

FUELS FROM RENEWABLES AT LESS THAN 1€ PER LITER

IS POWER-TO-LIQUID A WAY INTO THE FUTURE?

ARE POWER-TO-LIQUID FUELS A DESIRABLE OPTION FOR THE FUTURE?

Power-to-liquid fuels are CO₂-neutral if they are produced from renewable energy. The production of these fuels only requires, water, CO₂, and electricity. The CO₂ emitted during combustion is equal to the CO₂ absorbed during production.

Power-to-liquid fuels are compatible with the existing infrastructure and vehicles. Thus, a direct market entry is possible. Moreover, the high energy density of the fuels allows for cost efficient storage and long-distance transportation of the fuel.

Yet, it is questionable whether power-to-liquid fuels can be offered profitably on the market.

POWER-TO-LIQUID FUELS CAN BE PROFITABLE – UNDER THE RIGHT CIRCUMSTANCES

FEV Consulting estimates production costs at 0.97 € per liter diesel equivalent. This is for a production process with proton-exchange membrane electrolysis and Fischer-Tropsch synthesis in 2030.

The three dominating cost drivers are electricity costs, plant utilization, and plant size:

Electricity costs account for 75% of the production costs. Therefore, high availability of low cost electricity is required. For example, this can be achieved in the Middle East and Northern Africa from renewable energy.

Further, a high plant utilization is necessary, otherwise the fix costs would drive up the fuel production costs.

Moreover, large-scale production facilities have the potential to decrease production costs. A plant which produces fuel for about 2 million passenger cars for one year requires an investment of about 2 billion €. The main cost driver within the investment costs is the electrolyzer that accounts for 65 % of the total investment costs.

To ensure competitiveness of power-to-liquid fuels, the fuel pump price should be equal compared to fossil fuels. Production costs of 0.97 € per liter diesel equivalent are above today's production costs of fossil fuels of about 0.50 € per liter diesel equivalent.

To achieve price parity between power-to-liquid fuels and fossil fuels, three scenarios – and combinations of them – could be considered:

1. CO₂ taxation of energy carriers based on well-to-wheel emissions
2. Crude oil prices increase to around 150 \$ per barrel
3. Power-to-liquid fuel prices decrease by subsidizing 0.50 € per liter diesel equivalent

The subsidies could be supported by OEMs, since these can be attractive compared to other solutions that reduce carbon emissions. For this, a legal framework could be introduced to attribute a bonus to each OEM. This bonus would be proportionate to the CO₂ emission savings enabled by the OEMs' subsidies.

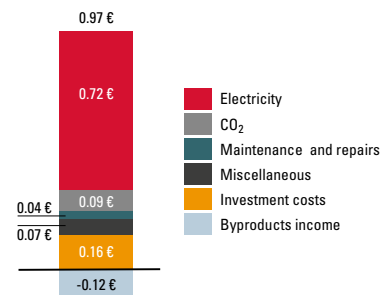
Additionally, planning security is key for companies to commit the high investment into a power-to-liquid fuel production facility. This planning security could, for example, be reached by a guaranteed demand for their fuel. To guarantee demand, further fuel standardization is necessary.

POWER-TO-LIQUID FUELS CAN RAPIDLY INCREASE THE SUSTAINABILITY OF OUR ECONOMY

Our analysis shows that a rapid market adoption of power-to-liquid fuels is feasible. Yet, the right frameworks need to be established. With these, power-to-liquid fuels will be a key contributor to achieve the carbon emission reduction goals and make our economy more ecologically sustainable.

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PRODUCTION COST COMPOSITION PER LITER POWER-TO-LIQUID DIESEL EQUIVALENT



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