

Power-to-X solutions

Energy is a valuable commodity. Effectively managing renewable energy resources is economically beneficial and contributes to the goals of decarbonization. Besides the power industry, other sectors like heating, cooling, and mobility also have to reduce their use of fossil fuels in order to cut CO₂ emissions. Power-to-X is an energy transformation technology that converts electricity into carbon-neutral synthetic fuels (gas or liquid) which can be stored and later used by the mobility, heating and electricity sectors.

Benefits at a glance

- Substitute fossil fuels with CO₂-neutral alternatives
- Long-term storage of renewable energy
- Reduce CO₂ emissions
- Couple electricity sector with heating, cooling, and transportation
- Single-source solution
- Cost-optimized concept



Carbon-neutral energy for the future

Managing supply and demand

The Paris Agreement provides a roadmap for economic growth fueled by low-carbon energy – which will eventually be replaced by carbon-neutral and carbon-free energy.

These goals require the further development of reliable renewable energy technologies. Wind and solar in particular are becoming the primary sources of energy for electricity generation. However, it is just as important to reduce CO₂ emissions in other sectors in which full electrification is not possible, like marine, transportation or aviation. Natural gas can act as a transition resource and ultimately fossil fuels have to be replaced with synthetic fuels as a truly carbon-neutral, sustainable solution.

Power-to-X for decarbonization

MAN power-to-X (MAN PtX) is a sustainable solution for synthetic fuel production and long-term energy storage. PtX complements other storage technologies like batteries, which are suitable for short-term storage. The PtX sector coupling and storage technology converts electricity into gases like hydrogen or methane (power-to-gas) or liquids like methanol (power-to-liquid) which can be stored for long periods if needed.

PtX can respond to two fundamental challenges of decarbonization: The direct use of synthetic fuels allows the decarbonization of sectors which currently rely on fossil fuels, like marine, aviation or certain industrial processes. The substitution of

fossil fuels with CO₂-neutral alternatives can directly reduce emissions in many sectors. In addition, very large amounts of energy can be stored over a long period in order to balance the seasonal mismatch between renewable energy supply and demand. Electricity should therefore no longer be thought of as only a final energy product, but rather a source of sustainable and resource-conserving power for the industrial, mobility and heating sectors coupled by PtX.

General competence

MAN Energy Solutions provides sector coupling and energy storage technologies like MAN PtX that help our clients reduce their energy costs and carbon emissions and improve their security of energy supply. MAN continuously optimizes all processes from idea to marketable and production-ready product. With its DWE reactor, MAN is a market-leading provider of methanation technology. In addition, we offer full engineering, procurement and construction (EPC) services for power-to-X plants anywhere in the world.

We are certain that, with effective technologies, renewable energy can be economically sustainable at a global level. That is why we are continuously developing our technology and looking for new and more advanced process solutions together with our partners in science and industry.

System solutions

MAN power-to-gas (MAN PtG)

Renewable energy is used to run an electrolysis plant that breaks water down into hydrogen and oxygen. The hydrogen is then put into a methanation reactor with carbon dioxide, resulting in synthetic methane – also known as synthetic natural gas (SNG) or e-gas. The SNG can be stored and then be used directly as fuel for cars, trucks and public transport or later reconverted into electricity. One of the major advantages of SNG is that the existing gas infrastructure can be used without any modifications.

MAN power-to-liquid (MAN PtL)

Hydrogen can also be converted into methanol, which can play a key role in the sustainable production of synthetic fuels for road and air transport. Synthetic methanol can be used directly by the mobility sector and the existing petrol/diesel infrastructure can be easily adapted.

MAN power-to-chemicals (MAN PtC)

Instead of producing gas or liquids, the hydrogen can be combined with carbon dioxide, nitrogen or other compounds to make chemicals such as ammonia, ethylene or propylene. These chemicals provide a CO₂-neutral base in industrial processes.

Key components

– Renewable energy

Wind, solar or other renewable energy sources provide the power for a PtX plant.

– Electrolysis

The renewably powered electrolysis plant splits water into oxygen and hydrogen.

– CO₂ source

A broad variety of gases containing CO₂ can be used as a source, e.g. biogas, flue gases or waste gas streams from the industry.

– Methanation

In a methanation plant, the hydrogen reacts with carbon dioxide. The result is synthetic natural gas (SNG).

– Storage and transportation infrastructure

The synthetic fuels can be stored on site, fed into the gas grid or transported via trucks or ships to the destination of use.



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