efuels report europe

2—2023

On course for green
In place of fossil fuels, green hydrogen and synthetic methanol will be used to power aircraft and ships

MEP Jan-Christoph Oetjen
It is important to create incentives for the use of non-fossil fuels

REHABILITATING THE ENERGY TRANSITION

ADD A LITTLE WIND AND SUN, SUBTRACT NUCLEAR POWER, COAL AND GAS – IT'S CALCULUS THAT CANNOT PAY OFF IN AN INDUSTRIALISED AREA LIKE EUROPE. IT IS TIME TO GO BACK TO A RATIONAL ENERGY POLICY.

‘Efuels are an effective, complementary solution. They make it possible to operate engines in a virtually carbon-neutral way. In this manner, every vehicle can play its part in reducing carbon emissions – regardless of the drive type. Furthermore, as a hydrogen derivative, renewable synthetic fuels are ideal for mixing with fossil fuels. And every percentage added contributes to climate protection.’

VW CEO Oliver Blume

Photo: Roderick Aichinger/Porsche AG

Florian Flicke (left) and Gerhard Walter, editors-in-chief: Climate-neutral mobility – a dream that could soon become a reality in Europe.

An Efuels Use Act? How Europe can become the global green pioneer

WHAT'S YOUR OPINION OF US? –

If you have any praise, criticism or suggestions to share with us, please feel free to write to: ***europe@uniti.de***

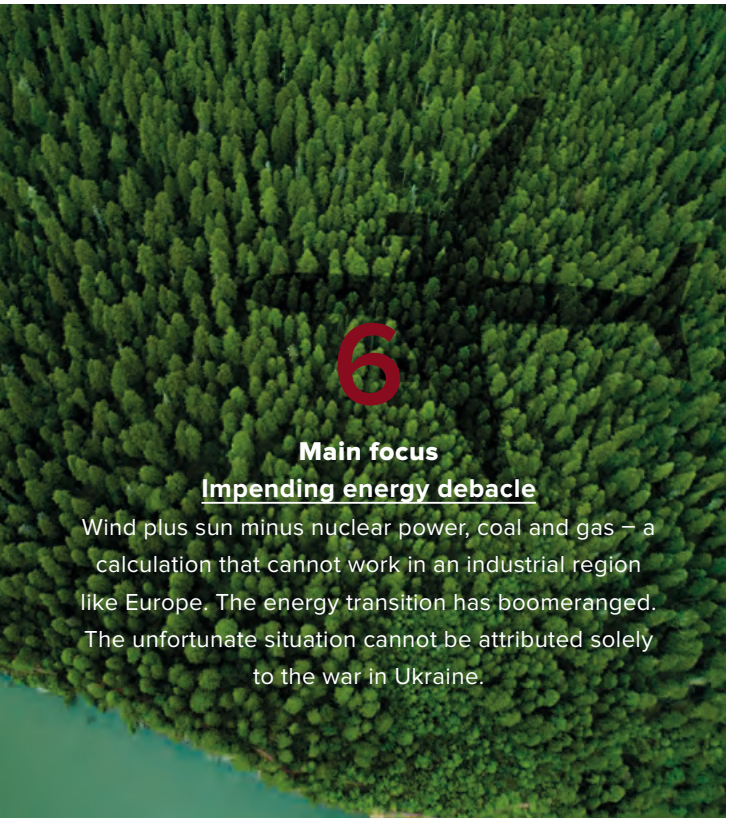
There is no doubt that the US Inflation Reduction Act (IRA) is an important step towards stabilising the American economy. But with all due sympathy for the US government's subsidy programme, the IRA also fuels the technology competition in the fight against climate change. This has consequences for Europe. It is more than realistic that the investments made under the IRA will lead to the US becoming the global leader in the development and deployment of green technologies – and it's moving faster than Europe. Over the next ten years, an estimated 369 billion US dollars in subsidies will be available for the green energy transmission of the industry, for renewable energies, hydrogen, also nuclear power and other things. Subsidies hinge on the goods being produced in the US or in countries that have a free trade agreement with America. This puts imports from Europe at a disadvantage and creates incentives for European companies to relocate production sites to North America. As a result, the IRA could lead to a loss in jobs, prosperity and green innovation in Europe.

This makes it all the more important for Europe to rely on its own strengths and focus on developing and implementing new climate-friendly technologies in a non-bureaucratic, practical and technology-neutral way. For example, the use of carbon-neutral fuels. It is common knowledge that the EU Council and EU-Parliament adopted new CO_2 emission limits according to which it will still be legal to register internal combustion cars powered by green synthetic fuels after 2035. However, in order to speed up the market ramp-up of climate-friendly fuels, regulatory measures that apply to the whole of the EU should now be put in place. This is the only way to sustainably integrate the EU's fleet of around 250 million passenger cars into climate protection efforts. But for investors to be willing to commit to ramping up the production of efuels, there must be long-term sales potential for green fuels. This is a great opportunity for Europe to once again become a green pioneer in developing and implementing sustainable efuel technologies – and to regain its former leadership position in the fight against climate change by promoting carbon-neutral green fuels through its own EU initiative, such as an Efuels Use Act. After all, one thing is certain: Europe and the world still need the green combustion engine.

Happy reading! We hope you gain some new insights into this exciting topic!

The editors-in-chief,
Florian Flicke and Gerhard Walter

Cover photo: Fred Marvaux/European Union 2019 - Source : EP ; Photo: Mateusz Tondel



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Main focus

Impending energy debacle

Wind plus sun minus nuclear power, coal and gas – a calculation that cannot work in an industrial region like Europe. The energy transition has boomeranged. The unfortunate situation cannot be attributed solely to the war in Ukraine.

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Innovative mastermind

For Jan-Christoph Oetjen, Member of the European Parliament, it is clear: efuels are one way to make individual climate-friendly mobility affordable in the future.

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Electrolyser in the maritime endurance test

The world's first offshore electrolyser is to produce green hydrogen directly at sea. The test run off the French Atlantic coast has already begun.

IMPRINT

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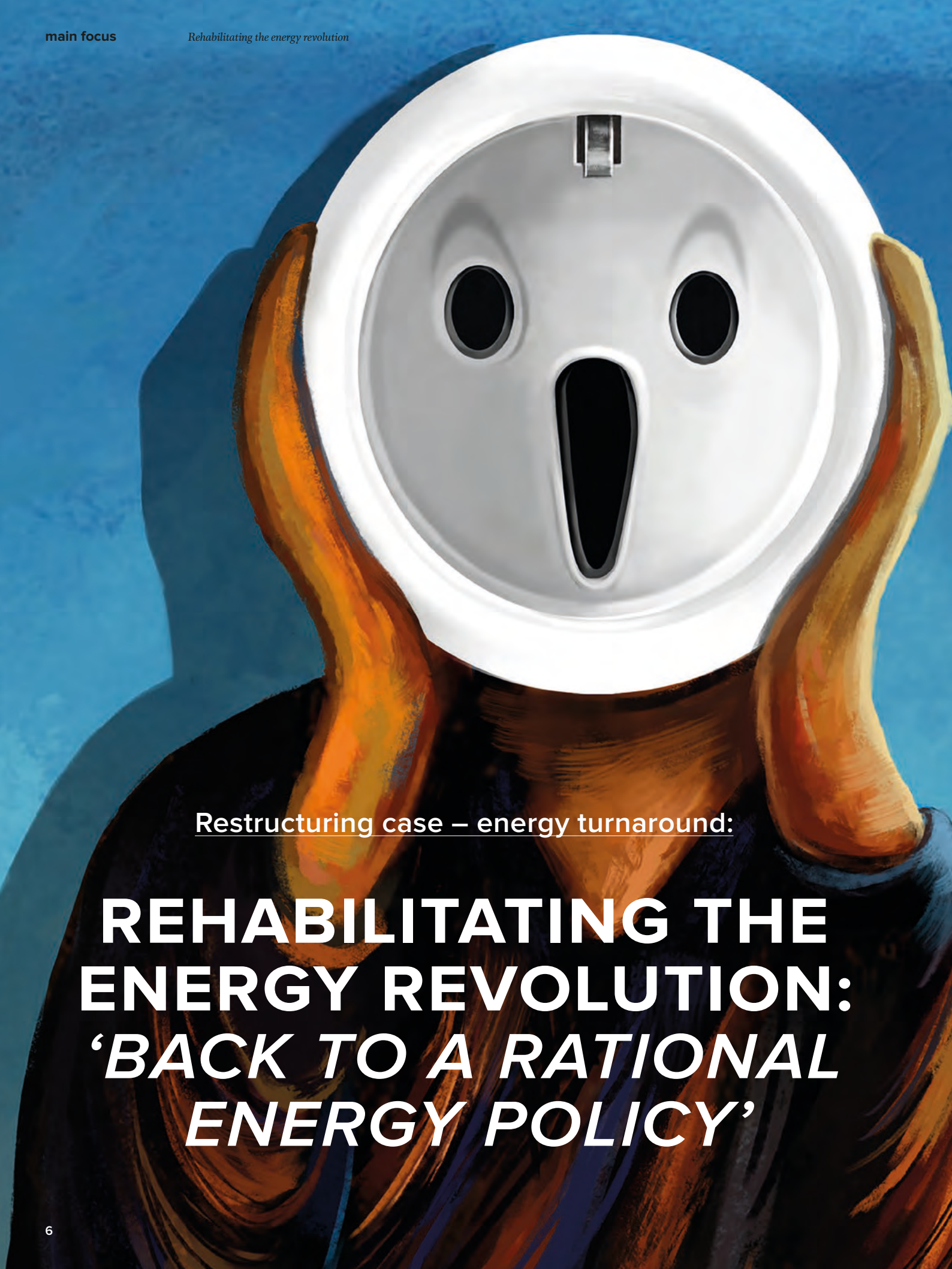
Successful pilot project: use of efuels in real life

The four-year-old VW Golf VII 1.4 with its 122 PS four-cylinder engine has been on the road since July 2022. It is suitable for driving on motorways and country roads as well as in urban traffic. The TV personalities 'Die Autodoktoren' (German for 'the car doctors') tested the car themselves by driving it thousands of kilometres, which they covered on their YouTube channel. What made the test special is that their Golf had been running exclusively on carbon-neutral synthetic fuel in recent months. The efuels used, which were produced in a pilot plant run by the industrial equipment supplier Chemieanlagenbau Chemnitz GmbH, are chemically identical to and meet the standard for conventional petrol. The content creators' initial conclusion was unmistakable: when it comes to handling, performance and fuel consumption (five litres per 100 kilometres), using efuels is no different than driving with conventional fossil fuels. The pilot project was initiated by ADAC, Europe's largest motoring club with 21 million members, Zentralverband Deutsches Kraftfahrzeuggewerbe (ZDK), which represents Germany's approximately 36,570 car dealerships and car workshops, and UNITI Bundesverband mittelständischer Mineralölunternehmen, a trade association representing medium-sized oil companies in Germany. Launched under the motto 'E-Fuels for Future', the project proves that carbon-neutral efuels are suitable for everyday driving and do not have any negative effects on handling and engine performance or pollutant emissions. Quite the contrary: by running on efuels, the Golf can become a carbon-neutral road user. At the end of June, the two car experts informed EU parliamentarians about their positive experiences with the CO_2-neutral fuel (see report on p. 26).

Photo: Autoren-Union Mobilität/FabuCar



Restructuring case – energy turnaround:

REHABILITATING THE ENERGY REVOLUTION: *'BACK TO A RATIONAL ENERGY POLICY'*

Add a little wind and sun, subtract nuclear power, coal and gas – it's calculus that cannot pay off in an industrialised area like Europe. The energy revolution has become a boomerang. The unfortunate situation cannot be chalked up to the war in Ukraine alone.

TEXT Sebastian Wolking

Throughout Europe, rising energy and food prices have led to losses in purchasing power over the past year. According to the EU statistical agency Eurostat, the average electricity price paid by EU households reached a new high of 28.40 euros per 100 kilowatt-hours in the second half of 2022. In the same period of 2021, the average price was only 23.50 euros per 100 kilowatt-hours. The highest rises in electricity prices were in Romania (+112%), the Czech Republic (+97%), Denmark (+70%), Lithuania (+65%) and Latvia (+59%). Gas cost EU households 11.40 euros per 100 kilowatt-hours in the second half of 2022, up from 7.80 euros the year before. Gas prices rose in all 27 EU countries; the greatest increases were in the Czech Republic (+231%), Romania (+165%), Latvia (+157%), Lithuania (+112%) and Belgium (+102%). And no improvement is in sight.

According to a forecast by the International Monetary Fund (IMF), the economy in the eurozone will grow by only 0.8 per cent this year, significantly slower than economic growth in the United States (1.6 per cent) and in emerging and developing countries (3.9 per cent). The IMF even predicts a decline in economic performance for individual EU countries such as Germany (–0.1 per cent), the Czech Republic (–0.5 per cent), Estonia (–1.2 per cent), Lithuania (–0.3 per cent) and Sweden (–0.5 per cent). Germany is facing a 'loss of prosperity on an unimaginable scale,' warned Peter Adrian, President of the Association of German Chambers of Industry and Commerce (DIHK), in early October. The feedback from companies is alarming, while livelihoods and jobs are at great risk. The same could undoubtedly be said of other countries and regions on the continent. Faced with the shortage of skilled workers, many companies remain reluctant to cut jobs – but there is no guarantee that will not change. 'A large-scale labour shortage in the face of demographic ageing does not rule out unemployment' – this was the gloomy premonition expressed by Michael Hüther, Director of the Cologne Institute for Economic Research (IW), at the Berliner Gespräche talks held in October under the telling title 'How can we save industry?'

Despite having loomed for some time now, especially in Germany, the inflationary spiral is taking many companies and consumers by surprise. 'Taking coal and nuclear energy off the grid entirely leaves a huge gap that needs to be filled,' said E.ON CEO Leonhard Birnbaum at the end of 2021, long in advance of the war in Ukraine. In response to a CDU inquiry, Germany's red-green-yellow government itself acknowledged that 'there is a need for natural gas-based energy sources in the long term to meet our energy needs, since electrification alone is unable to achieve the goal of greenhouse gas neutrality.' The latest study on the availability and effective use of renewable power produced in Germany by the consulting firm Frontier Economics (available only in German) now warns of the risk of a large, far-reaching shortfall in secured capacity from renewable sources – and a loss of industry, jobs, economic power and prosperity in the country. Avoiding this nightmare scenario will require a resilient energy system that also relies on energy imports. This is because the electric cars and heat pumps pushed by politicians will use more electricity and, in addition, industry itself, with its new battery factories and AI applications, also needs more power. In the transport sector alone, demand for electricity in 2045 is projected to increase to up to 246 terawatt hours per year (TWh) in Germany alone. Today the figure is 12 terawatt hours. Industry will need up to 539 TWh of electricity in 2045; today it uses 218 TWh. Forecasts put the power requirements of households and the retail, commercial and service sector in 2045 at up to 444 TWh. They currently amount to 127 TWh. The political objective is for all Germany's electricity needs to be covered exclusively by renewable energies such as wind and solar by 2045. The so-called energy revolution must therefore be able to meet both existing and future electricity needs.

Especially in view of such forecasts, the ramp-up of a hydrogen economy and imports of green energy are necessary: 'Germany will not be able to meet its own energy needs fully by producing renewable energies in the long term and will therefore be dependent on energy imports from renewable sources and reliable business relations with other countries and ac-

Illustration: Mona Eing & Michael Meissner

tors,' was the German government's response to a CDU inquiry. That was in early February, a few weeks before the Russian attack on Ukraine that led to the gradual evaporation of gas supplies to Germany. 'Natural gas was the safety anchor of the energy revolution,' said Fritz Vahrenholt, former Hamburg Senator for the Environment and RWE Manager, at the 20 Jahre Energiewende conference in Stuttgart in June. That anchor is now defunct.

In order to achieve its green energy policy objectives, the German government would have to install four latest-generation wind turbines (which are particularly powerful and large) every day in the country over the next ten years. If the smaller older rotors were used, it would have to be eight per day. These figures are the result of calculations by Michael Beckmann, Professor of Energy Process Engineering at the Technical University of Dresden. In the *Frankfurter Allgemeine Zeitung* newspaper, the university lecturer recently questioned how such a massive project could even be made a reality. Especially in view of the current global supply scarcity of materials, not to mention the fact that mechanics and technicians for renewable energies are themselves also scarce due to the shortage of skilled workers. In addition, each wind turbine would contain rare and high-priced raw materials such as rare earths. Adjusting for price increases for construction, tenders and the purchase of the designated areas, the project would cost a good 20 billion euros every year on land alone. And this figure does not even include the social and administrative costs – such as political resistance in affected communities. For years, citizens have been suing operators of wind turbines in their vicinity through several courts. All this costs a lot of money and takes a lot of time. Even with radically simplified approval procedures, Beckmann considers such a project 'unrealistic, not to say impossible.' Moreover, as the European Commission also admitted in an analysis, wind energy competes for limited space on land as well as at sea with a multitude of interest groups, including agriculture, forestry, fishing, nature conservation, tourism, transport and the military. The outcome of such multipolar competition would determine whether the undoubtedly great potential of the project could be fully realised. In addition, offshore wind turbines require deeper waters such as the Iberian coast and the Mediterranean to float in as they cannot be attached to the seabed – a huge technical challenge. What's more: wind turbines have an average lifespan of around 20 years. After that, new plants have to be built – four large ones or eight small ones every day in Germany alone. According to Beckmann, there is a mistake that runs throughout the entire strategy of the energy revolution: 'The magnitude of the transformation is constantly underestimated. Initially, concepts seem based on viable ideas, but once experts have done the maths, it is shown that ideas on the scale of an industrialised nation cannot be implemented quickly enough, a fact which is often ignored,' says the university lecturer in *Die Welt* newspaper. Beckmann describes the current state of the energy revolution in Germany from the perspective of a technician: 'As engineers, we classify projects on the scale of technological maturity. TM1 would be the idea of an aircraft, TR9 the airborne aircraft with passengers on board, that is, the mature technology. Some parts of the energy revolution, such as solar panels, are at TR9. Overall, however, the energy revolution is only between TR4 and TR6.'

Unrealistic goals: In order to implement the green energy policy plans, four large wind turbines would have to be erected every day in Germany alone over the next ten years.

Three reasons for the energy fiasco

According to André Thess, Professor of Energy Storage at the University of Stuttgart, three factors are responsible for the current dilemma: 'Firstly, the one-sided focus on solar and wind power and Russian natural gas. Secondly, the systematic increase in the price of fossil fuels as a result of carbon pricing. And it is only with reason three that we come to the war in Ukraine, which acted as a catalyst for the mistakes of the past, further exacerbating the crisis. In the long term, we must return to a rational energy policy in Germany.'

Almost everyone – scientists and activists alike – agrees that the rapid expansion of renewable energies is right and important. But an energy-policy foundation composed solely of domestic sun and wind power is obviously too insecure for an industrialised nation like Germany, not to mention the whole of Europe. According to Eurostat, in 2021, renewables, including biomass and hydropower, accounted for almost 22 per cent of final energy consumption in the EU countries – a slight decrease compared to the previous year. Already in 2015, the share of renewables was just under 18 per cent. An overwhelming majority still drive, fly, heat and manufacture, not with solar and wind power, but with fossil energy.

Moreover, the green expansion is faltering. The Ampel-Monitor Energiewende of the German Institute for Economic Research (DIW) shows a huge gap between the current status and the German government's targets for 2030 – in all categories: installed heat pump capacity, the electric vehicle fleet, number of public charging points, and installed capacity of wind and photovoltaic systems. Furthermore, the current pace of expansion is far too slow to achieve the current targets. Wind turbines in particular are, quite

Illustration: Mona Eing & Michael Meissner; Photo: picture alliance/Rupert Oberhäuser

literally, a thorn in the eye of many citizens. According to a report by the Federation-Länder cooperation committee, planning takes at least five years, sometimes even twelve years. So wind power has limits in terms of acceptance, in addition to physical ones. The more wind turbines there are in a region, the weaker the wind becomes because the atmosphere is unable to compensate for the losses. These are the findings of a study by the Max Planck Institute for Biogeochemistry in Jena. The searchers predict that if new wind turbines were built in proportion to the existing wind turbines, i.e. especially in the northern German states, the yield would be reduced by a good ten per cent. In addition, the planned dense offshore expansion in the North Sea will result in a 40 per cent reduction in yield, due to too many plants being located in too small a space. 'Due to the geographic and meteorological situation in Germany, we will not be able to achieve a full supply,' says Michael Beckmann in the magazine *energie+Mittelstand*.

'These are the three major storage technologies'

The problem is compounded by electrification in large parts of the economy. In 2015, electricity covered just under 22 per cent of final energy consumption in the European Union, but this share will rise to between 42 and 53 per cent by 2050, depending on the forecast. The EU is likely to require 3,500 to 4,800 terawatt-hours of gross electricity, which in the high-end scenario would be more than 2,000 terawatt-hours more than in 2015. In 20 to 30 years, electricity could be the dominant energy source. According to forecasts by the European Commission, the share of electricity in the heating supply in residential buildings will increase from 14 per cent in 2030 to between 22 and 44 per cent, depending on how quickly heat pumps are introduced. In commercial buildings, the development is even faster, from a share of 29 per cent in 2030 to between 44 and 60 per cent in 2050. Electricity is also rising in the transport sector, where battery-powered electric cars are being vigorously promoted. Nevertheless, the Federation of German Industries (BDI) believes that a 22 per cent addition of green fuels – e.g. efuels – by 2030 is essential for the decarbonisation of existing vehicle fleets.

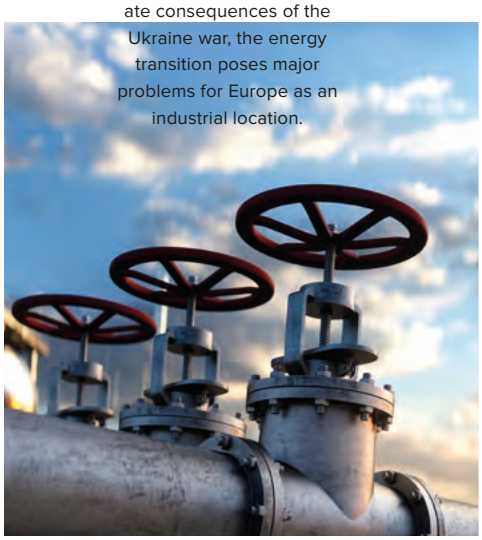
According to Eurostat, in 2021, the EU generated five per cent more electricity from renewable sources than in 2020. However, as demand accelerated at the same time, the share of green electricity in gross electricity consumption grew by just 0.1 per cent – from 37.4 to 37.5 per cent. Wind and solar power account for just over half of this, while biomass and hydropower account for the remainder. The latter holds a dominant position in the energy supply of individual EU countries such as Austria, Sweden and Croatia.

Here is the sore point: the electricity system has virtually zero storage capacity. The existing electricity storage facilities are at best sufficient to supply Germany with electricity for 30 to a maximum of 60 minutes in an emergency. And unlike other energy sources, wind and solar energy are notoriously unreliable. If the sky is dark and there is no wind, their ability to yield melts like an ice lolly in the desert. On the other hand, on days with a lot of wind or sun, renewables could also supply more electricity than needed, which would result in bitter energy losses due to curtailments. An analysis by the lobby organisation Agora Energiewende shows that, in the future, Germany will either have to import missing electricity or regulate excess electricity because wind turbines and solar panels sometimes produce too much and sometimes too little of it. 'We need secondary energy sources that will allow us to bridge periods when the sun is not shining and the wind is not blowing,' says Beckmann. 'That could be hydrogen.'

'The magnitude of the transformation is permanently underestimated.'

Michael Beckmann,
Professor of Energy Process Engineering,
TU Dresden

It is essential to discover storage options. 'Batteries, heat storage and hydrogen are the three major storage technologies that are needed in combination with wind and solar power,' says André Thess. Hydrogen is green and emission-free if it is produced from renewable energies. Sunny and windy regions of the world, such as North Africa, South America, the Middle East and Australia, are ideal for hydrogen production. The ideal scenario is to convert the green hydrogen into gaseous or liquid energy carriers – above all, synthetic fuels called efuels, but also methane or ammonia – and then ship them to Europe. After all, hydrogen derivatives are excellent storage media for energy. Unlike electricity, they can be moved over greater distances and easily integrated into the energy system on site. Efuels, for example, would not require converting existing filling stations; the synthetic fuels can be stored for any length of time without energy losses and they have the potential to greatly reduce the carbon footprint of the petrol and diesel vehicle fleet. Ten years from now, this will still comprise tens of millions of vehicles across Europe, regardless of the strides made in electromobility by then. Hydrogen remains expensive and the market is only just beginning to emerge – but rising fossil fuel prices are currently closing the gap. 'I expect to see hydrogen applications increase faster than we would have seen if fossil energy prices had remained low,' concludes André Thess. If his prediction holds true, there could at least be a silver lining to the damage caused by the energy crisis.



Potential crisis: Together with the immediate consequences of the Ukraine war, the energy transition poses major problems for Europe as an industrial location.

Photos: Tobias Ritz/TU Dresden; Studio-Fi /stock.adobe.com

Mr Oetjen, the Federal Minister of Transport Volker Wissing, like you a member of the FDP, has ensured through his political efforts in Brussels that it will still be legal to register combustion cars that run on efuels after 2035. This confirms our rapid move away from fossil fuels in the interests of climate protection. However, in view of the criticism, the EU Parliament does not seem to see it that way?

_____ Volker Wissing has been successful in promoting efuels and technology openness. Electric drive systems are not the only carbon-neutral solution, and politicians should not presume to pick winners and losers between technologies. In this light, this agreement is an important step towards ensuring affordable and climate-neutral mobility for all EU citizens, not to mention millions of jobs. I am therefore confident that my fellow MEPs will act in the interests of their constituents and support this agreement.

? The use of efuels is now on the EU's political agenda. When do you expect the EU Commission's proposal for passenger cars?

_____ The issue remains high on the agenda. We in the FDP are waiting, as agreed with the European Commission, for the timetable to be adhered to. A proposal to include efuels in the Euro6 standard is due to be presented in July. It will then have to be approved by the relevant Commission committee, which we expect to happen. The European Parliament will then have three months to approve or reject this delegated act.

? A regulation on the EURO standard seems complicated. What do you think is the right approach?

_____The regulation on the EURO standard is now the agreed way forward and that is what we are doing. Other ways would be easier, but it is politically impossible to build a majority behind them.

Jan-Christoph Oetjen
is a German FDP MEP from Rotenburg, Lower Saxony. In 2019, he became vice chairman of the TRAN Committee, alternate member of the LIBE, DEVE and DROI Committees, after serving three terms in the Lower Saxony Parliament from 2004 to 2019. During his time in the Lower Saxony Parliament, Jan-Christoph Oetjen became an expert in the fields of migration and asylum as well as agriculture. He has been a member of Germany's liberal Free Democratic Party (FDP) since 1995 and leads its work in the European Parliament in the areas of aviation and railways, migration and asylum, human rights and development cooperation with Africa.

‘An important step towards ensuring affordable and climate-neutral mobility for all EU citizens’

INTERVIEW BY Gerhard Walter

The use of efuels is one way to make individual climate-friendly mobility affordable in the future. Jan-Christoph Oetjen, Member of the European Parliament, is convinced of this. In an interview, the liberal reveals why the German FDP will continue to advocate technological openness in Europe and why it is important to create incentives for the use of fossil fuels.

? The Commission will soon debate the proposal on CO_2 fleet limits for lorries. Will you follow a similar strategy for cars?

_____ Yes, we in the FDP remain true to the principle of technological openness. In the debate on CO_2 fleet limits for lorries, we will again advocate a comprehensive strategy based on technology-neutral solutions. It is important to create incentives for the development and use of low-emission technologies that take into account both environmental objectives and the competitiveness of European industry.

? What would need to happen in order to be able to introduce synthetic fuels across Europe?

_____ The next step is to create a vehicle category exclusively for efuelled vehicles. The second step is to integrate this category into the fleet limit regulation. Once this has been achieved, there will be nothing to stop combustion engines running on efuels.

? A concept for establishing efuel production plants in windy and sunny regions of the world is undoubtedly important – but isn’t it high time that hydrocarbons, which are net carbon-neutral, were also generally accepted as part of the EU’s zero-emissions strategy? After all, this would be a forward-looking project just waiting for the political will to finally unleash it …

_____ The acceptance of carbon-neutral hydrocarbons as part of the EU’s zero-emission strategy is an important debate. It makes sense to consider all technologies and approaches that can contribute to decarbonisation. A full assessment of sustainability and environmental impact is essential. Incentives should be created to promote innovative and efficient technologies for the production and use of carbon-neutral hydrocarbons.

? It still seems that many in the EU Commission are willing to surrender Europe’s leadership in combustion engines without a fight. Wouldn’t it be more appropriate to promote projects with a high efficiency of more than 45 per cent for combustion engines in passenger cars, as the Chinese government is doing, for example?

_____ In my opinion, yes. It is surprising how many people in Brussels and in national governments believe that the combustion engine is an outdated technology. That is for the market to decide, for consumers to decide. Not politics. As long as we meet our climate targets, we should not impose a blanket ban on a technology, especially one that ensures prosperity in Europe and where we are the world leader.

? To what extent can the current energy policy strategy actually enable Europe to meet its ambitious targets for carbon neutrality in transport by 2045?

_____ We need to cut red tape, i.e. make it easier for businesses, and we need to make a conscious effort to build up renewable energy capacity. Other pillars include the promotion of low-emission vehicles, the expansion of charging infrastructure for electric vehicles, the development of sustainable fuels and the promotion of research and innovation. It is also important for policymakers to create a clear and stable framework to enable investment in climate-friendly mobility. These are opportunities and challenges that we want to seize together with the people. Courage instead of fear. →

Photo: Fred Marvaux/European Union 2019 - Source : EP

→
Looking ahead:
The use of efuels is one way of making individual, climate-friendly mobility affordable in the future. By using efuels, existing vehicles with combustion engines can help reduce emissions without people having to buy expensive electric cars.

? Climate-friendly mobility for all – this is what you wrote on your website in mid March. To what extent does the use of efuels also present an opportunity to make individual climate-friendly mobility affordable in the future?
_____ The use of efuels is one way of making individual, climate-friendly mobility affordable in the future. By using efuels, existing vehicles with combustion engines can help reduce emissions without having to buy expensive electric cars. This may be particularly relevant for certain vehicle segments and regions where alternative powertrain technologies are not yet widely available or where infrastructure challenges exist.

? On the subject of resilience, wouldn't it make more sense to rely on renewable electricity, gas and liquid energy sources rather than just going all-electric?
_____ That is exactly what we in the FDP mean by technology openness. The goal of climate neutrality is clear. Politics should only decide how we get there if the free market fails to. Fewer regulations, more freedom for companies and people, while meeting climate targets. It's possible.

? Let's look across the Atlantic: European companies are migrating to the US because green investments are rewarded with large subsidies under the Inflation Reduction Act. What should Europe offer in response to this US industrial policy strategy?
_____ The EU already has a response to the IRA: the Net Zero Industry Act. By 2030, 40 per cent of the EU's demand for key technologies should be produced within the EU. It's an ambitious target, as it should be. These technologies include photovoltaics, batteries and heat pumps, but also fuel cells, biogas/biomethane and carbon storage. Similar to the US through the IRA, the EU is orienting its industry and other parts of Europe's value chains towards future technologies through the NZIA. As a representative of the FDP, I remain committed to ensuring that Europe maintains important friendships and partnerships while standing on its own two feet. Unfortunately, we have lost this in some areas.

? One of the possible consequences of a badly managed energy revolution is the loss of jobs and the relocation of added value. To what extent is Europe at risk of losing its industrial core and skills in the coming years as a result of a poorly managed energy revolution?
_____ Unfortunately, the chances of this happening are not small. As the FDP, we want to combine Germany's self-imposed climate targets with economic recovery. Almost all climate issues offer opportunities that Germany should seize. This is what we are committed to. If we fail to do so, we will pay a high price for the climate transformation of our society and run the risk of overburdening our fellow citizens. There is a risk of potential deindustrialisation. We must act decisively to counter this.

? Electric vehicles, heat pumps and the production of green hydrogen using renewable energies – Europe is pinning its hopes for climate protection on green electricity. But the Achilles heel of this plan is the European electricity grid and its state of suboptimal development. Is this a prophecy of doom or an actual risk?
_____ The European electricity grid is indeed a challenge for the expansion of renewable energies and the integration of e-mobility, heat pumps and green hydrogen. Targeted investment and modernisation of the grid are required to meet growing demand. This includes increasing transmission capacity, developing smart grids and promoting energy storage solutions. It is important for Europe to take the necessary measures to modernise its infrastructure and meet its climate protection targets.

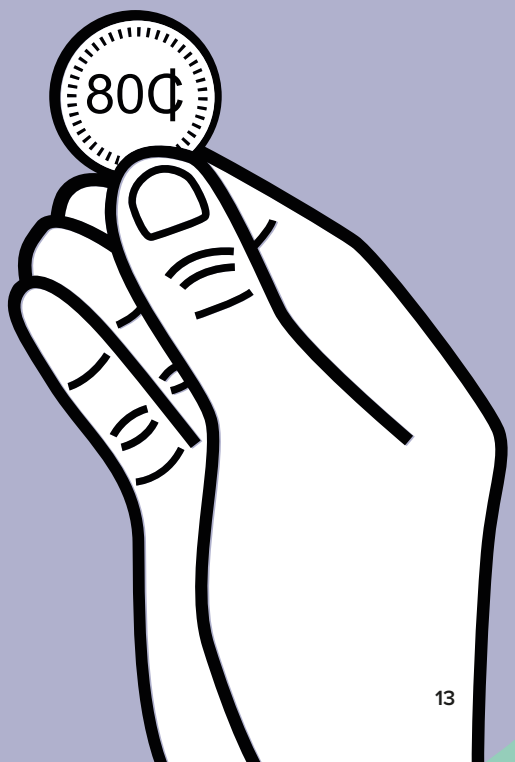
'Fewer regulations, more freedom for companies and people, while meeting climate targets. It's possible.'

Photo: Genevieve Engel/European Union 2021 - Source : EP

80 cents

▶ *is what it costs to produce one litre of green synthetic fuel in the sunny and windy regions of the world. This is the conclusion arrived at by Professor Thomas Koch, head of the Institute of Piston Machines at the Karlsruhe Institute of Technology (KIT). Koch is one of Europe's most distinguished experts in combustion engines and drive technology. His conclusion refutes the oft-repeated claim that the production of green hydrogen and its derivatives is an uneconomical pursuit. What is instead true is that the production of hydrogen and green carbon-neutral fuels requires electricity, and the price of that energy plays a decisive role in production. In Saudi Arabia, for example, one kilowatt-hour of electricity from solar energy costs around one euro cent – if around 20 kilowatt-hours of green power are required to produce one litre of green hydrogen, the energy costs are around 20 cents. Then there are expenses for the electrolysis of hydrogen from water and the synthesis of hydrogen into a carbon-neutral synthetic liquid fuel, as well as costs for carbon recovery from point sources and, in the medium term, from the atmosphere, along with the costs of running and maintaining on-site wind or solar power plants. Finally, the additional costs of transporting green liquid fuels via tankers or pipelines must be taken into account. These, however, as is well known, are marginal.*

Thanks to a successful market ramp-up and industrial production in the windy and sunny regions of the world, synthetic fuels could be available in Europe for around 1.60 euros per litre by 2030. This would make synthetic fuels competitive with fossil fuels. The scenario would benefit climate protection and affordable individual mobility in equal measure. However, it would require a clear import strategy and an appropriate regulatory framework for synthetic fuels. Even at a price of around two cents per kilowatt-hour of electricity from wind or solar power (such as in southern Africa, especially Namibia, and the Atacama region in northern Chile and Argentina), the cost of producing green carbon-neutral fuel in large quantities could be less than one euro per litre in the long run. ◀



Icon: Flaticon

ON COURSE FOR GREEN

WRITTEN BY Sebastian Wolking

Global aviation and shipping should be carbon-neutral by 2050 at the latest. In place of fossil fuels, carbon-neutral fuels will be used to power aircraft and ships.

The international aviation and shipping industry is recovering from the economic downturn caused by the coronavirus pandemic – and is heading towards its peak levels of 2018/19. The International Air Transport Association (IATA) estimates that airlines will be booking at least 47 million flights by the end of 2023. The situation is similar in the shipping sector: having resumed their routes, both cargo vessels and cruise ships are expanding their fleets considerably.

But what is good for the free movement of passengers and the global flow of goods and the economy is damaging to the climate. According to the European Parliament, European air transport already accounts for 3.4 per cent of global greenhouse emissions; shipping, for 3.6 per cent. Companies in the aviation and shipping industries have recognised the problem – and have set course for carbon neutrality. In early October 2022, in Montreal, Canada, at the headquarters of the International Civil Aviation Organization (ICAO), representatives of 184 countries set a common climate target: the global civil aviation sector would have net-zero carbon emissions by 2050 at the latest.

Ramp-up of carbon-neutral fuels

Using various concepts, the signatories are working on replacing climate-damaging fossil fuels with green and synthetic alternatives. Sustainable aviation fuels (SAFs) will have an important role to play in the aviation sector. These include waste fats (such as used cooking oils from the fryer) and renewable biomass such as forest waste as well as synthetic fuels from renewable sources (efuels). Most commonly in use at the moment are waste fats known as HEFA (hydroprocessed esters and fatty acids), for example, from commercial kitchens.

So far, the share of SAFs in aviation is only 0.1 per cent. At the end of April, however, the European Council and Parliament agreed on a ramp-up of climate-neutral aviation fuels as part of the 'ReFuelEU Aviation' initiative, which calls for at least two per cent of aviation fuels to be carbon-neutral by 2025. This share will be increased every five years: to six per cent in 2030, 20 per cent in 2035, 34 per cent in 2040, 42 per cent in 2045 and, finally, to 70 per cent in 2050. The agreement has yet to be formally approved by Parliament and the EU states. According to a report by the European Union Aviation Safety Agency (EASA), the use of SAFs could reduce aviation emissions by up to 69 per cent by 2050. 'Liquid fuels are no alternative in the aviation sector,' explains Ralf Diemer, Managing Director of the eFuel Alliance. With the quotas set, the industry now has a concrete roadmap.

Flying with deep-frying fat

European aircraft manufacturer Airbus recently tested the positive effects of SAFs on the environment. Its boss Guillaume Faury is convinced that the dream of climate-neutral aviation is feasible. In the VOLCAN (VOL avec Carburants Alternatifs Nouveau) project, both engines of an Airbus A321neo were filled with an SAF; the test series was carried out with different shares of SAFs. In tow along the French coast, he had a research aircraft from the German Aerospace Center (German: Deutsches Zentrum für Luft- und Raumfahrt; DLR) measure the emissions and ice crystals in the exhaust gas jet, known as contrails. A familiar sight in the sky, these contrails are considered to be far worse for the climate than kerosene, as artificial clouds retain the earth's heat even more intensively than carbon. The result: even with a 50:50 mixture of kerosene and SAF, the ice crystals in contrails can be reduced in such a way that they have a 20 to 30 per cent lower impact on the climate.

However, SAFs cannot yet be used broadly, as there are simply too few of them. The available quantity currently accounts for only 0.02 per cent of global aviation fuel consumption; there is a lack of the necessary refineries. One of the largest manufacturers, the Finnish company Neste, produced around 100,000 tonnes of SAF in 2022. 'The target of ten per cent SAFs by 2030 will require around 40 million tonnes,' explains Thorsten Lange, Executive Vice President of Renewable Fuels at Neste. Airbus is already securing SAF access and cooperating with Neste. 'All Airbus aircraft are already certified to fly with up to 50 per cent SAFs. By the end of the decade, it could be 100 per cent,' explains Julie Kitcher, Executive Vice President of Communications, Sustainability and Corporate Affairs at Airbus.

But SAFs only serve the aircraft manufacturer as a bridge technology to a climate-neutral future: on short- and medium-haul routes, Airbus will rely on green hydrogen, which does not emit any carbon dioxide when it is produced from renewable energy sources. The corresponding A380 MSN1 flight test aircraft is currently being converted for the transport of liquid hydrogen tanks. The aircraft is planned to be commissioned by 2035. 'Fuel →

Photo: Yaorusheng/Getty Images

please continue on page 16

Game changer: The Danish A.P. Møller - Mærsk A/S Group, one of the largest container ship companies in the world, is using green methanol, produced by mixing carbon dioxide and green hydrogen produced by decomposing water molecules with the help of electricity from renewable energy sources, for the company's transition towards climate neutrality.

cell engines may be able to power an aircraft with 100 passengers and a range of approximately 1,000 nautical miles,' says Glenn Llewellyn, Vice President of Zero-Emission Aircraft, Airbus. The planes will then be refuelled at a first hydrogen refuelling station planned jointly with the ArianeGroup at Toulouse Airport.

An important and necessary alternative to SAFs from biomass in the long term are carbon-neutral efuels, used here as jet fuel. INERATEC has just broken ground for the first large-scale industrial PtL plant in Frankfurt, Germany. It is expected to produce up to 2,500 tonnes of sustainable efuels per year from 2024. DLR is also planning a production facility for efuels: construction on the technology platform PtL (TPP) is scheduled to begin in 2024 and will serve as a link between development and the industrial market ramp-up. It has not yet been decided where the plant will be built. In any case, according to TPP project manager Professor Manfred Aigner from the DLR Institute of Combustion Technology in Stuttgart, the platform will be able to produce up to 10,000 tonnes of efuels each year.

Synthetic kerosene from PtL plants is available in practically unlimited quantities, but requires large amounts of electricity and water. Sun-to-liquid technology, which uses solar heat for production, can help here. In Jülich near Aachen, Germany, Synhelion, a spin-off of ETH Zurich and DLR have built such a facility called DAWN. The plant is intended to show that this technology can also be used to produce SAFs on an industrial scale. Unlike the use of hydrogen or electric drives, SAFs allow the existing tanking infrastructure to still be used. 'The plant will show that solar fuels are not just a theoretical construct, but will soon make an active contribution to the decarbonisation of air and long-distance transport,' explains Patrick Hilger, Managing Director of Synhelion Germany. SWISS will be the first airline to take to the air using the carbon-neutral solar kerosene produced there. This makes the rapid market ramp-up and associated cost increases decisive for competition policy in the aviation sector. Technical and economic feasibility must go hand in hand.

At sea with green methanol

Cruise lines have long invested in the development of sustainable marine fuels such as liquefied natural gas (LNG), biofuels and synthetic fuels and are equipping new ships for connection to shore power. The members of CLIA, the world largest cruise lines association, were the first in the maritime sector to publicly commit to reducing carbon emissions by 40 per cent by 2030 compared to 2008. The world's first cruise ship powered by LNG was commissioned at the end of 2018.

'In 2022, we made significant progress towards our ambitions for 2030 and 2040 targets.'

Vincent Clerc,
CEO of the Danish A.P. Møller - Mærsk A/S Group

In contrast to the new EU regulation for the aviation sector, the 'Fit for 55' ReFuel Maritime law does not specify the fuels to be used for maritime transport, but determines the level of permissible emissions, reducing them over time: minus two per cent in 2025, minus 20 per cent in 2035 and minus 80 per cent by 2050. These targets apply to ships operating within the EU. And from 2030, when docking in major EU ports, container and cruise ships will have to cover their energy needs with electricity from the port.

Vincent Clerc, CEO of the Danish A.P. Møller - Mærsk A/S Group, one of the largest container ship companies in the world, is using green methanol, produced by mixing carbon dioxide and green hydrogen produced by decomposing water molecules with the help of electricity from renewable energy sources, for the company's transition towards climate neutrality. Mærsk has commissioned 19 new vessels that will run on green methanol. Once they are in use, they should be able to save around 2.3 million tonnes of carbon dioxide per year. To ensure the supply of electricity to the ships, Mærsk has signed a memorandum of understanding with nine green fuel manufacturers around the world and his company is also building its own plants, two of them in Spain. The first container ship to run on a hybrid propulsion system – green methanol and standard fuel – will set course for a green future starting in September.

Photos: VCG/Kontributor/Getty Images; picture alliance/Ritzau Scanpix/Emil Helms

Where the winds of technological change blow

Efuels are climate-friendly if they are produced in a carbon-neutral manner – a factory in Chile that has finally opened shows how using wind power can make this work on a large scale.

WRITTEN BY Frank Burger

The compromise that the German Federal Government has negotiated with the European Union is giving the internal combustion engine (ICE) a new lease on life: contrary to what was originally planned, ICE vehicles can still be registered in the EU after 2035 – provided they are carbon-neutral.

At this point, this is probably common knowledge and hardly bears mentioning. The political solution is a far-sighted one, as 1.3 billion cars around the world still run on combustion engines. Indeed, as Michael Steiner, Chief Development Officer at Porsche, emphasises, 'Many will still be on the road for decades.

Together with the energy and technology group Siemens, Porsche recently opened a factory in Chile that generates the electricity it needs from wind power – and the project should not be underestimated: the Haru Oni plant near Punta Arenas is the first in the world to produce synthetic fuels on an industrial scale. By 2025, with 50 wind turbines to date and a total capacity of 320 megawatts, it is expected to produce around 55 million litres per year, and by 2027, it will produce as much as 550 million litres per year.

The factory is the initiators' way of acknowledging their responsibility for future generations who will be even more affected by climate change: 'We are facing one of the greatest challenges in the history of our species,' says André Clark, Vice President of Siemens Energy Latin America.
The key to the factory's enormous capacity is the constant wind blowing in the southern regions of the South American country – unlike in Germany, for example, where petrol and diesel are used rather than produced.

While there are 14,000 kilometres of water between Punta Arenas and the Port of Hamburg, it is only 126 kilometres to Cabro Negro harbour, located directly on the Strait of Magellan. It is clear that when choosing its location, the factory's planners also made sure that tankers would be able to embark on their crossing nearly immediately. This is relevant due to the compelling logistical argument in favour of green efuels: they can be transported over long distances just as easily as conventional liquid fuels.

Photo: tifonimages/iStock/Getty Images

ELECTRIC CARS COMPETE WITH WIND AND SOLAR

The production of electric cars could jeopardise the energy revolution throughout Europe. Will wind turbines and solar plants fall by the wayside in the race for scarce, expensive raw materials?

TEXT Iris Quirin and Thomas Trösch

Sun and wind instead of oil and gas – climate change can only be combated effectively by expanding renewable energies. This is true in Europe as well as any other nation committed to systematic defossilisation. According to the EU Parliament's vote, combustion engines will only be approved throughout Europe from 2035 onwards if they run on efuels. Together with electric cars, these 'green combustion engines' will form the foundation for carbon-neutral individual mobility. Unlike the use of green synthetic fuels, electric cars, which have long been promoted by politicians in many places unilaterally, are already gaining momentum on Europe's roads. According to the European Automobile Manufacturers Association ACEA, almost one tenth of new cars sold in 2021 were electric. Automotive supplier Bosch predicts that by 2030, two-thirds of all newly registered cars in Europe will be electric cars. But here's the catch: they rely on the same raw materials that are required for the expansion of renewable energies.

Operators such as the Danish energy company Ørsted assume that the production of offshore wind turbines will have to triple in order to reach the EU's climate targets of reducing greenhouse gases by at least 55 per cent by 2030 compared to 1990. There is also a consensus, however, that expansion should not be equated with energy self-sufficiency, which Europe, in spite of all its efforts, will not be able to achieve: the continent's native resources are simply too few, and its labour and manufacturing costs too high.

'If the automotive industry pushes ahead with its goal of a one-to-one replacement of combustion engines by electric cars, it will be competing with the energy industry for these high-demand metals.'

Michael Reckordt,
Co-author of the Powershift study

Against this backdrop, importing carbon-neutral liquid green energy sources from regions with inexhaustible wind and solar resources will also play an important role in any future European energy policy. For example, there are 97 countries and regions around the globe, on an area of coastlines and inland waterways covering 2.4 million square miles, with the potential to supply Europe with green hydrogen and carbon-neutral synthetic fuels. But the raw materials that are urgently needed for the construction of wind turbines or solar power plants are also in demand in other sectors. Experts from the Germany-based NGO Powershift therefore warn against a 'wide gap in the metal market' if demand for raw materials such as steel, nickel, copper or aluminium continues to increase due to high reliance on individual passenger cars. For example, a study conducted by Powershift shows that the automotive sector's growing demand for copper for electric car batteries could jeopardise the expansion of renewable electricity production.

'The amount of metal raw materials required has tripled'

'Wind energy and solar power are often seen as drivers of metal consumption,' says Michael Reckordt, one of the authors of the Powershift study. 'We looked at whether that is actually true.'

Fotos: Bernhard Ludewig/PowerShift ; NiseriN/iStock

The study found that, in addition to tonnes of steel, a wind turbine contains copper, selenium, manganese and many other raw materials. Solar modules also contain rare metals such as silver and indium, in addition to silicon, aluminium and various plastics. Compared to the metal-intensive automotive industry, however, wind energy and solar power are therefore not strong drivers of metal consumption. Nevertheless, many companies from sectors such as transport, agriculture, metalworking and energy are already competing for these raw materials.

'The amount of metal raw materials required has tripled over the past 20 years,' notes Reckordt. 'In addition to fossil and renewable energy production, the automotive industry is also one of the main drivers of metal consumption.' Reckordt and his co-authors examined the enormous future demand that can be expected in the industry, using the example of the VW Group. To achieve the car manufacturer's target of equipping seventy per cent of all vehicles sold with battery power by 2030, VW would need 800,000 tonnes of aluminium and 250,000 tonnes of nickel – for car batteries alone. 'If the automotive industry pushes ahead with its goal of a one-to-one replacement of combustion engines by electric cars, it will be competing with the energy industry for these high-demand metals.' In its study, Powershift refers to a presentation by the University of Leuven in Belgium, which states that the transport sector will be responsible for 60 per cent of the raw material consumption predicted for the future.

Such competition would not only mean a drastic increase in prices and thus an increase in the cost of the energy revolution. It would also lead to a further intensification of the mining industry – with all the negative environmental and social consequences that can already be observed in many mining areas today. Take, for example, the Bayan Obo mine in the Inner Mongolia Autonomous Region of the People's Republic of China, where ruthless over-exploitation is destroying the natural livelihoods of the area's people, animals and plants. China currently extracts and processes 87 per cent of the world's rare earth resources as well as most of the metals that the energy revolution relies on, such as cobalt, copper, lithium and nickel. The growing demand for metals is leading the European economy directly into new, undesirable dependencies.

This could change in the future: According to a recent draft of the Critical Raw Materials Act (CRM Act), the EU Commission plans to bring 40 per cent of the further processing of strategically important raw materials to Europe and also wants to promote large-scale mining in the EU. The industry hopes to contribute to European self-sufficiency from the discovery of what is probably the continent's largest rare earth resource in Kiruna in northern Sweden last January. However, it remains to be seen how much of the material used in smartphones, electric engines or wind turbines will ultimately be sold by Sweden – and, more crucially, when. After all, the Swedish mining company LKAB first has to apply for mining approval, says Managing Director Jan Moström in the *Tagesschau news* proramme: 'If we establish the mine according to the approval procedures in place today, it will take another ten to 15 years. If the green revolution is to succeed, we need to significantly speed up this process, because technically it can be done much faster.' And so many manufacturers whose products are powered by rare earths would also like the CRM Act to significantly shorten the approval process for mining projects from the current ten years.

PLANTS

'Circular economy strategy at EU level'

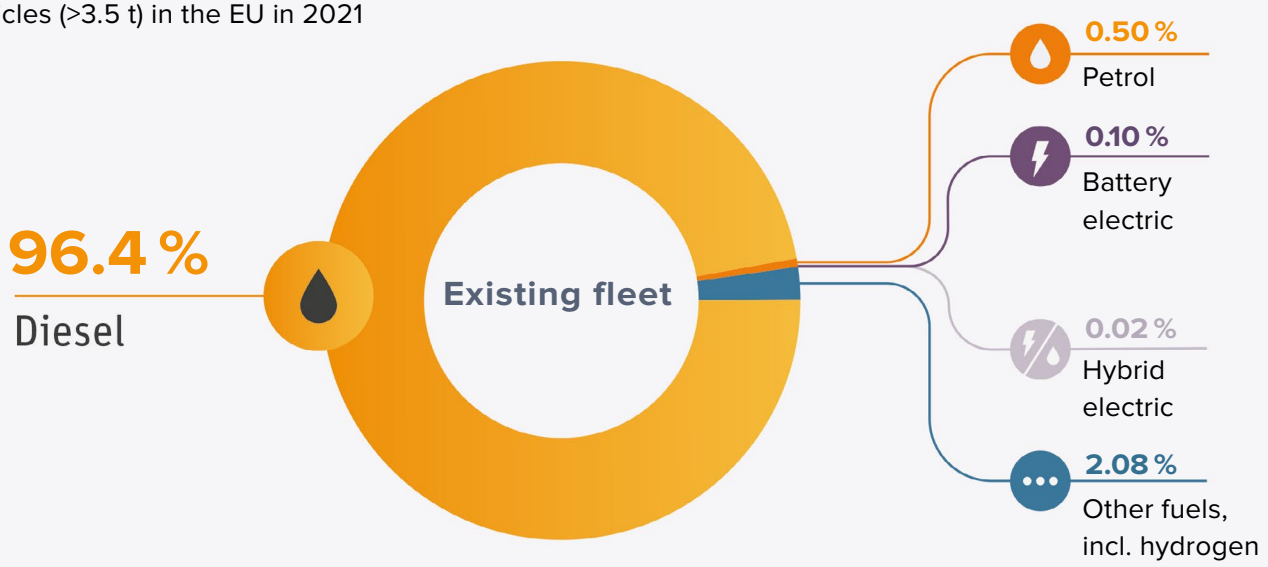
However, Powershift raw materials expert Reckordt sees further room for improvement in the draft of the CRM Act: 'Even on important issues such as recycling, the draft only formulates imprecise wishes for member states,' he says and calls for binding recycling and recyclate use quotas. There is still a lot of room for manoeuvre here, Reckordt claims, especially in energy-intensive sectors such as the car manufacturing and construction industries.

VW has quantified how much recycling the automotive industry already uses: for a 400-kilo battery, the recovered raw materials add up to over 100 kilos of aluminium, over 100 kilos of electrode materials such as lithium, nickel, manganese, cobalt and graphite and over 20 kilos of copper. 'We need to counteract the impending shortage of raw materials with a circular economy strategy – and at a European level,' says Reckordt. For Michael Reckordt, it is obvious that the European energy revolution cannot succeed without raw materials: 'Our results prove the urgency of transforming the way we handle raw materials if we are to revolutionise their use. Just like fossil fuels, renewable energy production is very metal-intensive. But I still see no alternatives to renewables if we want to achieve the goal of decarbonisation. That's why we need to reduce primary consumption more strongly elsewhere.'

Heavy-duty commercial vehicles in the EU – alternative charging/ refuelling infrastructure almost non-existent

Only 0.1% of lorries run on electricity

Share of fuel types in the medium- and heavy-duty vehicle fleet and heavy commercial vehicles (>3.5 t) in the EU in 2021



Diesel also clearly dominates among newly registered vehicles

Share of fuel types among new registrations of medium- and heavy-duty commercial vehicles (>3.5 t) in the EU in 2021

* Lorry charging points are almost non-existent to date. There is no data on the existing charging infrastructure in the EU countries.

Sources: Statista, ACEA, European Commission, FuelsEurope

	Filling stations	Hydrogen filling stations	Lorry charging points (800 kW)*
Belgium	3,121	3	/
Bulgaria	3,531	0	/
Denmark	2,068	6	/
Germany	14,458	89	/
Estonia	491	0	/
Finland	N/A	0	/
France	11,151	19	/
Greece	5,889	0	/
Ireland	1,906	0	/
Italy	21,700	1	/
Croatia	N/A	0	/
Latvia	605	0	/
Lithuania	N/A	0	/
Luxembourg	235	0	/
Netherlands	4,147	7	/
Austria	2,748	4	/
Poland	7,852	0	/
Portugal	3,333	0	/
Romania	2,292	0	/
Sweden	2,678	3	/
Slovakia	1,003	0	/
Slovenia	N/A	0	/
Spain	11,810	3	/
Hungary	2,015	0	/

* Lorry charging points are almost non-existent to date. There is no data on the existing charging infrastructure in the EU countries.

Graphics: UNITI

‘Drop-in substitutes for fossil fuels are essential’

In order for Europe’s more than 280 million existing vehicles to be able to roll along the roads in a climate-neutral way in the future, renewable ‘drop-in’ substitutes for fossil fuels are essential – CLEPA Secretary General Benjamin Krieger is convinced of this. In an interview, he explains how the energy transition in Europe can succeed.

Mr Krieger, although the EU Council of Ministers recently voted in favour of the use of green synthetic fuels in combustion cars even after 2035, European policy seems to continue to focus on e-mobility as the most important building block for decarbonisation in transport. As Secretary General of the European automotive supply industry, what are your views on this policy planning?

Electrification will play a crucial role in achieving the objectives of the European Green Deal. But the continued emphasis in Europe on e-mobility as the only means to decarbonise the automotive industry risks excluding other climate-neutral solutions and limiting future innovation.

In fact, renewable alternative fuels and e-mobility actually complement each other, not only in current hybrid technologies, but also as important elements of a comprehensive strategy to achieve climate-neutral mobility in Europe. We need these ‘drop-in’ ready substitutes for fossil fuels in order to decarbonise the existing fleet of over 280 million vehicles on the road today.

The shift towards e-mobility, including →

INTERVIEW BY Gerhard Walter

Photo: CLEPA

Benjamin Krieger
has been Secretary General of CLEPA – European Automotive Suppliers Association – since September 2022. Working closely with the team, members, and key stakeholders, he aims to ensure that the EU policy community embrace the CLEPA vision to be the leading provider of innovative technologies and solutions for safe, sustainable and smart mobility around the world. CLEPA represents over 120 of the world's best-known automotive suppliers directly and over 3,000 indirectly through 25 national trade and European industry associations.

in major automotive markets like China and the US, who strongly promote alternative drivetrains, is clear. But the key word here is promote. No other market in the world has effectively banned the internal combustion engine.

? How will European suppliers have to develop their business model that has been so successful for many years?
_____ Automotive suppliers will have to invest around 20 billion euros per year in capital expenditures, R & D and reskilling measures in the years ahead. Many e-mobility activities are not yet profitable, so it will be a balancing act of generating profitability in the ICE space while investing in green and smart mobility. Other trends, such as the increasing role of software in vehicle performance, digital services, sustainability reporting and supply chain responsibilities, and closer collaboration across supply chains all will require significant changes to business models. These will have to be implemented against the background of still significantly lower car sales and with weakened balance sheets after three years of crisis. Meanwhile, new entrants, either from markets like China or from the digital economy, will pose a competitive challenge.

? To what extent is technological openness a criterion for the decarbonisation of European transport?
_____ Automotive suppliers have long advocated for an approach that encourages innovation and investment in a range of climate-neutral technologies, such as hybrids, hydrogen and sustainable renewable fuels, alongside electrification. Powertrain electrification comes itself in many forms, from full battery electric to, for example, the e-trailer, which can complement a lorry's conventional drive. Technology openness is an essential element to driving forward innovation and decarbonisation, promoting affordable and sustainable mobility solutions with real impact, while supporting the competitiveness of the European automotive industry. Mobility is an essential part of our daily lives, and we need to find a way to balance efforts to reduce emissions with affordability, employment, innovation and EU competitiveness. No one is questioning the green mobility revolution, but parallel and complementary climate-neutral solutions simply make sense in the current economic and political context. Energy prices and the Inflation Reduction Act (IRA) in the US are two key challenges, but not the only ones.

? What importance do you and CLEPA members attach to the use of green carbon-neutral fuels that are produced, for example, in sunny and windy regions of the world and transported to Europe by tanker or pipeline?
_____ Carbon-neutral fuels should be a complement to electrification and help meet the challenge of decarbonising the existing fleet. Europe will not be energy independent, so it makes sense to consider an import strategy for renewable fuels. Synthetic fuels and green hydrogen would be best produced where green electricity is abundant, in windy and sunny regions, to complement European production.

? Green diesel fuel from used vegetable fats can also contribute to carbon neutrality. The German Bundestag recently voted to allow HVO (Hydrotreated Vegetable Oils) to be sold in pure form at public filling stations in Germany. Why is this vote so important for European transport policy?
_____ Renewable fuels come in many forms, and recycled cooking oil is one of them. As an association representing automotive suppliers, we don't comment on the different types of renewable fuels, as this is the domain of the oil and refining industry. What is important is that sustainable renewable fuels are seen as part of an overall approach to gradually replace fossil fuels.

? Frans Timmermans, the Vice-President of the European Commission, told the Handelsblatt newspaper some time ago that he thought it would be quite a challenge, to put it very mildly, for cars with combustion engines to be emission-free. How can Mr Timmermans be persuaded otherwise?
_____ The technology of the powertrain is not the enemy, fossil fuels are. Sustainable renewable fuels sequester CO_2 from the atmosphere (in the case of efuels and other synthetic fuels) or from plants (in the case of biofuels) and emit that same CO_2 back into the atmosphere when burned in an engine. Since those emissions are offset by those sequestered, the fuels can be carbon-neutral. The issue is that current CO_2 emission standards are measured at the tailpipe only. And to achieve zero emissions after 2035, as currently mandated, only electric vehicles (full battery electric or fuel cells) qualify. However, we know that 'tailpipe only' is not representative of a vehicle's entire carbon footprint. For example, a lot of energy is used (and CO_2 emitted) in the production of the vehicle, including for example, batteries for EVs. This is why CLEPA has long advocated for a more holistic approach, such as a life cycle assessment (LCA), starting with a well-to-wheel approach (including fuel and energy production). There are several studies on vehicle LCA, but they use different methodologies and assumptions. We need a common methodology to compare apples to apples and put all technologies on a level playing field.

? To what extent is the use of efuels after 2035 also an opportunity for less affluent EU states to become an active part of the European energy revolution?
_____ Less affluent countries have on average an older car fleet, which makes it unlikely that electrification alone will deliver the energy revolution in time. Renewable fuels will have to play a crucial role in defossilising the existing fleet. Southern European countries may also find opportunities by using an abundance of solar energy to produce efuels or by taking advantage of their proximity to third countries that may be well placed to do so.

TEXT Kristina Simons

HYDROGEN:

PRODUCTION ON THE HIGH SEAS

↑ **Project Sealhyfe:** The world's first floating offshore electrolyser is being tested off the French Atlantic coast.

French Cleantech company Lhyfe is building the world's first offshore electrolyser. 'Sealhyfe' is going to produce green hydrogen directly at sea. The test run began in September 2022. At the end of May, the system is to be docked to a floating wind turbine on the high seas.

Europe is a pioneer in offshore wind energy, with Great Britain and Denmark commissioning the first offshore wind turbines in the early 2000s. Clearly lagging behind, France did not open its first offshore wind farm until September 2022 – around 12 kilometres off the Atlantic coast near Saint-Nazaire. Eighty turbines with a total capacity of 480 megawatts (MW) were installed on an area of 78 square kilometres. But this is only just the beginning. President Emmanuel Macron announced plans for 50 offshore wind farms in France that will deliver a total of 40 gigawatts of green power by the middle of the century. Lhyfe, a company founded in Nantes in 2017, is just on cue for France's entry into offshore wind power. 'The acceleration of offshore wind power development announced by the President of the French

Photos: Lhyfe (2)

Republic will strongly support the deployment of Lhyfe as part of our offshore strategy,' said Matthieu Guesné, CEO and founder of Lhyfe, at the inauguration of Sealhyfe, the world's first offshore electrolyser. Fittingly, the event took place just as the country's first wind farm was going online.

Lhyfe, which produces and supplies green hydrogen for the mobility and industry sectors, is already involved in 93 projects across Europe. The floating electrolyser Sealhyfe is the young company's newest advancement. By using green electricity to split water into its constituents, hydrogen and oxygen, electrolysers play a key role in building a green hydrogen economy. Green hydrogen, in turn, is the basis for the production of sustainable synthetic fuels or efuels: when CO_2 is added to the hydrogen as a kind of catalyst, synthesis gas is produced. With the help of special liquefaction processes, this type of gas can be used to produce efuels for trucks, ships, aircraft and more. This means efuels are a good decarbonisation strategy for sectors such as sea, air and heavy transport, which, at least currently, cannot be electrified. In addition, green hydrogen can be used to produce synthetic raw materials, such as waxes for the cosmetics, pharmaceutical and food industries.

Wind power and seawater

Lhyfe's bright-yellow 1 MW pilot plant is installed on a wave energy platform and is expected to produce renewable hydrogen in the middle of the ocean – up to 440 kilograms per day. A pipeline will then bring the green hydrogen ashore. The project partners, along with Lhyfe, are the University of Nantes and offshore specialist Chantiers de l'Atlantique. They hope that the offshore electrolyser will be ready for large-scale deployment in 2024.

The pilot plant will initially be tested under real conditions for six months on the quayside in the port of Saint-Nazaire. Then, the electrolyser will be tested for another 12 months under extreme conditions on the high seas. Here, 20 kilometres off the coast, is the SEM-REV offshore test site run by Centrale Nantes University. It is providing Lhyfe with access to its research infrastructures and supporting the company throughout the various regulatory, experimental and logistical phases. The site has been home to a floating 2 MW 'Floatgen' wind turbine since 2018, which the offshore electrolyser will be docked to. The Sealhyfe platform is secured to the ground with an anchor system and connected to the underwater hub at the site via a dedicated line for power and data transmission. The wind turbine powers the electrolyser, which is the world's first to use seawater to produce green hydrogen.

Stress test for electrolyser

In the test phase, the Sealhyfe system has to pass multiple stress tests, so the manufacturer Plug Power has optimised it for extraordinary operating conditions. Even with strong waves, the electrolyser must be able to carry out all the steps of hydrogen production: converting the electrical voltage of the floating wind turbine, pumping up seawater, desalinating and purifying it, and splitting the water molecules by electrolysis. Further, the system must be able to withstand shocks and temperature fluctuations without being damaged. As its position 20 kilometres off the coast is quite isolated, the Sea-lhyfe platform also has to function fully automatically.

After the pilot phase, the findings will be evaluated. Lhyfe intends to use the data to design and deploy further offshore production systems on a large scale. Between 2030 and 2035, the company plans to install a total of three gigawatts of offshore electrolysis capacity to generate green hydrogen. According to Lhyfe CEO Matthieu Guesné, Sealhyfe is paving the way for the mass production of renewable hydrogen at sea.

As part of a cooperation agreement concluded in November 2022, Lhyfe and the Port of Nantes – Saint Nazaire are now investigating how best to deliver renewable hydrogen to shore. The Saint-Nazaire Port Authority also intends to investigate possible application scenarios for the hydrogen sector within its port ecosystem. 'Green hydrogen is an emerging sector that we and many other players in the region believe in,' says Olivier Trétout, Chairman of the Board of Directors of the Port of Nantes – Saint Nazaire. 'The Port of Nantes – Saint Nazaire has the potential to play a key role in the energy revolution. Our partnership with Lhyfe is an important first step on this path.'

'We need to produce hydrogen cleanly and at a competitive price.'

Matthieu Guesné, CEO and founder of Lhyfe (left, speaking with Emmanuel Macron, President of the French Republic)

Technology openness

WHERE POLITICS MEETS PRACTICE – 'DIE AUTODOKTOREN'

Hans-Jürgen Faul and Holger Parsch are known to millions of German-speaking audiences on TV and on YouTube as 'Die Autodoktoren'. The two master car mechanics recently looked into the practicality of efuels. For a period of many months, they used a vehicle that runs on efuels in their workshop day-to-day to determine whether synthetic fuels are already suitable for use today. Their conclusion? They found no differences in vehicle operation compared to conventional fuels and no technical anomalies or problems – but with efuels, their car was a carbon-neutral road user.

At the invitation of Jens Gieseke, MEP of the EPP Group in the EU Parliament, the two car experts briefed EU parliamentarians such as Jan-Christoph Oetjen (Renew Europe Group), Barbara Thaler (EPP Group) and Dr Angelika Niebler (EPP) about their experiences with carbon-neutral fuels in an expert discussion at the end of June. Together with Dr Kurt-Christian Scheel, Managing Director of the Zentralverband Deutsches Kraftfahrzeuggewerbe, and Matthias Plötzke, Managing Director of the UNITI Bundesverband mittelständischer Mineralölunternehmen, Die Autodoktoren discussed with the representatives of the European Parliament the need for the use of efuels and the opportunities they afford. The exchange in Brussels can be viewed on the Die Autodoktoren YouTube channel. It was not only the politicians who benefited from the practical report given by Die Autodoktoren: the occasion also offered fans of the two car experts some interesting insights into how the European Parliament works.

Discussion about the importance of efuels: Dr Kurt-Christian Scheel, Holger Parsch, Matthias Plötzke, Jens Gieseke and Hans-Jürgen Faul (right photo, from left) and Austrian MEP Barbara Thaler of the ÖVP/EPP Group (left picture).

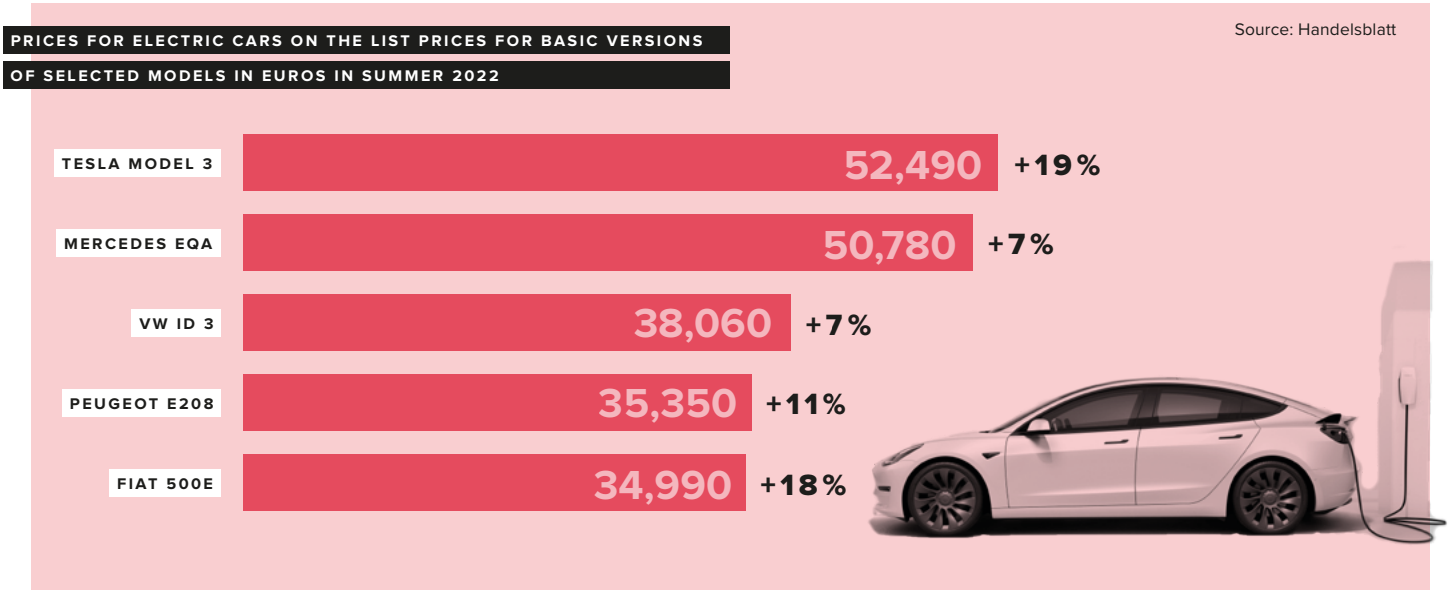
Climate protection

AUSTRIA ALSO TURNS TO CARBON -NEUTRAL FUELS

For a long time, it seemed as if Germany was the only country in the European Union to support renewable synthetic fuels. However, after the EU Council of Ministers voted at the end of March for the use of carbon-neutral synthetic fuels in passenger car drives after 2025, a move prompted by the Federal Republic of Germany and FDP Transport Minister Volker Wissing, other EU countries are now also discovering a passion for green liquid fuels. This includes Italy, Poland and others, such as Austria. At the Austrian Auto Summit in mid April at the Federal Chancellery at Ballhausplatz 2 in Vienna, Federal Chancellor Karl Nehammer spoke out publicly in favour of the use of efuels in Austria. At the meeting, Nehammer stressed the need to exhaust the entire range of drive types: from e-mobility and hydrogen drives to green combustion engines. 'Mobility cannot rely on just one form of technology,' the Austrian head of government was reported saying in Vienna's *Kronen Zeitung*. The conservative chancellor thus follows the line of Dietmar Schäfer, Chairman of the ARGE Automotive Suppliers of the Austrian Chamber of Commerce (WKÖ). According to Schäfer, the focus should no longer be solely on electromobility, but also on efuels. Declines in car sales 'also stem from a radical political shift in mobility,' Schäfer says. The fact that electric cars are mainly procured for company fleets also shows 'that the electric car has not been accepted by private consumers'. A ban on combustion engines would hardly be an environmental boon, he claims. After all, a lot of electricity currently used for charging comes from non-renewable energy sources.

Photos: FabuCar

→ Rising electric car prices



...individual mobility on a razor's edge

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8,520 euros. 6,430 euros. 2,600 euros. You might think these are the prices of used cars, but they instead represent this year's increases in the price of electric cars like the Tesla Model 3, the Fiat 500e and the VW ID.3. On average, consumers in Germany pay around *5,385 euros* more for the most common electric cars than they did in 2021, according to *Handelsblatt* newspaper. Even though Tesla has currently launched a price war and seems to be attracting customers with high discounts at the expense of its own profitability, prices for battery-powered mobility are likely to continue in only one

20 — direction: upwards. But why? In addition to the end of the politically forced purchase grant for electric cars, the prices of electrical components and semiconductors are also threatening to rise further. To put things in context, one electric car contains up to 2,000 such chips. These are components that will automatically become more expensive as material and energy costs rise. Then there are the skyrocketing costs of rare raw materials such as lithium, cobalt and nickel, all of which are urgently needed for battery production. ADAC Technology President Karsten Schulze warns that

40 — electric cars could become a 'privilege for the few'. Not least because manufacturers are increasingly focusing on high-priced mid- and luxury-class electric cars. It is very realistic to assume that many manufacturers will withdraw from the lower vehicle classes. As a result, normal earners face the risk of losing their individual mobility in the course of the revolution of combustion to electric motors. Smaller electric cars are rare or hardly available; at least those that offer familiar levels of comfort while remaining affordable. Currently, an electrically powered small car like the Fiat 500e

60 — costs around *35,000 euros* – an almost unaffordable purchase for many consumers.

Photo: Tesla

eFuel Alliance

eFuels: a way out of the European climate dilemma

78% of all drivers want to refuel with CO_2-neutral eFuels.* eFuels can be used in a climate-neutral way around the world, both today and in the future. Synthetic fuels can help reduce import dependency on Russia and bring us closer to our ambitious climate targets, providing a way out of the European energy dilemma.

Advantages of eFuels:

- Many potential applications in the mobility as well as the industry sector
- Ready for immediate use in all existing vehicles with cobustion engines – combustion vehicles can be operated CO_2-neutrally in the long term
- Existing gas station infrastructure can be used
- Withdrawal from combustion engines would not be mandatory
- End of dependence on fossil fuels, including those sourced from Russia
- Potential for cost-effective production in places with an abundance of sun and wind

The eFuel Alliance is an interest group with 180 companies that promotes the industrial production of synthetic fuels from renewable energy sources. The goal of the initiative is a recognition of eFuels as an essential component of a European, technologically open climate protection policy.

www.efuel-alliance.eu

* forsa survey in Germany from June 2022