable or low-carbon alternative to conventional jet fuel, produced from biomass or other sustainable feedstocks.
SMR	Steam Methane Reforming, a process that produces hydrogen by reacting methane with steam at high temperatures, commonly used in industrial hydrogen production.
TOE	Ton of oil equivalent

# TotalEnergies



## TotalEnergies Denmark & Biogas

INCOME STATEMENT (1.000 USD)	2023	2022	2021
Revenue	571.736	946.116	517.544
Production Cost	-166.249	-234.631	-206.757
<b>Gross Profit</b>	<b>405.487</b>	<b>711.485</b>	<b>310.787</b>
Administrative expenses	-30.840	-49.510	-22.912
Other operating income	390	347	332
Other operating costs	-1.167	-1.826	-567
<b>Result before financial items and tax</b>	<b>373.870</b>	<b>660.496</b>	<b>287.640</b>
Impairment/reversal of impairment, subsidiaries	-53.000	50.668	115.000
Income from equity investments in subsidiaries /gain from sale of subsidiaries	25.127	263.323	60.000
Financial income	109.350	32.805	639
Financial expenses	-38.775	-33.441	-83.892
<b>Result before tax</b>	<b>416.572</b>	<b>973.851</b>	<b>379.387</b>
Tax on the result for the year	-165.708	-433.499	-97.263
<b>Result for the year</b>	<b>250.864</b>	<b>540.352</b>	<b>282.124</b>

TotalEnergies Denmark A/S is the Danish subsidiary of TotalEnergies SE, a global leader in multi-energy solutions. The company operates primarily in oil and gas while increasingly focusing on renewable energy to support the company's energy transition.

The Nordic headquarters of TotalEnergies are located in Copenhagen, serving as the central hub for activities across all Nordic countries. With approximately 1.200 employees based in Esbjerg, offshore installations, and Copenhagen, TotalEnergies is deeply embedded in Denmark's energy ecosystem <sup>2</sup>. As the country's leading energy company, it operates 15 fields in the North Sea with the support of 49 offshore installations and five main platforms, producing more than 85% of Denmark's oil and 97% of its gas <sup>3</sup>.



TotalEnergies is strongly committed to sustainability and emissions reductions. The company is developing carbon storage projects in the North Sea that aim to store 10 million tons of CO2 annually by 2030. It is also advancing renewable energy initiatives, including two offshore wind projects, while actively exploring opportunities in wind, solar, and biogas energy <sup>4</sup>.

<sup>2</sup> <https://corporate.totalenergies.dk>

<sup>3</sup> <https://corporate.totalenergies.dk/>

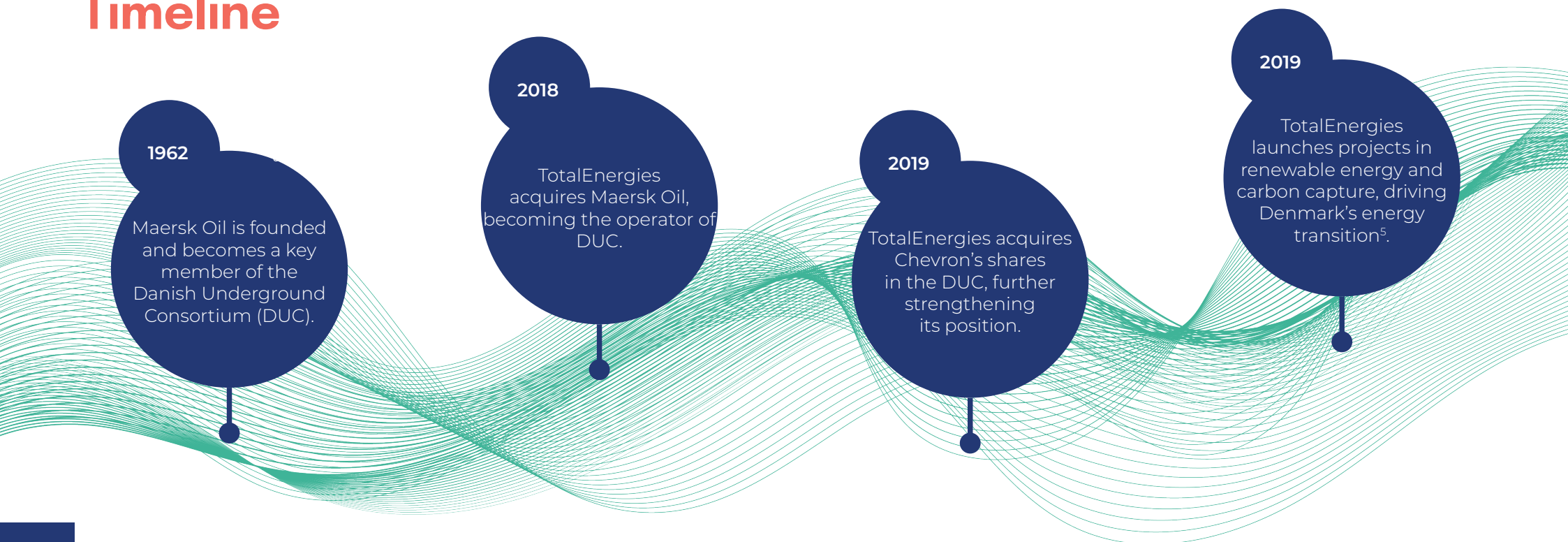
<sup>4</sup> <https://totalenergies.com/company/projects/carbon-capture-and-storage/northern-lights-first-major-carbon-capture-and-storage>

## A Look Back

TotalEnergies Denmark's journey began with the establishment of Maersk Oil in 1962, a pioneering company in the exploration and production of oil and gas in the Danish North Sea. Maersk Oil became a key player in Denmark's energy independence, driving innovation through its role in the Danish Undergrounds Consortium (DUC), a joint

venture that today includes TotalEnergies (43,2%), BlueNord (36,8%), and Nordsøfonden (20%). In 2018, TotalEnergies acquired Maersk Oil, integrating its operations, and becoming Denmark's leading energy producer.

## Timeline





## Organizational Overview

TotalEnergies' expansion into biogas is guided by a specialized leadership team working across global, regional, and technical functions. With deep roots in traditional energy and a shared commitment to decarbonization, these individuals are accelerating the company's transition toward renewable gas solutions. Their combined expertise spans upstream development, infrastructure scaling, policy

engagement, and M&A, positioning TotalEnergies to lead in biogas innovation. From headquarters to local markets like Denmark, they are shaping a strategic and operational path that aligns with the company's 2050 net-zero ambition. Each member brings decades of experience to ensure biogas plays a key role in TotalEnergies' multi-energy future.



**Patrick Pouyanné**  
*CEO of TotalEnergies*

**Experience:**  
Former French government adviser; joined TotalEnergies in 1997, ascending to CEO in 2014 and Chairman in 2015.



**Martin Rune Pedersen**  
*Country Chair  
TotalEnergies  
Denmark*

**Experience:**  
Ex-Maersk Oil executive; became TotalEnergies Denmark Country Chair post-2018 acquisition.



**Stephane Michel**  
*President of Gas,  
Renewables, & Power*

**Experience:**  
Joined TotalEnergies in 2005; now leads Gas, Renewables & Power division since 2021.



**Marc De Lataillade**  
*Vice President  
- Biogas*

**Experience:**  
Over 25 years at TotalEnergies; currently heads global biogas initiatives.



**Marc Fischer**  
*Sr Director Business  
development  
- Biogas Business  
Unit*

**Experience:**  
Renewables specialist; drives European biogas growth at TotalEnergies.

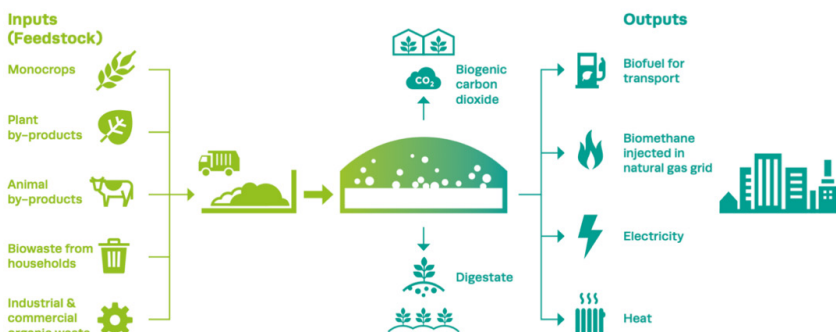


**Martin Wenstrup**  
*Business Developer,  
Biogas Nordics*

**Experience:**  
Martin Wenstrup, Head of Business Development Nordics Biogas at TotalEnergies, previously held roles at KPMG and Ramboll Management Consulting.

## What is Biogas?

Biogas is a renewable gas generated through the anaerobic digestion of organic waste from agriculture, the food industry, and municipal sources. This fermentation process occurs in an oxygen-free environment, breaking down organic matter into methane and carbon dioxide. The gas yield depends on the feedstock, with manure producing 0,008 TOE/ton of feedstock and industrial waste up to 0,361 TOE/ton of feedstock<sup>6</sup>. Production takes 15–40 days under mesophilic (35–40°C) or thermophilic (50–55°C) conditions for optimal efficiency<sup>7</sup>.



The main feedstocks for biogas production come from various organic waste streams. Agricultural waste, such as livestock manure and crop residues, is one of the most common inputs, typically sourced from farms with intensive animal husbandry. The food industry contributes byproducts like expired food, fruit and vegetable scraps, and food processing residues, which are collected from manufacturers, wholesalers, and supermarkets. Municipal organic waste, including household food scraps and sewage sludge, is processed at large-scale biogas plants or wastewater treatment facilities. In some cases, dedicated energy crops such as maize silage or grass silage are used, though their sustainability is often debated due to competition with food production and land use concerns.

Once purified, biogas transforms into biomethane, a gas with properties identical to natural gas, making it suitable for grid injection or use as an alternative fuel for land and sea transport, such as bioNGV and bioLNG. Biogenic CO<sub>2</sub>, a byproduct of upgrading, can be captured for industrial applications, while digestate, the solid residue, serves as a high-value organic fertilizer, replacing synthetic alternatives.

As a key player in the energy transition, the biogas sector supports renewable energy development, waste management, and greenhouse gas reduction, contributing to a more circular and sustainable economy.

<sup>6</sup> <https://www.iea.org/data-and-statistics/charts/average-biogas-production-yield-by-tonne-of-feedstock-type>

<sup>7</sup> <https://www.waterandwastewater.com/mesophilic-digestion-optimal-conditions-for-efficient-waste-treatment/>



# TotalEnergies' Biogas operations

## French production – Building the foundation

In April 2021, TotalEnergies acquired Fonroche Biogaz, positioning itself as a leading biogas producer in France. At the time of acquisition, Fonroche Biogaz had installed capacity of nearly 500 gigawatt-hours (GWh), accounting for over 10% of the French renewable gas market share. This strategic move positioned TotalEnergies as a prominent player in France's renewable gas sector, providing a robust platform to accelerate development of biogas projects nationwide and giving them essential know-how <sup>9</sup>.

Building upon the foundation established TotalEnergies commissioned the BioBéarn production plant in January 2023. Located in the south of France this is the largest Biogas plant in France with a capacity of 160 Gwh per year. The facility processes over 220.000 tons of organic waste annually, converting it to around 200.000 tons of natural fertilizer and producing enough biogas to meet the energy needs of approximately 32.000 people <sup>10</sup>.

In February 2024, TotalEnergies entered into a fifteen-year agreement with Cristal Union, a French sugar group to supply sugar beet pulp as feedstock for the BioNorrois Biogas plant that is currently under construction. The plant is projected to produce 100 GWh of biomethane annually in its initial phase with plans to expand to a maximum capacity of 154 GWh per year.

## Poland industry – example of successful acquisition

TotalEnergies has strengthened its position in Poland's renewable energy market by acquiring Polska Grupa Biogazowa (PGB), the country's leading producer of electricity and heat from agricultural biogas. This acquisition significantly boosts TotalEnergies' biogas production capacity and aligns with its broader strategy to expand in the renewable energy sector <sup>12</sup>.

Since its establishment in 2007, PGB has been at the forefront of biogas production in Poland, currently operating 20 biogas plants with a total capacity of 21 MW. In November 2024, the company launched its 20th biogas plant in Półwieś, Warmian-Masurian Voivodeship, which has a 1 MW capacity, producing 8.3 GWh of electricity and 8 GWh of heat annually—enough to supply 3.000 households.

PGB has ambitious growth plans, with 50 projects in advanced stages of development and many more in the pipeline. The company currently generates 0.4 TWh of energy per year and aims to significantly scale up production by 2030. A key focus of this expansion is the production of biomethane, which can be injected into the national gas grid, though this depends on regulatory developments and financial incentives.

## USA – A joint Venture initiative

In April 2024, TotalEnergies and Vanguard Renewables established a 50/50 joint venture to develop, build and operate biogas facilities across the US. The initial phase focuses on advancing ten projects into construction with a total of 0,8 terawatt (TWh). Beyond the initial projects the partnership has identified a potential pipeline of approximately 60 additional projects nationwide representing a total of 5 TWh per year <sup>13</sup>.

<sup>8</sup> EBA STATISTICAL REPORT 2023

<sup>9</sup> <https://totalenergies.com/media/news/press-releases/total-acquires-fonroche-biogaz>

<sup>10</sup> <https://totalenergies.com/media/news/press-releases/biogaz-france-totalenergies-commissions-biobearn-countrys-largest>

<sup>11</sup> <https://totalenergies.com/news/press-releases/biogaz-france-totalenergies-starts-its-2nd-largest-unit-normandy>

<sup>12</sup> <https://totalenergies.com/media/news/press-releases/poland-totalenergies-invests-renewable-energies-biogaz-and-solar-projects>

<sup>13</sup> <https://totalenergies.com/news/press-releases/totalenergies-and-vanguard-renewables-portfolio-company-blackrocks-diversified>

# TotalEnergies' Biogas operations

## Strategic Initiatives and Partnerships

### Carbon Capture and Storage (CCS)

TotalEnergies is developing one of Denmark's foremost CO<sub>2</sub> storage projects, capable of storing millions of tons of CO<sub>2</sub> in depleted oil and gas reservoirs in the Danish North Sea <sup>14</sup>.

### Research Collaboration

In partnership with the Technical University of Denmark (DTU), TotalEnergies established the DTU-TotalEnergies Excellence Center of Clean Energy. This center focuses on developing reliable, profitable, low-emission energy solutions to accelerate the decarbonization of industrial facilities <sup>15</sup>.



<sup>14</sup> <https://totalenergies.com/media/news/press-releases/denmark-totalenergies-obtains-two-co2-storage-licenses-danish-north-sea>

<sup>15</sup> <https://corporate.totalenergies.dk/dtec-dtu-totalenergies-excellence-centre-clean-energy>



## Strategic goals

TotalEnergies aims to establish a strong presence in the Danish biogas market by leveraging the country's well-developed infrastructure and highly productive assets. Denmark is home to some of the largest biogas plants in the world, offering an efficient and scalable foundation for market entry. A key advantage of the Danish biogas sector is the high proportion of agricultural feedstocks, particularly manure, which enhances production efficiency while leading to negative carbon-intensity scores.

With successful biogas operations in countries such as France, Poland, and the United States, TotalEnergies brings valuable expertise in project development, plant optimization, and feedstock management. The company has experience in navigating different regulatory environments and integrating biogas into national energy grids. Applying this knowledge to the Danish market will allow for an efficient scale-up and help optimize operational performance in line with local market conditions.

Denmark's structured energy market and regulatory framework provide strong incentives for biogas production, particularly through the issuance of green energy certificates. These certificates, generated through biogas production, hold significant market value, and offer multiple strategic advantages. They can either be sold to generate additional revenue or be used internally to reduce the net CO<sub>2</sub> footprint from TotalEnergies' existing energy operations, ensuring a more balanced emissions profile.

By combining its international expertise with Denmark's advanced biogas infrastructure and certificate market, TotalEnergies is well-positioned to develop a profitable and scalable biogas portfolio. The ability to generate and trade green energy certificates adds another layer of financial and operational optimization, making Denmark a compelling location for investment in this sector.

## Acquisition scope

TotalEnergies primary objective is to identify and acquire a biogas production company in Denmark, while also offering potential for future expansion. The ideal target should preferably have an annual production capacity of at least 1 TWh to ensure a meaningful market presence and revenue generation. Financial viability will be a key driver of the acquisition. The target must demonstrate robust revenue streams, an IRR of 12% and a quick return on investment, ideally before 2030. The acquisition should focus on an operational producing asset, but companies with a development pipeline will also be considered if they provide near-term revenue potential.

Beyond the core acquisition, vertical integration opportunities should be explored to enhance profitability, ensure long-term sustainability, and increase control over the value chain. Key areas of interest include:

### **Carbon Capture and Storage (CCS):**

Integration of CCS technologies to capture CO<sub>2</sub> from biogas production, either for sequestration or utilization in industrial applications, improving environmental performance while potentially generating additional revenue streams through carbon credits.

### **Feedstock Supply Partnerships or Acquisitions:**

Securing consistent and cost-effective raw material inputs by investing in agricultural partnerships or organic waste suppliers to stabilize feedstock supply and reduce dependency on third-party providers.

### **Biomethane Upgrading and Distribution:**

Expanding into biomethane purification and direct grid injection or transportation fuel applications to capture additional value beyond raw biogas sales.

### **Technology and Operational Efficiency:**

Partnering with or acquiring technology providers focused on process optimization, automation, or new technologies that can ensure long term profitability and relevance.

A strong safety record and high employee retention will also be prioritized to ensure smooth integration and maintain operational excellence post-acquisition.

When considering the acquisition, a good rule of thumb for an industrial player like TotalEnergies, the cost to build a new biogas plant is estimated at approximately 30-50 million EUR per 100 GWh of annual injection capacity. This benchmark can serve as a reference when assessing the valuation of potential acquisition targets against the alternative of greenfield development, ensuring a balanced approach between cost efficiency and strategic expansion.

**It is important for participants to understand that not all metrics are feasible for participants to research but should form a reference for the goals and strategy of the acquisition.**

<sup>16</sup> Note 1) The numbers and requirements are meant for study purposes only and does not represent TotalEnergies ongoing business.



# Overview of the biogas market



## Market size and growth

Denmark's biogas sector has experienced remarkable growth in recent years, with production reaching a record 720 million cubic meters of upgraded biogas in 2023. This marks an increase of almost 100 million cubic meters compared to 2022. Of this, 38% was injected into the national gas grid, while the rest was delivered directly to industries and energy producers. As a result, biogas accounted for 45% of Denmark's total gas consumption in 2023, solidifying its role as a key contributor to the country's green energy transition.

Despite this impressive growth, the biogas sector has encountered significant challenges since 2022, leading to a stagnation in production. The Danish Energy Agency estimates that biogas could fully replace fossil gas in Denmark by 2030, but achieving this goal requires substantial political and economic measures. Several barriers threaten the sector's future expansion, including

delayed support schemes, stricter regulations, and fluctuating market conditions that have made investment in biogas production more uncertain.

One of the key advantages of investing in Danish biogas is its strong international demand. In 2023, 87% of Danish biogas production was sold abroad, primarily to Germany and Sweden, where favorable tax incentives make biogas a competitive alternative to fossil fuels. This highlights the scalability and attractiveness of Danish biogas in the global energy market.

Globally, the biogas market is experiencing significant growth. The global biogas market is projected to reach USD 170.89 billion in 2025, with an expected growth to approximately USD 291.66 billion by 2034, reflecting a compound annual growth rate (CAGR) of 4.33% from 2025 to 2034. Meanwhile, the

European biogas market is anticipated to exceed USD 67.66 billion in 2025, growing at a CAGR of 4.40%.

Europe led the global biogas market in 2024, holding the largest market share of 39.59%. The European biogas market was valued at USD 63.75 billion in 2024 and is projected to reach approximately USD 115.61 billion by 2034<sup>18</sup>.

At the same time, there is a growing opportunity within the domestic market. While Denmark currently lacks sufficient financial incentives for local industries to fully transition to biogas, this presents a market gap that forward-thinking investors can capitalize on. With anticipated regulatory changes and the country's ambition to replace fossil gas entirely by 2030, there is significant room for market-driven expansion.

**720 million**

cubic meters of  
upgraded biogas in  
2023

**38%**

was injected into  
the national gas  
grid

Biogas accounted  
for

**45%**

of Denmark's total  
gas consumption  
upgraded natural gas

**87%**

of Danish biogas  
production was  
sold abroad

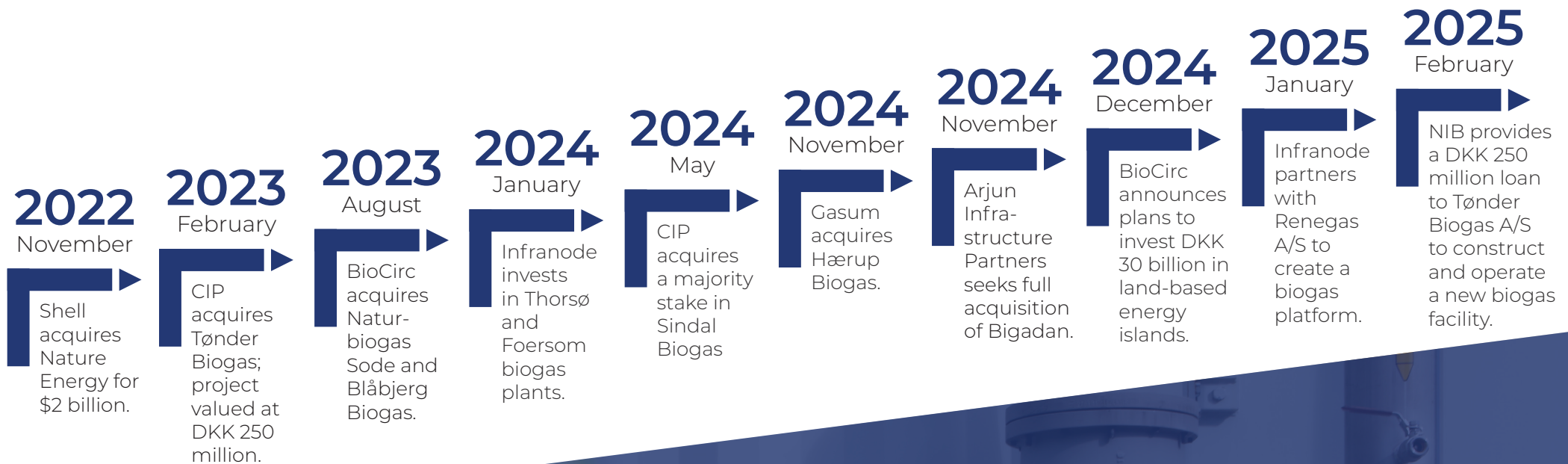
<sup>18</sup> <https://www.precedenceresearch.com/biogas-market>



# Overview of the biogas market



## Recent activities in the biogas industry



## Overview of the technology

Biogas technology harnesses the energy potential of organic waste through anaerobic digestion, producing a renewable energy source that contributes to sustainable energy systems. In the Danish and broader Nordic context, biogas plays a pivotal role in achieving environmental goals and integrating with advanced energy technologies.

### Sources of Biogas

Biogas is produced through the anaerobic digestion of organic materials such as livestock manure, agricultural residues, food waste, and sewage sludge. In Denmark and the broader Nordic region, biogas plays a crucial role in the green energy transition due to strong policy support, economies of scale, and standardized plant designs. The widespread use of livestock manure as a primary feedstock also enhances nutrient recycling, minimizes emissions, and supports sustainable agricultural practices. However, pure biogas is often processed further to maximize its economic value and fully utilize its molecules.

Power-to-X refers to processes that convert electrical energy into chemical energy carriers, such as hydrogen or synthetic fuels. Biogas integrates into PtX by providing a renewable feedstock for producing hydrogen through reforming processes. This hydrogen can be utilized directly as a clean fuel or further processed into synthetic natural gas or liquid fuels, aligning with PtX objectives.

### Integration with Power-to-X (PtX) and Hydrogen Technologies

### Biogas Upgrading to Biomethane

Raw biogas primarily consists of methane (CH<sub>4</sub>) and carbon dioxide (CO<sub>2</sub>), along with trace amounts of hydrogen sulfide (H<sub>2</sub>S), water vapor, and other impurities. Upgrading biogas to biomethane involves removing CO<sub>2</sub> and other contaminants to increase methane purity to pipeline-quality standards. Technologies used for upgrading include:

- Water Scrubbing: Uses water to absorb CO<sub>2</sub> and H<sub>2</sub>S, leaving a methane-rich gas stream.
- Pressure Swing Adsorption (PSA): Employs selective adsorption to separate CO<sub>2</sub>.
- Membrane Separation: Uses selective permeability to filter CO<sub>2</sub> from methane.

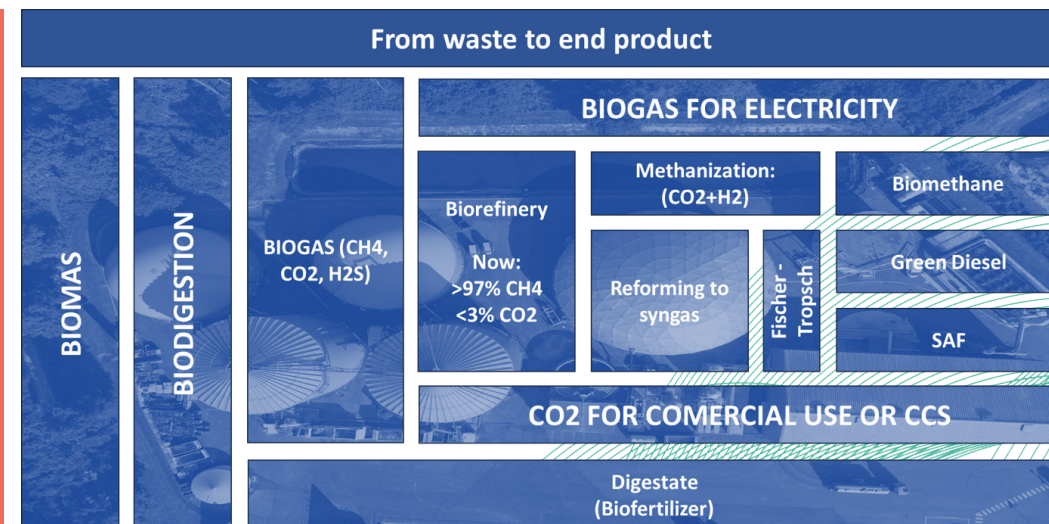
Produces liquid hydrocarbons from gas-based input materials with both hydrogen and carbon content by changing the structure of the molecules through chemical process.

### Fischer-Tropsch Process



## Overview of the technology

<p><b>Applications of Biomethane/ Syngas, Biofuels/Synfuels, and Pure Biogas</b></p>	<p><b>1. Biomethane/Syngas</b></p> <ul style="list-style-type: none"> <li>- Injection into the national gas grid for residential and industrial use.</li> <li>- Fuel for compressed natural gas (CNG) and liquefied natural gas (LNG) vehicles, reducing transport sector emissions.</li> <li>- Feedstock for hydrogen production via steam methane reforming (SMR) in a renewable context.</li> </ul>
<p><b>2. Biofuels/Synfuels (via Fischer-Tropsch and Methanation)</b></p> <ul style="list-style-type: none"> <li>- Production of sustainable aviation fuels (SAF) to decarbonize air travel.</li> <li>- Synthetic diesel and marine fuels for heavy-duty transport and shipping.</li> <li>- Integration into PtX-based industrial processes for carbon-neutral energy carriers.</li> </ul>	<p><b>3. Pure Biogas</b></p> <ul style="list-style-type: none"> <li>- On-site CHP generation for decentralized energy solutions in agriculture and industry.</li> <li>- Direct combustion for industrial heat applications.</li> <li>- Small-scale rural electrification in off-grid areas.</li> </ul>



## Commercial Comparison of Biogas and Power-to-X (PtX) Technologies

The transition to a low-carbon energy system requires a mix of hydrogen, biomethane, and synthetic fuels to meet diverse energy demands. Various technologies, including electrolysis, methanation, biogas collection, and Fischer-Tropsch synthesis, offer pathways to decarbonization. However, these technologies differ significantly in terms of cost, efficiency, complexity, and commercial viability.

**Electrolysis**, the process of splitting water into hydrogen and oxygen using electricity, is central to the hydrogen economy. While it provides a clean hydrogen source when powered by renewable energy, its high capital costs and energy requirements make it economically challenging without strong policy incentives. Hydrogen finds applications in fertilizer production, industry, and fuel cells, yet its competitiveness depends on continued cost reductions in electrolysis and hydrogen infrastructure expansion.

**Methanation**, which combines hydrogen with CO<sub>2</sub> to produce synthetic methane (SNG), presents a more infrastructure-compatible alternative. Since synthetic methane can be injected into existing natural gas grids, it offers a smoother transition compared to pure hydrogen. However, methanation remains moderately expensive and less efficient due to conversion losses, making its large-scale adoption reliant on abundant, low-cost renewable electricity.

On the other hand, **biogas collection** is the most cost-effective and straightforward technology, relying on anaerobic digestion of organic waste. However, raw biogas—containing 50-85% methane and a significant amount of CO<sub>2</sub>—has limited direct-use applications, primarily in heating and on-site power generation. To enhance its commercial attractiveness, biogas is often upgraded to biomethane through CO<sub>2</sub> removal. Biogas upgrading increases methane purity, making biomethane a viable replacement for fossil natural gas in grid injection, transportation (CNG/LNG), and industrial heating. While the upgrading process adds cost, it significantly expands biogas's market potential.

For **liquid fuels**, Fischer-Tropsch synthesis (FTS) provides a method to convert CO<sub>2</sub> and hydrogen into synthetic diesel and jet fuel. This technology is particularly relevant for hard-to-abate sectors like aviation and maritime transport, where alternatives such as batteries and hydrogen face technical challenges. However, Fischer-Tropsch is highly complex, energy-intensive, and capital-intensive, limiting its commercial deployment to locations with abundant renewable energy and carbon feedstocks.

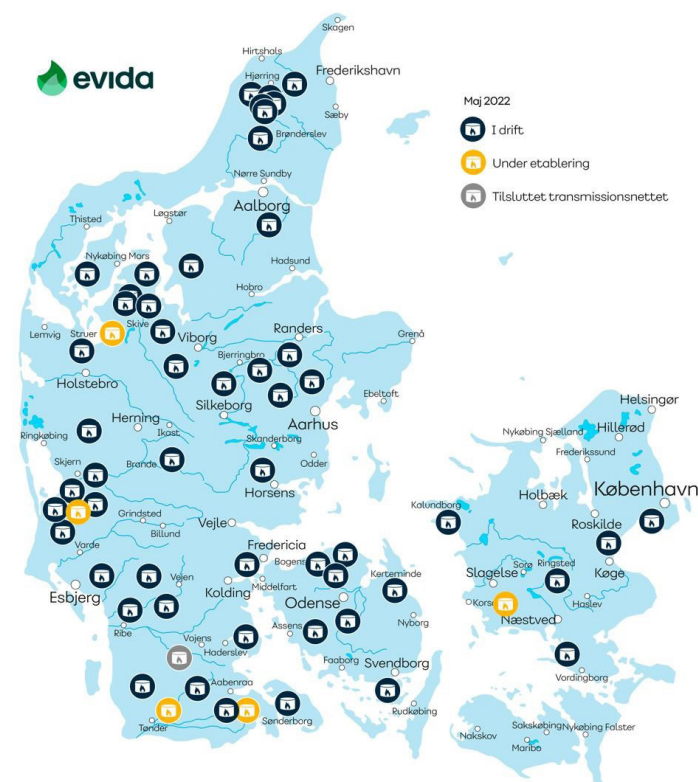
From a commercial perspective, biomethane and methanation emerge as strong contenders, balancing infrastructure compatibility with decarbonization potential. Hydrogen and Fischer-Tropsch fuels remain critical for long-term energy transition but currently face cost and infrastructure barriers. In the Nordic region, where strong policy support and an advanced biogas sector are present, biomethane is already making significant contributions to reducing carbon emissions in heating and transport. Meanwhile, Power-to-X integration, combining green hydrogen with biogas-derived CO<sub>2</sub>, is paving the way for synthetic fuels that can accelerate the decarbonization of heavy industry and transport.



# Overview of the biogas market

## Competitor landscape

The Danish biogas sector is highly competitive. Some of the biggest players include:



Competition is driven by strategic acquisitions (e.g., Gasum's expansion), technological innovation (e.g., CIP and Nature Energy's CO<sub>2</sub> capture advancements), and government & EU incentives, as companies capitalize on subsidies and carbon reduction targets to scale operations<sup>19</sup>.

<sup>19</sup> Evida: Map over connected biogas plants in may 2022 and planned under production

# Overview of the biogas market

## 4 highlighted acquisition targets

### Nature Energy

Founded in 1979 and headquartered in Odense, Denmark, Nature Energy has emerged as a global leader in the production of biogas. The company specializes in converting organic waste, including livestock manure, food waste, and other community waste products, into CO<sub>2</sub>-neutral biogas. As of 2024, Nature Energy operates 15 industrial-scale biomethane plants, primarily in Denmark, and maintains an international development pipeline of approximately 30 projects across Europe and North America. In February 2023, the company was acquired by Shell. In 2023 the company processed 5.1 million tons of biomass, producing 207 million m<sup>3</sup> of CO<sub>2</sub>-neutral biogas, enough to heat 180.000 homes annually <sup>20</sup>.



#### Highlighted Business opportunity: Biomethanol Production

Building upon its expertise in biomethane, Nature Energy has strategically expanded into biomethanol production. Biomethanol, a renewable form of methanol derived from biogas, is gaining prominence as a sustainable alternative fuel, particularly in the maritime industry. Shipping companies, such as Maersk, are increasingly adopting biomethanol to power their fleets, aiming to reduce greenhouse gas emissions. Nature Energy provides biomethane solutions as an alternative to the heavy road transport sector. The company offers refueling facilities designed to support the transition from diesel to renewable biogas. These facilities include both slow-fill and fast-fill systems, accommodating various fleet requirements <sup>21</sup>.

Key Figures in MDKK	2023	2022	2021	2020	2019
<b>Gross profit/loss</b>	<b>-8</b>	<b>-88</b>	<b>-36</b>	<b>0</b>	<b>-13</b>
Profit/loss before net financials	-198	-177	-126	-72	-59
<b>Profit/loss for the year</b>	<b>-627</b>	<b>-251</b>	<b>181</b>	<b>-64</b>	<b>-40</b>
<b>Balance sheet</b>					
Balance sheet total	3.726	1.509	1.614	1.190	1.064
Number of employees	184	91	66	56	47

<sup>20</sup> <https://nature-energy.com/about-us/nature-energy>

<sup>21</sup> <https://nature-energy.com/sustainability/green-transport->

# Overview of the biogas market

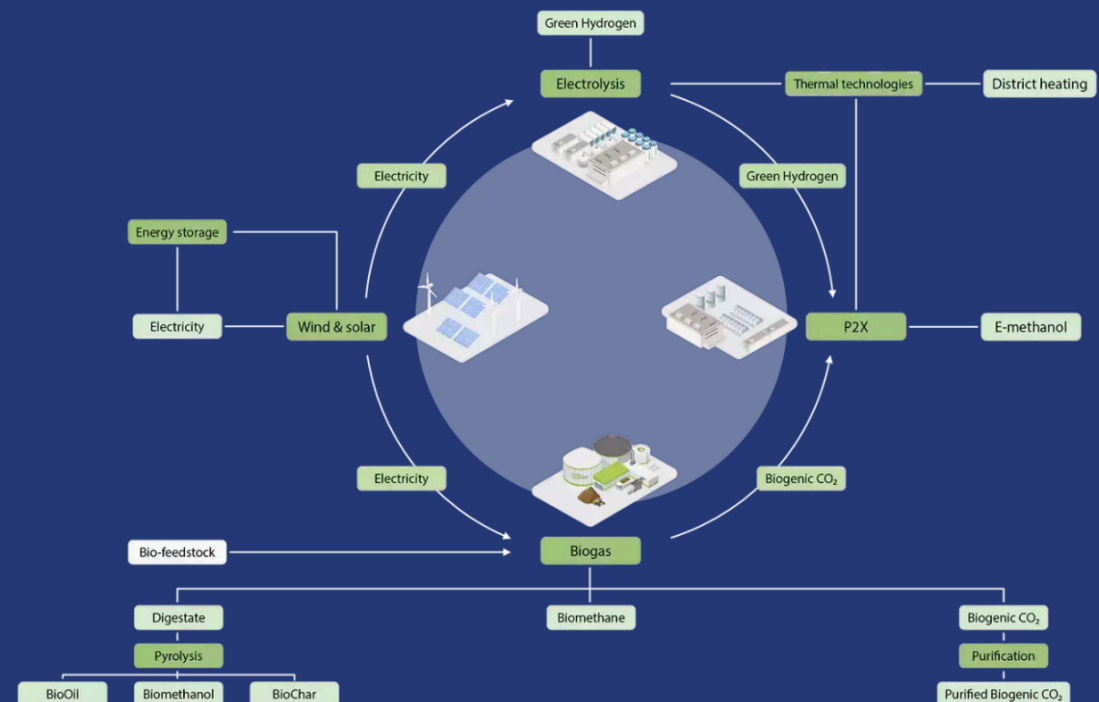
## 4 highlighted acquisition targets

### Biocirc

Founded in Denmark in 2021, BioCirc is a circular bioeconomic company that addresses CO<sub>2</sub> emissions by producing green energy, including electricity, gas, fuel, and heat. Operating eight biogas plants in Denmark, BioCirc is one of the largest biogas producers globally. The company specializes in creating circular energy clusters that enable municipalities to accelerate their green transition, ensuring local job creation and renewable energy production. BioCirc employs over 300 people and owns and operates eight biogas plants across Denmark. These facilities collectively process approximately 1.6 million tons of organic waste annually, generating around 1.5 terawatt-hours (TWh) of renewable energy each year. The company's ownership includes several entities, notably the DLG Group, a cooperative representing 25,000 Danish farmers <sup>22</sup>.

## BIOCIRC Highlighted Business opportunity: Energy clusters

BioCirc's strategy is centered around the development of integrated circular energy clusters, which combine multiple renewable energy technologies to optimize resource utilization and reduce CO<sub>2</sub> emissions. Unlike traditional biogas production, BioCirc integrates solar, wind, biogas, electrolysis, pyrolysis, and Power-to-X (PtX) solutions to create a self-sustaining energy system. This approach not only generates renewable electricity, gas, e-fuels, and district heating but also ensures that all by-products from energy production are leveraged, reducing waste, and increasing efficiency <sup>23</sup>.



<sup>22</sup> <https://biocirc.com/about>

<sup>23</sup> <https://biocirc.com/energy-clusters>



# Overview of the biogas market

## 4 highlighted acquisition targets

### Bigadan

With over four decades of experience, Bigadan is a pioneer in Denmark's biogas industry. The company specializes in developing, constructing, operating, and owning comprehensive biogas systems. Bigadan's operations encompass the entire value chain, from biomass sourcing and waste management to the production of biogas, biogenic CO<sub>2</sub>, and nutrient-rich biofertilizers. This integrated approach has enabled Bigadan to create sustainable energy solutions that serve both industrial clients and local communities. In November 2024, British asset manager Arjun Infrastructure Partners acquired all shares in Bigadan, providing the company with the financial resources and strategic support necessary to expand its operations and explore new market opportunities.

### **Highlighted Business opportunity: CCU and CCS**

Bigadan has established itself as a leader in the utilization of biogenic CO<sub>2</sub>, a byproduct of biomethane production. As biogas is upgraded to biomethane, CO<sub>2</sub> is separated from methane, and rather than releasing it into the atmosphere, Bigadan captures and processes it for commercial and industrial applications. Bigadan's Carbon Capture and Utilization (CCU) strategy involves purifying and liquefying CO<sub>2</sub>, making it suitable for various industries such as food and beverage (carbonation), electronics, and water treatment. This not only creates additional revenue streams but also strengthens the company's position as a provider of sustainable industrial solutions <sup>24</sup>.

#### A Gas with Many Applications

##### Sustainable Alternative

Biogenic CO<sub>2</sub> offers a renewable alternative fossil-derived CO<sub>2</sub>, reducing the carbon footprint of industries.

##### Various Applications

Being applicable in a long range of industries from food and beverage to consumer electronics, we're just starting to see the potential of biogenic CO<sub>2</sub>.

##### Potential for Innovation

From Power-to-X processes (like methanation) to the production of commodities like methanol biogenic CO<sub>2</sub> has wide-ranging new industrial applications.

##### Carbon Credits

Working with biogenic CO makes your green contribution quantifiable through carbon dioxide certificates that can be traded and used for offsetting.

<sup>24</sup> <https://bigadan.com/services/biogenic-co2>

## Overview of the biogas market

### 4 highlighted acquisition targets

## Danish Bio Commodities

Danish Bio Commodities (DBC) is a key player in Denmark's biogas industry, specializing in the management and sale of bio-natural gas certificates. These certificates are awarded to biogas plants based on their production volumes and serve as tradable assets, facilitating the integration of renewable gas into the energy market. DBC's expertise ensures that biogas producers can effectively monetize their outputs, supporting the financial viability of renewable energy projects.

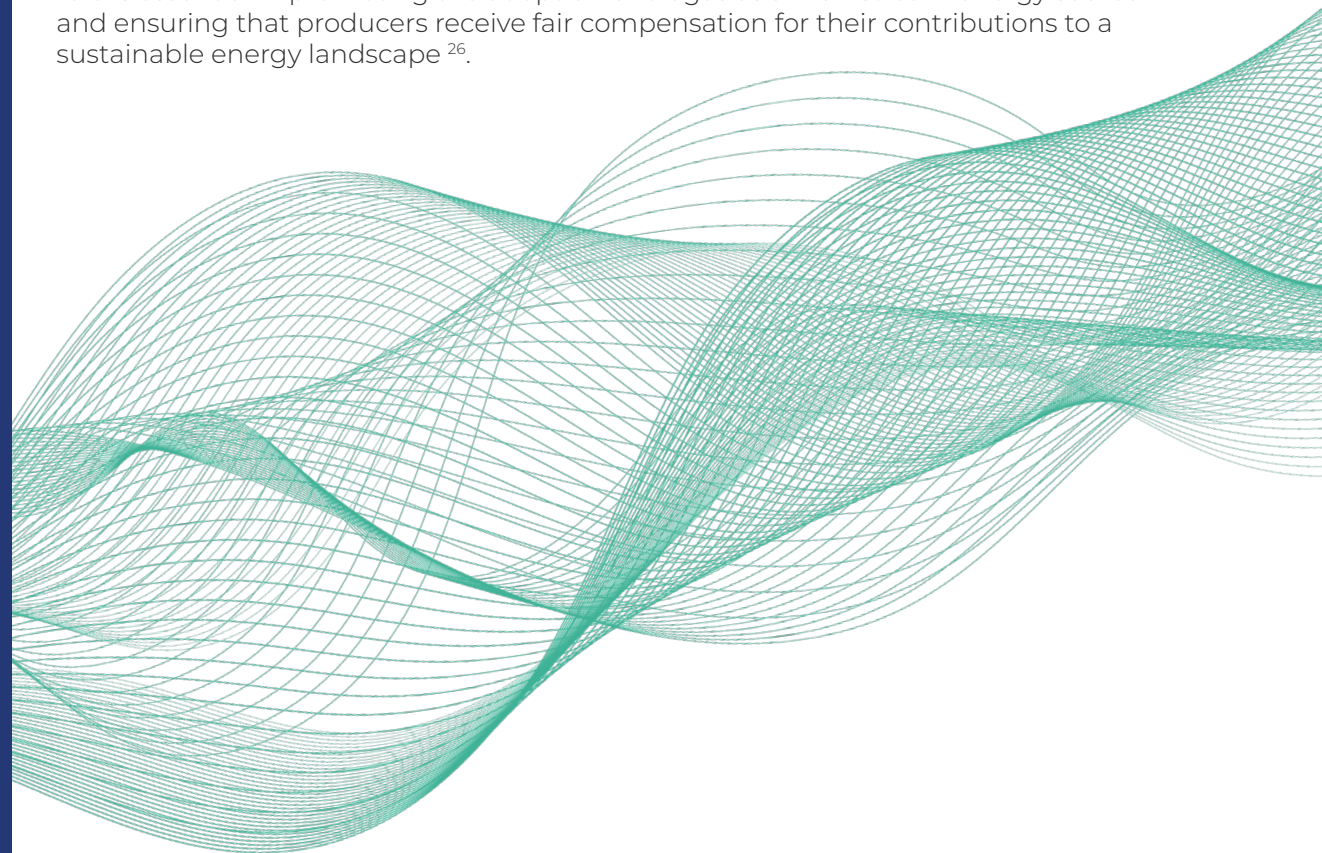
Beyond certificate management, DBC, through its investment arm DBC Invest, actively invests in, and develops biogas production facilities. A notable example is the Sindal Biogas plant in Hjørring, Northern Jutland. Founded in 2017, Sindal Biogas is undergoing expansion to process 500,000 tons of biomass annually, aiming to produce up to 34 million cubic meters of upgraded biogas for the gas grid. This expansion is expected to displace up to 50,000 tons of fossil CO<sub>2</sub> emissions per year <sup>25</sup>.

Additionally, DBC provides comprehensive advisory services to biogas plants, including guidance on biomass procurement, technical and biological processes, and assistance with gas and certificate sales. This holistic approach enhances the operational performance of biogas facilities and contributes to the advancement of Denmark's sustainable energy infrastructure.

**DBC** Danish  
Bio  
Commodities A/S

### Highlighted Business opportunity: Biogas Trading

DBC's primary focus is on the trading of biogas and related certificates. By providing a transparent and efficient platform for trading these certificates, DBC supports the financial viability of renewable energy projects and facilitates market integration. This role is essential in promoting the adoption of biogas as a mainstream energy source and ensuring that producers receive fair compensation for their contributions to a sustainable energy landscape <sup>26</sup>.



<sup>25</sup> <https://bioenergyinternational.com/cip-kk-invest-dbc-to-develop-sindal-biogas/>

<sup>26</sup> <https://danishbiocom.dk/certifikater>

# Overview of the biogas market



## Trading multiples for relevant companies

The following list of trading multiples for biogas companies is not exhaustive, and while these are provided for inspiration, participants are encouraged to explore additional data from other sources if they believe it is more relevant or suitable.

Company Name	Description	Market cap (M-DKK)	TEV (M-DKK)	Total Revenue (M-DKK)	Revenues Growth %	EBITDA Margin %	TEV Total Revenues	TEV/ EBITDA	HQ Country
Greenlane Renewables	Recovers and processes biogas.	70,00	4,40	313,20	0,14	-0,08	0,00x	NM	Canada
Montauk Renewables	Builds and operates biomass power plants.	3.508,20	3.555,70	1.397,20	0,10	0,31	2,50x	7,80x	United States
Charwood Energy	Manufactures fuel cell platforms for power and hydrogen.	151,90	158,00	41,80	0,32	-0,39	3,80x	NM	France
FuelCell Energy	Produces hydrogen generators.	846,10	520,90	804,00	-0,09	-1,06	0,60x	NM	United States
Enapter	Operates in renewable energy and natural gas.	717,90	971,60	285,50	0,66	-0,04	3,40x	NM	Germany
Engie	Produces specialty alcohols, fuels, and ingredients.	312.015,60	622.401,00	550.685,40	-0,11	0,18	1,10x	5,60x	France
Alto Ingredients	Engages in renewable power and biomass production.	884,80	1386,30	7.188,60	-0,22	0,00	0,20x	28,10x	United States
Drax Group	Manufactures biofuels and chemicals.	20.060,10	28.605,30	55.607,30	-0,24	0,18	0,50x	2,80x	United Kingdom
FutureFuel	Develops renewable natural gas and biofuels.	1.418,40	462,50	1.963,50	-0,31	0,12	0,20x	1,90x	United States
Aemetis	Designs fuel cell systems for power generation.	660,20	3.894,20	2.089,50	0,60	-0,10	1,90x	NM	United States
Bloom Energy	Produces renewable fuels and reduces carbon.	39.682,40	45.050,80	10.568,20	0,11	0,05	4,30x	56,30x	United States
Gevo	Operates biogas and biomethane plants.	2.337,40	1.244,70	111,80	0,17	-	11,10x	NM	United States
EnviTec Biogas	Produces low-carbon ethanol and corn oil.	3.334,80	3.677,70	3.575,30	0,19	0,20	1,00x	4,80x	Germany
Green Plains	Produces and distributes renewable natural gas.	2.724,50	6.206,40	17.630,60	-0,25	0,01	0,40x	22,30x	United States
OPAL Fuels	Produces and distributes renewable natural gas for vehicle fuel.	509,60	6.852,70	2.201,00	0,30	0,14	3,10x	15,60x	United States

### Comment from analyst at TotalEnergies:

"There is certainly a trap of recent high gas prices distorting the market. A natural question for an industrial player (such as TotalEnergies) is to buy or DIY. We have the competencies to develop and build new projects, so why should we pay a premium for acquiring existing assets? Ultimately, a balance of cost multiples, cashflow timing, and value appropriation."

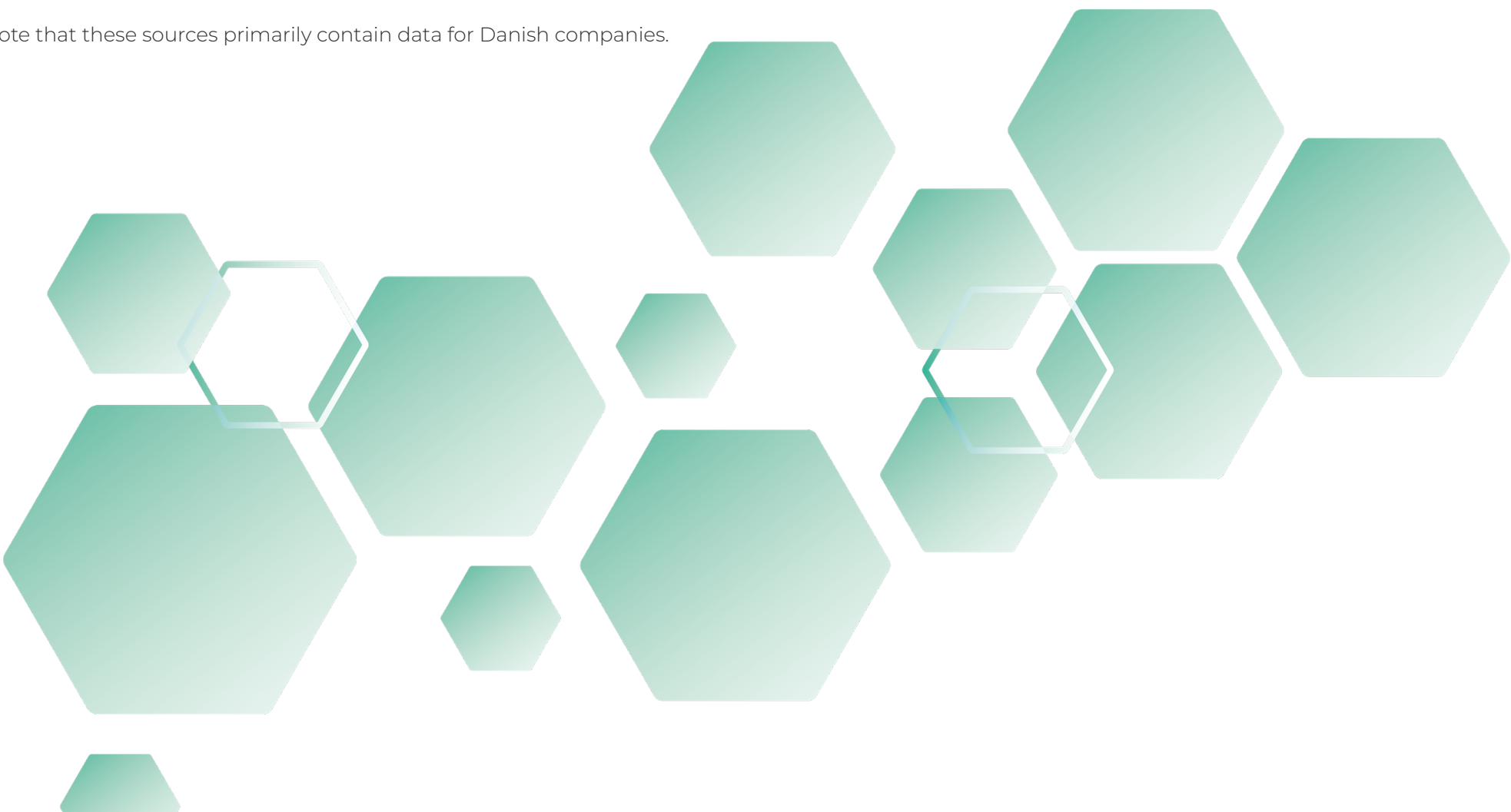


# Financial and Accounting Data

The necessary financial and accounting data can be found on the following Danish databases:

- **Virk.dk** (official portal for Danish businesses)
- **Proff.dk** (business information about Danish companies)

Please note that these sources primarily contain data for Danish companies.



# Acknowledgements

## Case writers

Askil Rishøj Møller  
Botond Dézsényi  
Julius Geert Dalsgaard  
Maciej Okraska

## Special thanks to

Zachary Brierley  
Betina Jørgensen

## Corporate Partners

