

Power-to-X

# E-methanol: A game changer for decarbonising heavy transport and industry

  
EUROPEAN  
ENERGY









# Solving the climate puzzle with e-methanol



In the coming years, sectors such as shipping, aviation, and the chemical industry must significantly reduce their fossil CO<sub>2</sub> emissions.

For these sectors, direct electrification is not a feasible solution in the foreseeable future. However, green alternatives exist that can help decarbonise heavy transport and the chemical industry substantially.

With Power-to-X technologies, we can significantly reduce fossil fuel consumption across these sectors. By transforming renewable energy from wind and solar into sustainable fuels, we can secure a fossil-free energy source and raw material for those sectors where direct electrification is impractical or unfeasible.

European Energy is a market leader in Power-to-X. We have an extensive

portfolio of Power-to-X projects under development in Denmark, Europe and worldwide. We are building the world's largest e-methanol plant in Kassø, Aabenraa, which will be operational during 2024 and will run on renewable electricity from the largest solar park in Northern Europe placed nearby.

We believe that e-methanol will play a crucial role in the green transition. Already today e-methanol can replace fossil fuels in heavy transport and can be used as a raw material in the chemical industry, e.g. in plastics production. E-methanol is also a critical ingredient for producing sustainable aviation fuel (SAF).

Shipping, long-distance aviation, and the chemical industry need e-methanol as a green alternative to reduce their fossil fuel emissions and contribute to achieving our climate goals.





At European Energy, we confidently regard e-methanol as the crucial missing piece in the vast climate puzzle we are collectively solving — particularly since it is imperative to drastically cut emissions in sectors that are notoriously challenging to electrify.

We are leading the way with a solution that can fulfill the need for fossil-free transport and a greener chemical industry.

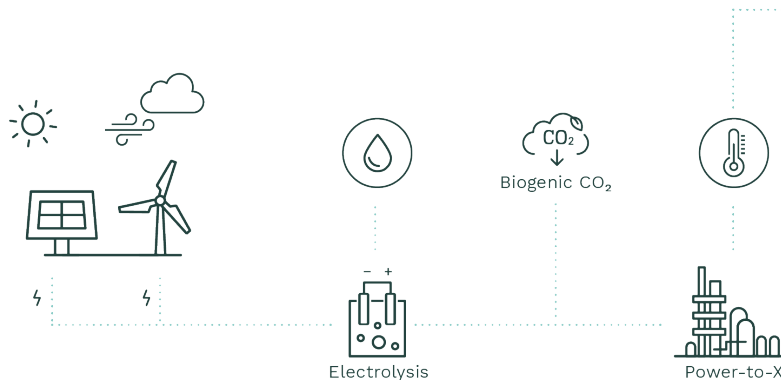
# Production of e-methanol

E-methanol is the same product as methanol (wood alcohol), which is already used as a fuel in combustion engines and as a raw material in the chemical industry.

Today, more than 100 million tonnes of methanol are produced annually using natural gas and coal. E-methanol, however, is a green alternative because it is produced using renewable energy and

biogenic CO<sub>2</sub> captured from e.g. biogas plants and waste incineration.

European Energy produces e-methanol using green power from wind and solar farms. An electrolyser powered by renewable energy will split water into green hydrogen and oxygen. When we combine the hydrogen with biogenic CO<sub>2</sub> it becomes e-methanol, which can

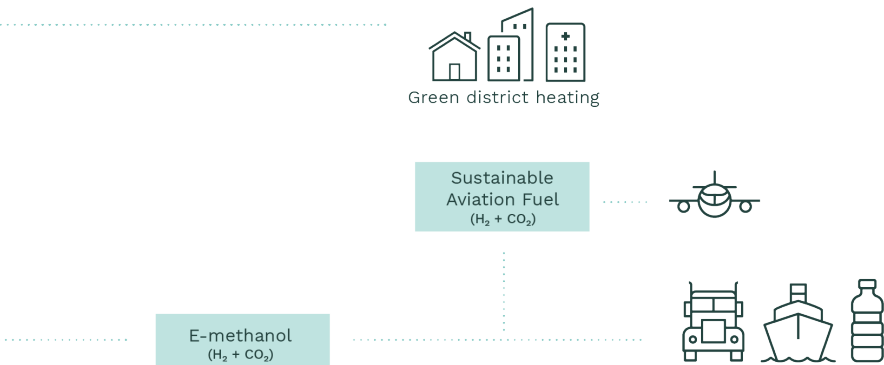




be used in both heavy transportation and the chemical industry, including the production of plastics.

The process creates excess heat, which can be supplied to the local district heating network and provide climate-friendly and affordable heat to local residents.

E-methanol plants can ramp up and down production and utilise surplus renewable electricity in the grid. Production of e-methanol can thereby play a role in balancing the grid during peak periods when the energy system is not consuming all the electricity produced.



# E-methanol is a key enabler for green transport and industry

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## E-methanol has an excellent potential to reduce the fossil CO<sub>2</sub> foot print across heavy transport and the chemical industry

These industries, usually referred to as hard-to-abate, are challenging to decarbonise due to their reliance on fossil fuels and carbon as integral parts of their production processes.

However, with e-methanol they now have a green alternative that displaces the fossil fuels and raw materials that would otherwise be used.

### Off-takers across industries

At the Kassø Power-to-X plant, we will produce up to 42,000 tonnes of e-methanol annually. The e-methanol will be delivered to Maersk to fuel the Laura Mærsk, the world's first container ship powered by e-methanol, and Circle K, Novo Nordisk, and the LEGO Group.

This first Danish-produced e-methanol thus contributes to reducing emissions in shipping and road transport, reducing the use of fossil raw materials in the chemical industry.

In the transport sector, e-methanol can be used directly as a green fuel for shipping and trucks and further processed into sustainable aviation fuel (SAF).

In the chemical industry, e-methanol can replace traditional fossil methanol in processes such as the production of plastics.





In the coming years, an increasing number of container ships will be launched that can run on e-methanol as a marine fuel.



Through further processing, e-methanol can be turned into sustainable aviation fuel (SAF).



E-methanol can be blended with gasoline and used in diesel for road transport.



E-methanol can replace fossil-based methanol in plastic production, among other things.





# Global demand creates export opportunities



E-methanol demand is increasing rapidly. However, e-methanol production is currently minimal. Analysts and industry experts expect global production to reach 250 million tonnes by 2050, mainly due to increasing demand from the transport sector and the chemical industry.

Many shipping companies have taken steps to convert their fleets to enable shipping with e-methanol. The orders for new methanol ships almost quadrupled (from 35 ships in 2022 to 138 in 2023). Maersk alone expects to require up to 6 million tonnes of e-methanol for its green fleet by 2030.

E-methanol can easily be exported across borders since it is liquid at room temperature, making it convenient to transport without needing a pipeline.

This feature enables the use of existing infrastructure, such as harbors, which handle liquid fuels.

There are already several practical applications for e-methanol in both chemical industries and the transport sector, and the growing global demand opens up great export opportunities.

# Biogenic CO<sub>2</sub> and renewable energy are cornerstones of the green transition

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For Europe to remain the global leader in Power-to-X, political focus is needed to ensure renewable electricity at competitive prices and sufficient amounts of biogenic CO<sub>2</sub> for the production of the green fuels of the future.

## Biogenic CO<sub>2</sub> is a key component for the green transition

When using e-methanol as a renewable fuel, we avoid fossil CO<sub>2</sub> emissions. The biogenic CO<sub>2</sub> captured from, e.g., biogas production is central to making e-methanol a green alternative to fossil fuels. Unlike fossil CO<sub>2</sub>, biogenic CO<sub>2</sub> is considered climate neutral in climate accounting.

We will need large amounts of biogenic CO<sub>2</sub> for the production of e-methanol. At the same time, supply is expected to decrease because biomass consumption

is generally expected to decrease in the coming years.

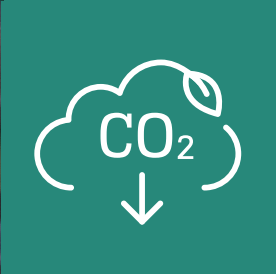
The increasing political and commercial interest in climate technologies within carbon capture, utilisation and storage (CCUS) further increases the demand for biogenic CO<sub>2</sub>.

## Utilisation of biogenic CO<sub>2</sub> should be politically prioritised

A balanced policy approach that focuses on using biogenic CO<sub>2</sub> as a valuable resource and does not one-sidedly prioritise the storage of biogenic CO<sub>2</sub> to generate negative emissions is needed.

Utilising biogenic CO<sub>2</sub> as a feedstock in Power-to-X creates a valuable fuel, reduces fossil CO<sub>2</sub> emissions, and contributes to achieving our climate goals.





# Facts about Kassø Power- to-X plant



42.000 tons e-methanol



When fully operational, the Power-to-X plant can produce up to 42,000 tonnes of e-methanol (50 million litres) annually. That amount is equivalent to the annual volume of three to four of Maersk's first green container ships.

304 MW renewable  
electricity



The largest solar park in the Nordic region, the 304 MW Kassø Solar Park, supplies the Power-to-X plant with renewable electricity.

45.000 tons biogenic CO<sub>2</sub>



The production includes approximately 45,000 tonnes of biogenic CO<sub>2</sub> captured from a nearby biogas plant.

## 52 MW electrolysis

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With 52 MW of electrolyser capacity, the Power-to-X plant produces around 6000 tonnes of green hydrogen annually, which is processed into e-methanol.

## 100+ full-time jobs

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The Power-to-X plant employs over 100 people during the construction phase, half of whom are locals. Around 30 full-time employees will manage the day-to-day operations of the completed plant, with support from external subcontractors. Many of European Energy's 60 Power-to-X employees are actively involved in the project and are supported by external advisors.



## Heating for 3,300 households

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The excess heat from the e-methanol production is used for district heating in the local area, providing heat for 3,300 households.





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