efuels report europe

1—2023

Ready for the hydrogen economy
Spanish energy company Repsol is planning a large synthetic fuels plant in Bilbao

Import of raw materials
The availability of metals and rare earths will determine the energy revolution in Europe

‘Liquid energy carriers are definitely not obsolete’

LIANA GOUTA, DIRECTOR OF ENERGY POLICY AND INTERNATIONAL AFFAIRS AT HELLENIQ ENERGY HOLDINGS S.A., ON THE IMPORTANCE OF CLIMATE-NEUTRAL SYNTHETIC FUELS FOR THE ENERGY TRANSITION IN EUROPE

‘The parliamentary majority and the Council have sounded the death knell for combustion engines. This comes as a hard blow to all who have promoted the potential of climate-neutral fuels. The fact that Commissioner Breton is now lamenting the decision demonstrates that doubts about the all-electric strategy are justified. Breton should now focus his energy on not repeating the same mistake when it comes to lorry limits. What is needed now is genuine technology openness to give efuels a chance. But the door still has not been closed on the use of efuels in passenger cars as well: against this backdrop, politicians should be honest when the regulation comes up for review in 2026.’

Jens-Gieseke Vice-Chairman of the European Parliament’s Transport Committee and shadow rapporteur for the dossier titled ‘CO_2 emission performance standards for cars’

Photo: Jens Gieseke

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

Electrons and molecules – the climate needs both

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***

The EU Parliament's decision has symbolic power, and it was overdue: by 2030, the share of renewable fuels of non-biological origin in the transport sector must be at least 5.7 per cent. This marks a turning point, as it means that efuels, the energy alternative to electric cars long ignored by politicians, can make the grade in Europe after all.

The 5.7 per cent figure corresponds to 25 billion litres or more than 21 million tonnes of climate-neutral fuel. This admixture alone could prevent around 60 million tonnes of carbon emissions in the EU, because producing efuels with green electricity binds the exact amount of CO_2 as is later released during combustion. And the cheaper the production of efuels becomes, the more synthetic fuels can be blended with fossil fuels. It's a win-win situation for the climate and consumers. Because efuels make individual mobility both climate-friendly and affordable. The fact is that not every European can afford a new electric vehicle or has the means to charge one. For everyone who falls into this category, synthetic green fuels are a real economic and environmental alternative. They give them the freedom to choose how they wish to travel in the future: electrically or on efuels.

At the same time, hydrogen-based synthetic fuels facilitate the transition away from fossil energy and autocratic suppliers.

However you look at it, the 290 million combustion cars in the EU right now cannot be replaced 1:1 by all-electric vehicles – they will still be on the road 20 or even 30 years down the line. Thus, the only solution available to us is a mix of technologies. Running combustion cars on efuels has the great advantage that it can make existing car fleets climate-neutral everywhere, in Europe and around the world.

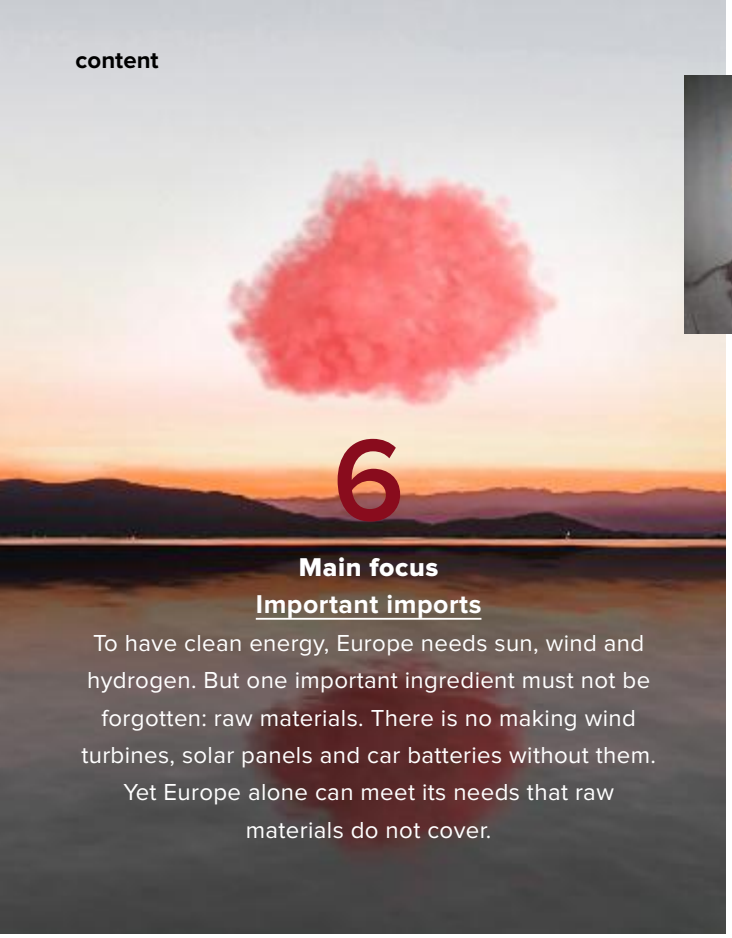
There is no doubt about it: when it comes to protecting the climate, both e-cars and efuels are urgently needed. It is the task of European policymakers to now institute the political framework for the widespread availability of climate-neutral fuel at the filling station. This also includes creating a level playing field for both drive technologies. In order to proactively rise to the challenge of climate justice in Europe and across the world, both electrons and molecules are needed.

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

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

Cover photo: Aris Rammos; Photo: Mateusz Tondel

content



IMPRINT

PUBLISHER UNITI Bundesverband mittelständischer Mineralölunternehmen e.V., Jägerstrasse 6, 10117 Berlin, Matthias Plötzke (person responsible according to the German Press Law) **EDITORIAL ADVISORY BOARD** Elmar Kühn, Dirk Arne Kuhrt, Dominik Hellriegel, Alexander Vorbau **EDITOR-IN-CHIEF** Florian Flicke **EDITORIAL BOARD** Gerhard Walter **EDITORS** Frank Burger, Wolfgang Kempkens, Kristina Simons, Sebastian Wolking **ART DIRECTION** Svenja Christiansen **IMAGE EDITING** Karin Aneser **PUBLISHER AND EDITORIAL OFFICE ADDRESS** Solutions by HANDELSBLATT MEDIA GROUP GmbH, Toulouser Allee 27, 40211 Düsseldorf, Tel. +49 (0)211 5422 7700, Fax +49 (0)211 5422 7722, www.solutions-hmg.com **EDITORIAL MANAGEMENT** Jan Leiskau, Dr Christian Sellmann **PRINT** MÖLLER PRO MEDIA GmbH, 16356 Ahrensfelde **LITHOGRAPHY** TiMe GmbH **ADDRESS CHANGES** UNITI office, Tel. +49 (0)30 755 414 300, Fax +49 (0)30 755 414 366, Email: info@uniti.de **ISSN 2195-4445**

Photos: Marcos Osorio/Stocksy United; HIF Global; Repsol

The price of e-mobility

The dark side of e-mobility: The Democratic Republic of Congo and its people could be among the winners of the energy revolution in the transport sector. After all, the country in the heart of Africa has the largest cobalt reserves in the world. Cobalt as a metal is indispensable for the production of batteries for electric cars. But the dream of economic prosperity is turning out to be a nightmare for the population of the Congo, where cobalt is dug up in countless small mines across the country – mainly by children and often at the risk of their lives. In 2019, at least 22,000 boys and girls worked in such mines, often for longer than eight hours a day, reports 'Together for Africa', an alliance of aid and development organisations that campaigns for better living conditions in Africa. The pay for working at depths of up to 50 metres? About 1.50 euros per day. At the outset of the year, a tonne of cobalt brought in some 62,852 euros on the international raw materials market. One thing is obvious: the population and natural environment in Congo are paying a high price for battery-electric mobility in wealthy industrialised countries. Is there a way to wake up from this nightmare? Metals would have to be extracted in safe mines – at a fair wage, without child labour and by environmentally sound methods. To prevent child labour, car manufacturers have now begun relying on industrial mining in Congo, a sector dominated by Chinese companies.

Photo: JUNIOR KANNAH/Getty Images

↓
Important imports: E-mobility and the energy revolution are fueling the demand for metals and minerals. Yet Europe alone can meet its needs that raw materials do not cover.

NO RAW MATERIALS, NO EUROPEAN ENERGY REVOLUTION

To have clean energy, Europe needs sun, wind and hydrogen. But one important ingredient must not be forgotten: raw materials. There is no making wind turbines, solar panels and car batteries without them. The availability of metals and rare earths will determine the speed and ultimate success or failure of the energy revolution.

TEXT Sebastian Wolking

The 2022 energy crisis has demonstrated that Europe is not resilient or robust enough to weather the geopolitical tides. This is made clear through the current gas and oil shortage as well as the scarcity of other raw materials. The Ariadne project, which is researching various scenarios for the energy revolution on behalf of the German government, writes: 'The demand for critical materials induced by the energy revolution poses major challenges.' According to the project, lithium, nickel, cobalt, dysprosium, vanadium and iridium are in particularly short supply.

These metals are indispensable if the energy revolution is to be successful. Large quantities of silicon, silver and zinc are used in solar modules, while iron ore, copper and aluminium are found in wind turbines. Electrolysers that produce green hydrogen rely on iridium, platinum and nickel. And a typical lithium-ion battery, as used in electric cars, contains lithium, nickel, manganese, cobalt and graphite. Electric cars cannot run without rare earths such as neodymium, praseodymium and dysprosium. Then there's copper, which is used for cabling in both the charging and electricity grids. The chemical and electrical industries need tin, a soft heavy metal used in flat screens, fuel cells and wind turbines.

The world's top raw materials powerhouse is China. According to the German Raw Materials Agency, the Middle Kingdom accounts for 18 per cent of global mine production, followed by Australia at 13.4 per cent, Brazil at 6.5 per cent and Russia at 5.9 per cent. There is not a single EU country in the top ten. At the beginning of the 20th century, Europe was still responsible for 40 per cent of global mining production; today it accounts for just three per

‘The goal is establishing integrated value networks for strategic areas in Europe with reliable partners.’

Siegfried Russwurm, President of the Federation of German Industries (BDI)

cent. Some raw materials are subject to monopolies and oligopolies, thus posing cluster risks for buyers. Take cobalt for instance, where 70 per cent of global deposits are found in the Congo, an African state in permanent crisis. South Africa has the world’s largest chromium and manganese reserves, while China leads the globe in the extraction of vanadium and graphite. Chile and Indonesia dominate the world’s supply of copper and nickel, respectively.

From one dependency to the next

As if the supply situation wasn’t already bleak enough, raw materials are not processed in Europe either. Here, the dependencies of the old continent are even greater. For example, 50 per cent of the world’s raw materials are refined in China. The Asian powerhouse imports the booming electronics metal lithium en masse and refines it for use by the automobile industry. This is a trump card against which Europe has nothing. It’s true that Germany does appear, as the only EU country, in eighth place in the list of the world’s largest refining countries – but with a measly 1.8 per cent share. ‘In the case of critical mineral raw materials such as rare earths, the dependence, especially on China, is already much greater than Germany’s previous dependence on Russian energy sources,’ warned Siegfried Russwurm, President of the Federation of German Industries (BDI) at the Raw Materials Congress in October. According to Russwurm, Europe is in danger of losing the global competition for strategically important raw materials, with fatal consequences for supply security and dependence on other countries. →

please continue on page 10

Demand for lithium outstrips supply

CHINA MINES AND PROCESSES **87%** *OF THE WORLD’S DEPOSITS OF RARE EARTHS AND METALS IMPORTANT FOR E-MOBILITY…*

COBALT	COPPER	LITHIUM	NICKEL
Co 27	Cu 29	Li 3	Ni 28
65%	40%	58%	35%

Photos: Marcos Osorio/Stocksy United; olympuscat/stock.adobe.com; Christian Kruppa/BDI

INTERVIEW

INTERVIEW BY Gerhard Walter

As the leader of the parliamentary group of the CDU/CSU and rapporteur to the European Parliament on revisions to the Renewable Energy Directive (RED III), **Markus Pieper plays a vital role in ensuring that myriad pragmatic solutions will drive forward the energy transition in Europe and enable reliable planning – without creating any new bureaucracy.** This, at any rate, is the position of the European Parliament, which is currently being negotiated with the European Council.

A good decision for Europe

Photos: Marcos Osorio/Stocksy United; EU-Parliament

‘Renewable energies represent the key to greater independence in energy policy and are vital to achieving the aim of net zero by 2050.’

Mr Pieper, in September, the European Parliament came out in favour of a revised version of the Renewable Energy Directive (RED III). Why is this decision so crucial for Europe?

_____ Europe needs to generate more energy from renewable sources. The Russian incursion into Ukraine has further intensified the already huge need to act. Renewable energies represent the key to greater independence in energy policy and are vital to achieving the aim of net zero by 2050. The Renewable Energy Directive is Europe’s tool in this regard. By 2030, we want to increase the share of renewable energies to 45 per cent, even though the EU Commission only proposed 40 per cent. The idea put forward by the EPP Group to enlarge the share of renewable energies to 45 per cent by 2030 was approved by a considerable majority in the parliamentary committee: a good decision for the energy transition in Europe.

In other words, a victory for pragmatism?

_____ The European Parliament has opted for a raft of pragmatic solutions that are far more innovative and ambitious than the Commission’s original proposal. The cross-border expansion of green electricity projects is set to be doubled to two projects per member state, with the largest energy consumers even required to reach three projects by 2030. We are introducing innovation quotas to ensure that innovative technologies account for five per cent of newly installed capacity, allowing us to achieve a breakthrough in this area more quickly.

This brings us on to green electricity: the Parliament has accepted your proposed amendment allowing green electricity to be drawn from the grid if green electricity certificates are presented. What does this mean in practice?

_____ The rules of origin, which the Commission is still developing, essentially make the consumption of green power much more complex. They would result in the production of green hydrogen, for example, becoming more difficult and expensive. The vote in the European Parliament means greater flexibility in the production of hydrogen and efuels. In effect, we have created a streamlined system for certificates of origin, with simultaneous digital recording of green electricity percentages, and prepared this system for the indirect consumption of green hydrogen. At the same time, we have made the criteria for the production of green hydrogen much more simple, thereby anticipating the Commission’s delegated act.

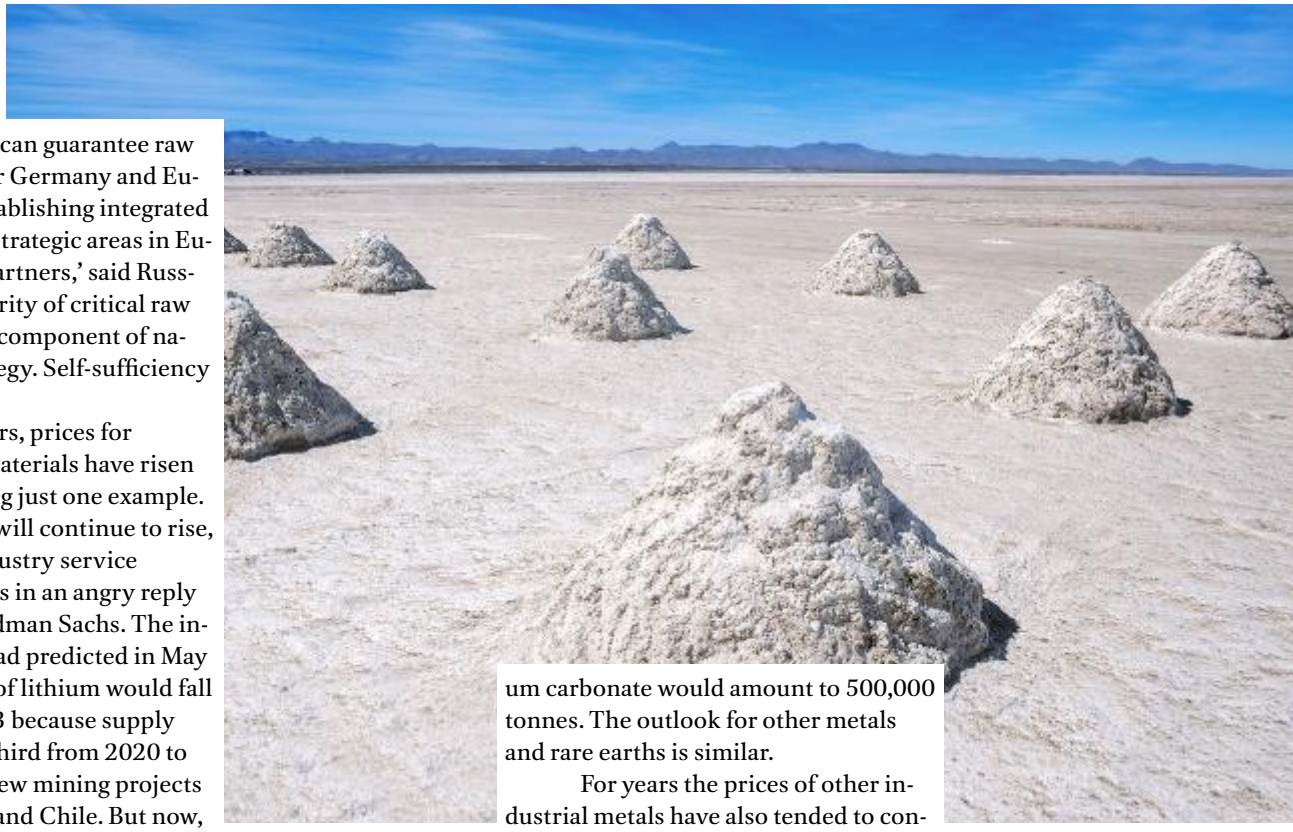
More ambition in terms of the 45 per cent target also means more renewable energies in the area of transport. You are also more ambitious when it comes to fuels. . .

_____ That’s right. In the transport sector, we are raising aspirations through a significant increase in the synthetic fuels quota to 5.7 per cent. This is more than double the figure proposed by the EU Commission. It is clear that we cannot reach climate targets without synthetic fuels. Many agree immediately when talking about shipping and aviation, but they are also urgently needed for existing cars and lorries. The current signal is therefore important.

What implications does RED III have for the production of climate-neutral fuels?

_____ In addition to the target for transport, there are, for instance, ambitious sector targets for industry (50 per cent green hydrogen mandatory by 2030), which can be flexibly adjusted to reflect developments, and for buildings (49 per cent renewable energies). The idea is to set out in law the introduction of a hydrogen import strategy that includes all green hydrogen production facilities, including existing ones. In combination with technology transfer and development assistance, we will structure imports of green electricity and hydrogen as a win–win situation and reduce energy costs in Europe.

Markus Pieper
has been the CDU MEP for North Rhine-Westphalia since 2004 and represents the Münsterland CDU district association. In the European Parliament, the doctor of economic geography is the parliamentary manager of the CDU/CSU group and its spokesman for medium-sized companies as well as the European Parliament’s rapporteur for the revision of the Renewable Energy Directives (RED III). Markus Pieper is married and the father of three children.



'No one pillar alone can guarantee raw material security for Germany and Europe. The goal is establishing integrated value networks for strategic areas in Europe with reliable partners,' said Russwurm. 'Supply security of critical raw materials must be a component of national security strategy. Self-sufficiency is not an option.'

In recent years, prices for high-demand raw materials have risen dizzily, lithium being just one example. And lithium prices will continue to rise, according to the industry service Benchmark Minerals in an angry reply to a forecast by Goldman Sachs. The investment bankers had predicted in May 2022 that the price of lithium would fall significantly in 2023 because supply had increased by a third from 2020 to 2021 alone due to new mining projects in China, Australia and Chile. But now, as the end of 2022 approaches, there are still no signs of a drop in the price of lithium – despite the floundering global economy. Somehow or other, according to Goldman Sachs, a new super-cycle for battery metals will begin in the second half of the decade, with demand for lithium far outstripping supply. Ninety-five per cent of lithium demand in 2030 will be for batteries, according to a study by the insurance group Allianz Trade – in the early 2010s, it was only about a quarter. Should this prediction prove accurate, the supply gap for lithium carbonate would amount to 500,000 tonnes. The outlook for other metals and rare earths is similar.

Price explosion for some important raw materials

For years the prices of other industrial metals have also tended to continuously rise – despite major cyclical fluctuations. It's a development that threatens to stimy Europe's ambitious goals of green energy and clean mobility, not to mention the European economy writ large. And at the same time, the continent is called upon more than ever to stand up for itself. 'The conflict between China and the USA threatens to crush Europe,' wrote Christoph M. Schmidt, President of the RWI – Leibniz Institute for Economic Research in Essen, in a September guest article in the German periodical Wirtschaftswoche. 'Only economic strength will help counter this.' States and companies are now called upon to become more resilient, he says. 'They should be able to largely absorb a negative shock such as

China with the greatest impact on demand

↑ **More problematic raw material:** 2,000,000 litres of water are needed to produce one ton of lithium.

→ **Ruthless depletion:** Rare earths and other raw materials are mined in the Bayan Obo mine in the Autonomous Region of Inner Mongolia in the People's Republic of China.

CHINA'S SHARE IN EUROPEAN IMPORTS

Raw material	Use, among others	Import share
Rare earths	Wind turbines, solar panels, LCD/LED screens, smartphones, notebooks	98%
Magnesium	Automotive industry, electrical and electronic industry	93%
Gallium	Solar cells, light-emitting diodes	75%
Bismuth	Chemical industry, nanomaterials	49%
Natural graphite	Semiconductor industry, solar industry, batteries, materials in the steel industry	47%
Barite	Radiation protection, chemical industry	38%
Silicon metal	Semiconductors, photovoltaics, silicons	11%

Photos: Lucas Ninno/Getty Images; Sven Lorenz/RWI; imago images/Xinhua

the loss of a supply source, through reliance on diversification, reserves and redundancies,' Schmidt demands. For companies, this strategy could reduce the prospects for short-term returns but make them more crisis-proof in the long term. Politicians, in turn, have a duty to identify critical dependencies and develop supply chains into resilient networks, Schmidt argues. 'Chains break when one link fails – networks provide alternatives,' he writes.

This is especially true since competition for raw materials is only intensifying further. Countries like Japan or India, with its 1.4 billion people, are starved for resources, and the topic is ubiquitous in the USA as well. The United States' 2002 list of critical minerals includes 50 important but difficult-to-procure raw materials, 15 more than the first edition in 2018. New on the list are nickel and zinc. The equivalent in the European Union is also getting longer and longer. The latest list of critical raw materials from 2020 named 30 metals – in the first version in 2011, there were only 14. The latest additions were bauxite, lithium, titanium and strontium. But no country has ever effected so great an increase in demand-side influence as has China in recent years, stated the Federal Institute for Geosciences and Natural Resources (BGR), which is responsible for Germany, in a report.

Five pillars for a secure energy supply

The Chinese have specialised in the industrial processing of raw materials.

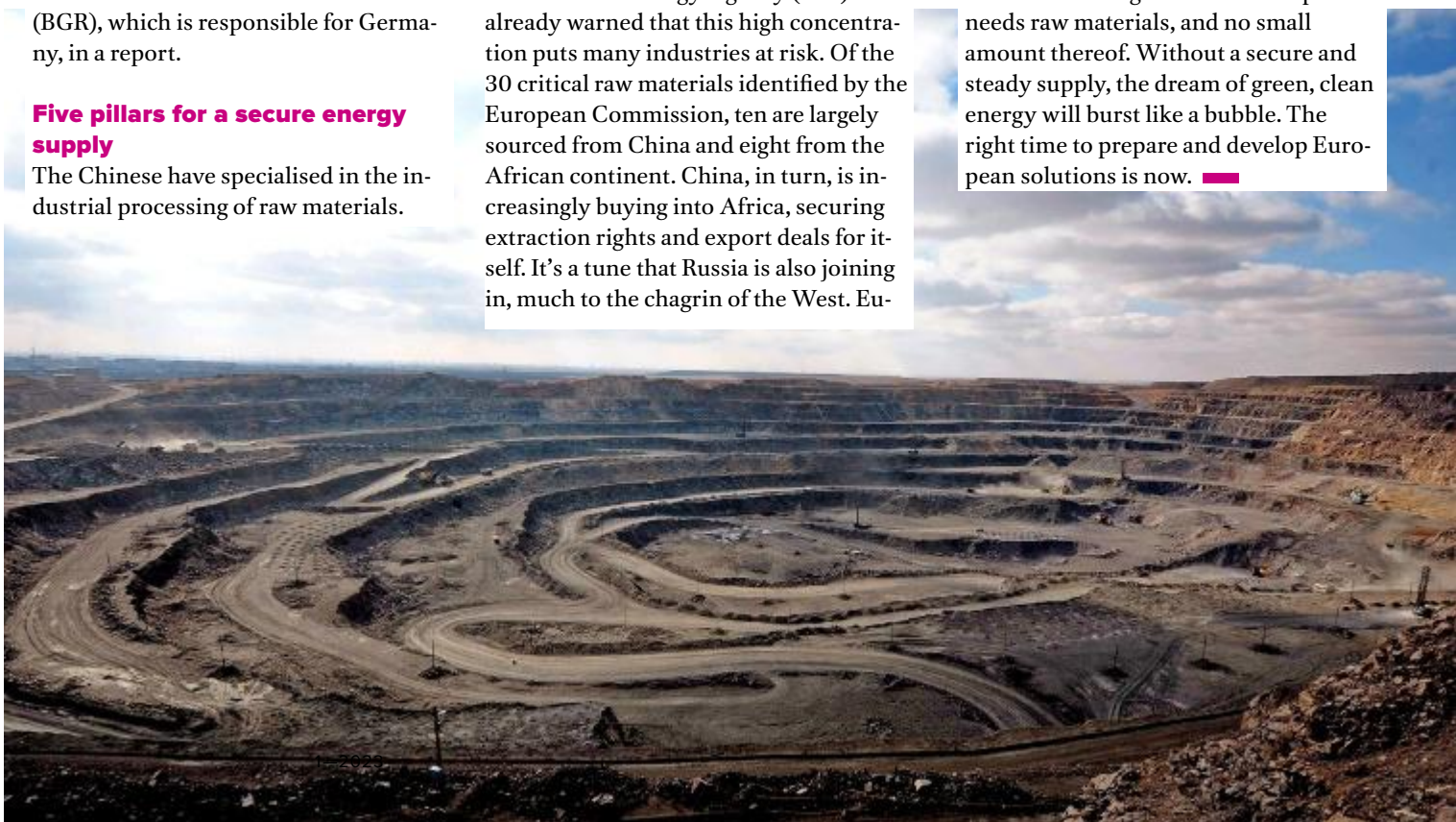
'States and companies are now called upon to become more resilient.'

Christoph M. Schmidt,
President of the RWI – Leibnitz Institute for Econimic Research, Essen, Germany

China refines 80 per cent of the world's rare earths, 60 per cent of lithium, 40 per cent of nickel and copper. According to an analysis by the EU Commission, more than half of all raw materials needed for electric motors, wind turbines and photovoltaic systems comes from China. The International Energy Agency (IEA) has already warned that this high concentration puts many industries at risk. Of the 30 critical raw materials identified by the European Commission, ten are largely sourced from China and eight from the African continent. China, in turn, is increasingly buying into Africa, securing extraction rights and export deals for itself. It's a tune that Russia is also joining in, much to the chagrin of the West. Europe is dependent on Russian exports, especially for nickel, palladium and chrome. Palladium is used in catalytic converters, among other applications. The Putin empire also produces vast quantities of vanadium, cadmium, aluminium, selenium, copper, iron, quartz sand, tungsten and phosphate.

According to a study by the Catholic University of Leuven in Belgium, Europe must base its raw materials strategy on five pillars: pushing ahead with its own extraction projects, building up refinery capacities, concluding raw material partnerships with reliable partner countries. Good candidates here include Australia, Canada, Argentina, Chile and South Africa – or Indonesia. The latter is currently gearing up to exploit its huge cobalt deposits. According to estimates by Benchmark Minerals, Indonesia's share of the global cobalt supply will rise from currently one per cent to 19 per cent by 2030. This would make the country the runner-up behind the Democratic Republic of Congo as the world's leading supplier of cobalt. Then there is recycling, which could enable Europe to achieve at least partial self-sufficiency in raw materials. The fifth pillar must be to save raw materials and substitute them in critical applications.

One thing is certain: Europe needs raw materials, and no small amount thereof. Without a secure and steady supply, the dream of green, clean energy will burst like a bubble. The right time to prepare and develop European solutions is now.



ENERGY CRISIS: HOW EUROPE CAN GROW RESILIENCE

WRITTEN BY Sebastian Wolking

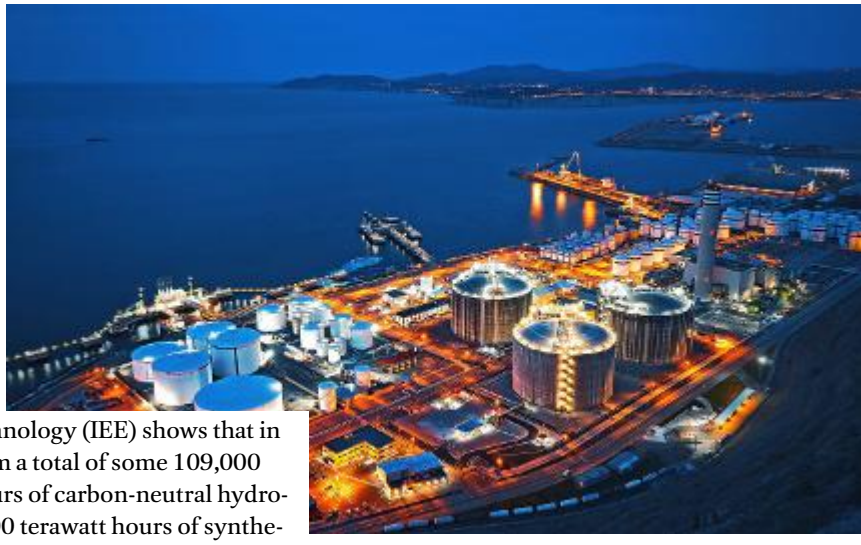
Europe needs fresh energy. At the same time, the continent is wantonly entering new dependencies. It is more important than ever that EU take responsibility for the energy revolution – and its own economic future. The EU should think beyond mere procurement to consider energy storage as well.

Within a few months, Europe has cut back its reliance on Russian natural gas – from over 30 down to ten per cent. This came, however, at a high price. EU countries are busily building LNG terminals, competing with Asian countries for liquefied gas, paying ever higher prices for energy and, most notably, having to reduce consumption – with unforeseeable consequences for the economy and jobs.

Crisis-proofing the energy supply

Whatever the case may be, Europe's energy problems are not likely to abate any time soon. Europe must position itself more broadly for the future: make supply chains more resilient, diversify supply. In this context, it is inarguably right to build up and expand renewables and electrolysis capacities for hydrogen production at a rapid pace. But even if these efforts succeed, the continent will not be able to achieve energy self-sufficiency. Its resources are too limited, local labour and production costs too high. A study by the Fraunhofer Institute for Energy Economics and Energy

Photos: Richard Drury/Getty Images; Mimadeo/Stock



↑

New infrastructure:
In the future, Bilbao in Spain is to become the port of call for liquid gas, green hydrogen and synthetic green fuels.

System Technology (IEE) shows that in the long term a total of some 109,000 terawatt hours of carbon-neutral hydrogen or 87,000 terawatt hours of synthetic fuels (power-to-liquid or PtL) could be produced outside Europe with wind power and photovoltaic (PV) plants – more than enough to power Europe's economies. Possible partner countries for importing climate-friendly energy products to the EU include sun-drenched Australia, global leaders of wind Chile and Argentina or hot and neighbouring North Africa, not to mention the United States, Kazakhstan and oil champion Saudi Arabia, which wants to diversify its energy mix and make it greener.

According to an analysis by acatech, the German Academy of Science and Engineering, Europe could begin importing hydrogen in the short term – if existing natural gas pipelines are converted to transport hydrogen gas. Shipping is also realistic in the medium term, especially over longer distances. Hydrogen could be liquefied or, more likely, be shipped after conversion into a carrier medium such as ammonia or methanol. To achieve this dream, however, tankers capable of transporting hydrogen across the oceans at under 700 bar of pressure or at temperatures below minus 230 degrees Celsius must first be built – there is only one in the world today that could do the job. Shipping synthetic fuels instead would quite literally allow the EU to sail around the problem altogether. The existing fleet of oil tankers could easily convey efuels to Europe from all corners of the world, doing so at normal ambient temperatures and without high pressures. This would require using wind from Chile or the hot Australian sun to convert hydrogen into synthetic fuel before loading it onto ships from there. 'Hydrogen and its derivatives, especially ship imports of ammonia and efuels, could help diversify our energy supply in the medium term, although this may also give rise to new dependencies,' say the scientists of the Ariadne project, which is researching various scenarios for the energy revolution on behalf of the German government.

> 'Europe could begin importing hydrogen in the short term.'
>
> Analysis by *German Academy of Science and Engineering*

Liquid energy sources as a storage medium

Once it's arrived in Europe, energy in this form is suited for flexible, decentralised storage. This benefit cannot be overstated: after all, the lack of electricity storage options could collapse the entire →

↑

New partnerships:
In Australia, up to 600 million tonnes of green hydrogen can be produced on just 3 per cent of the landmass with the help of climate-friendly solar energy, which can be shipped to Europe.

←

Proven transport routes:
LPG, green hydrogen and efuels can be transported by ship from Australia, North Africa or South America to Europe and unloaded in Bilbao, for example.

framework of the energy revolution like a house of cards. The storage capacity of our electricity system is virtually nil – and solar and wind power are notoriously unreliable. When the wind and sun cannot be bothered to behave just like we need them to, there are shortages in the power supply... that is, unless other energy sources step in. Liquid energy sources would act as an additional crucial pillar to make Europe's energy supply more crisis-proof. They have a high storage capacity in addition to high energy density by weight and volume. Efuels in particular would require no updates to the infrastructure at all. Synthetic fuels could be easily sold and distributed via the existing filling station network. Green hydrogen and power-to-X products such as e-fuels bolster supply security by making the energy system more flexible and resilient.

If the goal is energy resilience in Europe, it will only come at the cost of effort – and solidarity. As it happens, many in Europe seem to have grasped the gravity of the situation. The EU countries are joining forces to buy gas together. At the same time, they want to push ahead with the goal of a common electricity grid, where part of the electricity generated can be channelled to neighbouring countries. Thirty-one European grid operators and electricity utilities are planning to build a European transport network for hydrogen. Even the option of the Pyrenees pipeline, which would transport gas from Spain to Germany, is back on the table. New energy partnerships with non-EU countries should, indeed must, be concluded and existing ones expanded. All these approaches must now be brought together to form a reliable foundation: Europe needs energy security if it wishes to escape further blackmailing in the future. In political and military terms, the EU is a dwarf. If it wants to avoid being an economic dwarf as well, it will need to finally make its energy policy crisis-proof.

←

New perspective:
The energy transition needs many players – that's why it's important to be open to technology and avoid one-sided dependencies.

Photos: Andrew Merry/Getty Images; imago images/agefotostock; Zoran Orcik/iStock

1,622 *kg*

▶ *is the average weight of an electric car, which is about 284 kilograms more than a traditional petrol-run car (average weight approx. 1,338 kilograms). Electric cars are rolling behemoths that threaten the central promise of climate-friendly mobility, as was recently analysed by the German publication Handelsblatt. Their heavier weight means that electric cars use more raw materials for production and consume more electricity in operation. The main reason for the increased heft? The heavy, box-sized lithium-ion batteries they run on. Take, for example, the battery in the Mercedes EQS, which weighs in at 700 kilograms, or about 28 per cent of the car's total weight. At the same time, the proposal to fulfil the core promise to consumers of increasing electric car range is, you guessed it, larger batteries. Not to mention the demand of many customers for fast acceleration, effective brakes and robust car bodies. Additional benefits like these have to carried when they hit the road – by a battery whose production emits CO_2 aplenty into the atmosphere. It should be obvious, but a heavy car is harder to get moving. Weighing in at nearly 2.1 tonnes, even the Tesla Model S suffers from car obesity. And German electric competitors, among them the BMW i7, can weigh as much as 2.7 tonnes. On average, electric cars roll off the line with 21 per cent more weight than petrol-run vehicles, according to the Center for Automotive Research. What's more, heavy e-mobiles also create more tyre wear particles, thus worsening particulate matter pollution, as the OECD warned in a study published in 2020. Overall, electric cars generate eight per cent more particulate matter than combustion cars. Not to mention the space requirements for city parking. On city streets, these e-behemoths look like occupying tanks blocking you every way you turn. Small petrol cars like the Opel Mokka or the Toyota Yaris weigh only 1,355 and 1,356 kilograms respectively and could – if they ran on synthetic green fuels – make traffic on our roads more agile as well as climate-neutral.* ◀

‘Liquid energy carriers are definitely not obsolete’

INTERVIEW Gerhard Walter

The realisation of the European climate protection goals can only succeed if people support this challenge. Above all, this means that individual mobility in the EU must remain available and affordable – of this Liana Gouta Energy Policy and International Affairs Group Director at HELLENiQ ENERGY Holdings S.A., is convinced. In this interview she explains the importance of efuels in the transformation.

Ms Gouta, the COVID-19 pandemic and the war against Ukraine – the environment for energy companies is anything but business as usual. What is your day-to-day business in the company like today?

Indeed, after the unprecedented crisis caused by the COVID-19 pandemic, followed by a second crisis due to the invasion of Ukraine, there is no business as usual for the energy sector. The energy companies today have to not only operate, but also plan their transition, in a challenging global environment. At HELLENiQ ENERGY, since the beginning of the pandemic, we placed emphasis on protecting the health of our people while ensuring the supply of the fuels and the energy products that the society and the economy needed during this crisis with a social and economic disruption around the world. At the same time, and despite the consecutive crises, we shaped a clear strategy for the Group’s digital and energy transformation, called Vision 2025, and not only did we continue to focus on its implementation, but we also accelerated it, despite the difficult economic environment, trusting that this is the only way forward.

? The political framework conditions are also changing on several levels: the transition to climate neutrality is being accelerated with the Fit-for-55 package and RePower EU plan. Can a socially balanced transition succeed like this?

I believe that the transition to climate neutrality by 2050, a just transition, socially balanced for every EU citizen, is the biggest challenge we have to address, considering that transition comes with significant cost, not only for the industry, but for the governments and the citizens as well. The transition targets agreed at EU level were already ambitious, setting a clear direction towards decarbonisation, but now the successive crises put pressure to further accelerate the transition, as dictated by the Fit-For-55 package. Within this context and the need to speed up the pace, finding the right balance between ambition and reality should be a top priority for policymakers so that all European citizens have access to green and affordable mobility, in a way that no one is left behind.

? You engage in the efuel alliance. In terms of mobility, e-mobility is being promoted politically, and combustion engines are banned. Have liquid energy carriers become obsolete?

Liquid energy carriers are definitely not obsolete. Renewables and low-carbon liquid fuels will be critical to achieve the climate neutrality goal in 2050. We will still need them for the many sectors of the economy for which electrification is not ideal, such as aviation, maritime and heavy-duty transport sectors that will rely on carbon neutral fuels to decarbonise. But even in the case of passenger cars, and despite the very ambitious policies that support EV’s acceleration, those fuels would still be needed to decarbonise the some 200 million cars estimated to remain on EU roads after 2035. Therefore, EU policymakers must seize the opportunity provided by the 2026 review of the Regulation of the CO_2 standards for cars and vans, to allow ICEs to enter the EU market after 2035, provided they use climate neutral fuels. This would be a very strong market signal and a strong push for the development of those fuels for all transport sectors.

‘The transition to a greener, smarter and more resilient mobility system should leave nobody behind.’

Liana Gouta
is Director of Energy Policy and International Affairs at HELLENiQ ENERGY Holdings S.A. and has a degree in chemical engineering (MSc) with honours. She started her career as a process engineer at Hellenic Petroleum's Thessaloniki industrial complex. Liana Gouta is a board member of HELPE Kyparissiakos Gulf SA, a board member of the eFuel Alliance and an alternate board member of the European Fuels Manufacturers Association.

Photo: HELLENiQ ENERGY

? How can individual and affordable mobility be secured?

The transition to a greener, smarter and more resilient mobility system should leave nobody behind. Mobility must be available and affordable for all EU citizens in West and East Europe, in urban, rural and remote regions. The policy framework in preparation loses sight of this objective. A technology-neutral approach to decarbonisation would allow for all sustainable technologies to compete on the market, making them available in all geographies and at all income levels. Carbon-neutral fuels should be included in the solutions, as they would require no additional costs for new infrastructure or new vehicle fleet. Climate neutrality is such a huge challenge that we do not have the option to exclude any technologies.

? The EU parliamentarians recently decided that the proportion of renewable fuels of non-biological origin in the transport sector should be at least 5.7 per cent by 2030 (RED III). How are HELLENiQ ENERGY Holdings S.A and the other energy companies in Southeast Europe prepared for this?

At HELLENiQ ENERGY we are currently assessing the opportunities that arise from the production of green hydrogen for our objective to become climate neutral in 2050. Like other companies in Southeast Europe, the high renewable energy potential of the countries we operate in works to our advantage. High targets set a clear signal for investment and for this they are welcome. However, it must be kept in mind that green hydrogen, produced with renewable energy, is not yet cost-competitive. Therefore, support policies and initiatives are critical for its development.

? What exactly is HELLENiQ ENERGY planning for the coming years? Is there a roadmap for green hydrogen and synthetic fuels?

The Group is rapidly transforming, based on our new strategy for transition and sustainable growth, called 'Vision 2025'. Vision 2025 aims to strengthen our position in the industry, making our activities compatible with the environmental and climate challenges within the

→

HELLENiQ ENERGY is one of the leading energy groups in Southeast Europe, with a presence in six countries. The Group is rapidly transforming, based on its new strategic plan for sustainable growth, called 'Vision 2025'. Its pillars are a diversified portfolio among its core businesses, emphasising 'New energy', the reduction by 2030 of its carbon footprint by 50 per cent and reaching climate neutrality by 2050.

new international environment, enabling substantial growth in new, cleaner forms of energy. Our investment plan for this decade will amount to approximately four billion euros, of which more than 50 per cent will be directed towards the development of new activities in sustainable energy (RES, hydrogen), while the remainder is earmarked for the modernisation of our existing business, the reduction of our carbon footprint, the transition of our raw materials mixture from fossil to sustainable raw materials and, last but not least, the production of sustainable liquid fuels for our customers. There is no doubt that green hydrogen and efuels will play a crucial role in achieving this strategy.

? How would the political framework conditions have to be designed so that a refinery in Europe – for example in Greece – can be transformed to the production of liquid synthetic fuels?

_____We need a political and legislative framework that stimulates demand for all possible sustainable energy carriers in all markets, for instance all transport sectors. We also need technology neutrality and openness, CO_2-based taxation of fuels, guaranteed access to affordable green electricity and adequate public support for the first industrial projects. Moreover, it is important that it does not escape the policymakers' attention that refineries are a critical infrastructure for the energy security of the country and the wider region and that competitiveness of refineries highly exposed to international competition should be guaranteed.

? Efuels are not only climate-friendly, they are also affordable – especially considering that all-electric vehicles are expensive and therefore mostly affordable for the middle and upper classes. Do synthetic green fuels ensure social justice in the energy transition and the implementation of the EU Green Deal?

_____ Efuels can contribute to a socially just transition, as they allow the use of existing vehicle fleets and infrastructure in a climate-neutral way in the future, easing the cost of transition both for public finances and the consumer. Besides, the increase of supply of synthetic fuels in the market and their gradual addition to conventional fuels, in parallel with the fall of production costs, would make running an ICE car on efuels an affordable option to consumers.

? Do we need bulk imports for efuels for Europe? If so, with which regions should these partnerships be established?

_____ Electricity from renewable energy sources might not be sufficiently available to produce the amount of efuels and hydrogen that would be needed for transport in the coming years. Importing green energy, hydrogen and efuels from those areas of the world where climatic conditions allow cost effective production, for instance North Africa, while at the same time developing green network infrastructure, is therefore necessary. Efuels in particular, with all the advantages of liquid fuels in transport, will have a strong lead as a long-distance energy carrier. Therefore, European companies should be encouraged to establish partnerships with countries and regions with a great potential for green hydrogen and efuels production, to promote large-scale production and develop the necessary grid. In this context, Greece, due to its geographical location and as recently announced by Prime Minister Kyriakos Mitsotakis, aims to play a key role, as a green energy gate and exporter of green energy to the rest of the EU, while also playing an important role in these international partnerships.

'Efuels can contribute to a socially just transition, as they allow to use existing vehicle fleets and infrastructure in a climate-neutral way in the future, easing the cost of transition both for public finances and the consumer.'

Photo: mauritius images/GreekStock/Alamy

WRITTEN BY Frank Burger

A plea for technological openness in heavy-goods transport

The EU is also seeking to make Heavy Duty Vehicles (HDV) operations climate-neutral – and plans to adjust the CO_2 fleet limits. The aim is to incorporate the life-cycle approach, which covers all emissions from production and operation through to disposal.

The European Commission is currently reviewing the applicable CO_2 fleet limits for commercial vehicles. As things stand, EU law currently stipulates that the CO_2 emissions of newly sold HDVs in the EU must – as a fleet average – come in 15 per cent below the 2019 and 2020 levels by 2025, and 30 per cent below these levels by 2030. Interest groups are now calling for a tightening up of the limits to drive the transition to battery-powered HDVs, but there is a fundamental obstacle. 'The sticking point is the charging infrastructure,' explained Frank Huster, Chief Executive of industry body DSLV Bundesverband Spedition und Logistik e.V., speaking to *Handelsblatt*. In the article, he argued that, at best, the major motorway routes would be electrified in the years ahead and that little progress was being made at company depots and elsewhere.

Climate-neutral operation, including for existing HDVs

This raises the question of whether the use of synthetic green fuels for HDVs would not be a more sensible alternative to fossil diesel than more stringent fleet limits and a politically mandated switch to electric systems. Efuels certainly represent the only way to achieve climate neutrality in terms of existing vehicles with combustion engines, which will still be on the roads for many years to come. In particular, the introduction of battery-powered HDVs and a corresponding charging infrastructure is energy-intensive – and therefore carbon-intensive. Charging outputs of 800 to 1,000 kW are required to ensure seamless operations, with 50 kW already a large amount for the standard charging stations that predominate for electric cars. By contrast, synthetic green fuels are able to make continued use of the existing infrastructure of petrol stations, oil terminals, refineries and garages without generating any further CO_2 emissions.

According to the European Automobile Manufacturers' Association (ACEA), some 6.2 million HDVs transport goods of all kinds – from food and industrial manufacturing components through to liquids, gases, recyclable materials and waste – within the EU. This clearly illustrates the differences in comparison with passenger cars; HDVs form part of a complex logistics chain in which other modes of transport, e.g. sea freight and airfreight, are dependent on feeder HDVs. There alternatives are few and far between.

A trick that helps obscure the true carbon footprint of electric vehicles

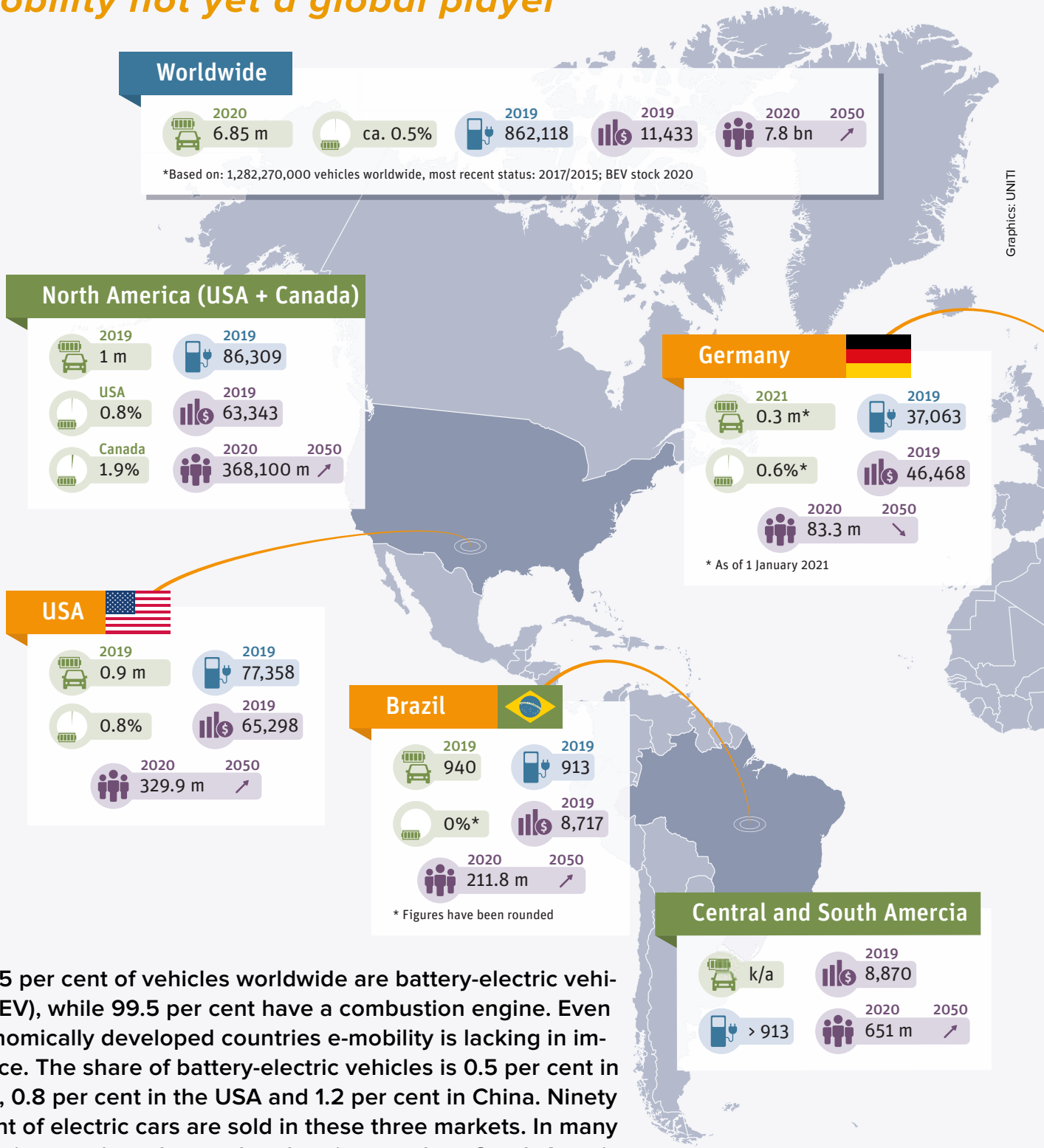
Nevertheless, many political decision-makers at EU level have – despite the almost complete lack of a charging infrastructure – identified the electric motor as the sole drive system with a viable future. This is partly due to a trick that helps to obscure the true carbon footprint of electric vehicles: their CO_2 emissions are measured using the 'tailpipe' method, i.e. directly at the exhaust pipe, where it is known that no CO_2 is emitted. As such, these vehicles are deemed climate neutral. This calculation method fails to mention that the electricity used to power the vehicles is derived from fossil fuels (as stocks of renewable energies – at least from the EU's standpoint – are limited). What's more, it doesn't even take into account the CO_2 emissions generated in connection with the manufacture and disposal of the batteries. By contrast, the life-cycle assessment (LCA) method, which reflects a vehicle's impact on the environment across its entire life cycle, does factor in such emissions. While a method of this kind is clearly complex, it would be a start if the 'well-to-wheel' approach, i.e. the footprint of the fuel, were to be considered in full.

The intention is to use the LCA method for the planned revision of the EU Regulation governing the CO_2 fleet limits, but we will have to wait until publication of the proposal in early 2023 to see if this is the final direction taken.

Photo: Bim/Getty Images

E-MOBILITY AROUND THE WORLD

E-mobility not yet a global player



Just 0.5 per cent of vehicles worldwide are battery-electric vehicles (BEV), while 99.5 per cent have a combustion engine. Even in economically developed countries e-mobility is lacking in importance. The share of battery-electric vehicles is 0.5 per cent in the EU, 0.8 per cent in the USA and 1.2 per cent in China. Ninety per cent of electric cars are sold in these three markets. In many developing yet densely populated regions such as South America, Africa and large parts of Asia, e-mobility plays no role at all.

Number of battery-electric vehicles (BEV) | GDP/capita in USD | Public charging stations

Share of battery-electric vehicles (BEV)*
* Of total number of passenger cars

2020 Population 2050 ↗→↘*
* Increasing/equal/decreasing

Europe
2019 1.7 m
2019 26,332**
ca. 0.6 %*
2020 747 m** 2050 ↘
* Based on: BEV stock 2019 / 1.7 million BEV stock in EU+UK+EFTA+Turkey, ** incl. Russia

EU-27
2020 1.1 m
2019 214,200
0.5 %
2019 30,431
2020 448 m 2050 ↘

Asia
2019 > 548,129
2019 7,259
2020 4.6 m 2050 ↗

China
2019 2.6 m
2019 515,908
1.2%
2019 10,217
2020 1.4 bn 2050 →

Japan
2019 152,000
2019 30,394
0.2%
2019 40,247
2020 126 m 2050 ↘

India
2019 11,200
2019 1,827
0.1%
2019 2,100
2020 1.4 m 2050 ↗

Africa
n/a
2019 1,881
> 67*
2020 1.3 bn 2050 ↗
* Africa & Middle East

Australia
2020 < 21,000
2020 ca. 2,300
< 0.1%*
2019 55,057
2020 25.8 m 2050 ↗
* Based on passenger car stock of 15 million and e-car stock

Sources: Statista, ACEA, Australian Bureau of Statistics, Bisresearch, Deutsche Stiftung Weltbevölkerung, European Alternative Fuels Observatory, Eurostat, IEA, KBA, Ministry of Transport of China, MLIT (Japan), OICA, PRB, Statistic Times, TheDriven, The Electric Vehicle Council, The International Council of Clean Transportation, US Department of Transportation, World Bank. Research and calculations: Statista and UNITI

Thorsten Herdan

Thorsten Herdan
is the CEO of the efuels company HIF Europe, Middle East and Africa (EMEA), whose core competence is the production and distribution of green synthetic fuels. Herdan worked at the German Federal Ministry of Economics and Technology until the end of January 2022, where he headed the Energy Policy – Heat and Efficiency Department from 2014. Before that, Herdan held a management position at the German Mechanical and Plant Engineering Association (VDMA), where his main focus was wind power.

Mr Herdan, can you explain what HIF is?

_____ HIF Global is the world's leading producer of so-called efuels, or renewable hydrocarbon-based molecules. We produce raw materials and fuels from renewable energies for our customers from across the mobility, aviation, maritime and chemical industries, or even in construction, agriculture and forestry. By doing so, we are helping to make these sectors climate neutral as quickly as possible. We produce petrol, aviation fuel, methanol or ethylene and propylene from wind and sun, renewable energies that would go unused without our efforts. We have developed the best areas for wind energy in the world in the Magallanes region in southern Chile. Besides Chile, we are also developing projects in other regions in South America as well as in the USA, Australia, Europe, Africa and the Middle East, to harness the power of renewable energies for the whole world. HIF Chile, HIF USA, HIF Australia and HIF EMEA (Europe, Middle East and Africa) are wholly owned subsidiaries of HIF Global.

? What are your tasks as the CEO of EMEA?

_____ The role of HIF EMEA is to develop and implement new projects for producing renewable molecules in the EMEA region. HIF EMEA is also responsible for commercialising renewable products from Chile in Europe. In this context, it becomes relevant to create associated value in Europe. Finally, HIF EMEA is responsible for developing a globally viable certification system that can assign our products, but also other products, a clear, traceable and marketable CO_2 footprint.

? When will the first synthetic green fuels be available at filling stations in Europe, when will homes be heated with green hydrogen and when will companies be able to use green hydrogen for industrial production?

_____ There are three prerequisites here: 1) the supply of green molecules provided through a high-speed ramp-up; 2) the demand for long-term purchase contracts from our customers, which we are seeing on a large scale; and 3) the necessary legal basis for green molecules, without which neither 2) nor 1) can become a reality in Europe. Here's the nutshell picture: while other countries, such as the USA, have created a gigantic market for renewable molecules through legal certainty and extensive support, we in the EU are increasingly lost in arguments over how to define 'green'. In the process, we're forgetting that not a single investment decision can be made without legal backing. I for one am confident that the legal foundation will be put in place quickly, putting green molecules on the market within a few short years.

‘High time to make markets for zero-emission products’

INTERVIEW Gerhard Walter

A clear statement: as soon as possible, green synthetic fuels are needed to ensure climate-neutral mobility in Europe, while green hydrogen should warm our homes and drive emissions-free industrial production. In this interview, Thorsten Herdan, CEO of the efuels company HIF Europe, Middle East and Africa (EMEA), explains how we can achieve this goal – and why the EU must act now.

? Against the backdrop of the urgent need for diversification on the European energy market, rapidly ramping up the development of a hydrogen economy including its derivatives such as efuels should be the order of the day. What is the reason that Europe is slow to get going on this issue?

_____ There are three main reasons here: Firstly, the partly ideological battle over what ‘green’ is. All the parties in Europe are divided by the argument as to what the requirements for ‘green’ should be. As long as this is question remains undecided, the economy too will be indecisive about whether the product in question is really green and, even more important, might not abruptly turn grey. Secondly, the disastrous argument over the share of electrification in the various sectors of the economy. It is simply not the job of politics to prescribe technical solutions. Instead, the economy needs a clear framework of CO_2 targets in order to be free to find the most efficient and marketable solutions. One example of where this has gone wrong is the debate over combustion engines. It is not combustion itself that matters, but the fuel engines run on. And thirdly, although industrial policy is an important issue in the EU, there is still a lot of room for improvement in the political understanding of the ins and outs of different business models. Some political minds seem to ignorant of the fact that no investment decisions can be made without green fuel legislation in place. This is especially true for high-capital projects like green hydrogen derivatives. And worst of all, while the EU is embroiled in political trench warfare, the USA is busy changing the on-the-ground reality. The Inflation Reduction Act has opened up a huge market for the hydrogen industry. If Europe does not begin creating practical solutions soon, the global value chains will migrate to the USA.

? And where is the greatest opposition?

_____ The opposition runs right through the European Commission, the European Parliament and the EU member states. To put it bluntly: in its push to regulate the end of all CO_2 emissions, the EU is nipping markets in the bud before they have even developed. In my view, the major common interest in the EU of reducing CO_2 emissions as quickly as possible is being lost. It’s a goal that can only be achieved by creating markets for zero-emission products.

? How would the political framework have to change to permit the prompt and industrial-scale production of green hydrogen and green synthetic fuels for the energy revolution?

_____ The delegated legislative acts on the Renewable Energy Directive must be published as soon as possible. They are one of the most important legislative projects for a successful market ramp-up of hydrogen. At the same time, they help facilitate and accelerate the approval procedures in the member states. The regulations should be simple and applicable for producers across the EU. One thing is clear: in Europe, neither the available land nor sun and wind will suffice to produce the amount of green hydrogen we need here. As soon as the delegated legislative acts are available, we can start to produce zero-emission fuels in Germany and Europe as well – after all, this is where they are needed, and not only to support the ambitious goal for the transport sector.

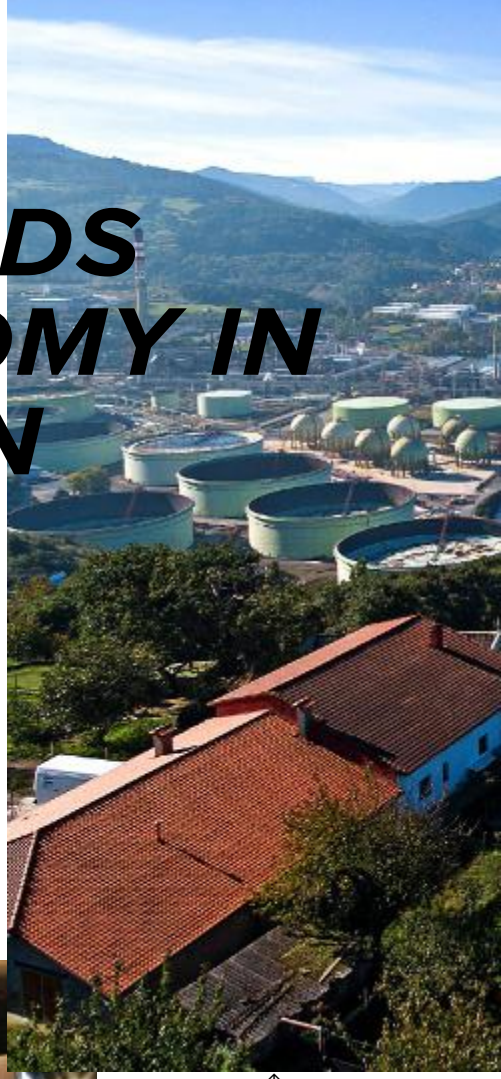
‘I am confident that the legal foundation will be put in place quickly, putting green molecules on the market within a few short years.’

Photo: HIF Global

REPSOL SPEARHEADS HYDROGEN ECONOMY IN THE BILBAO REGION

Spanish energy company Repsol is planning a large synthetic fuels plant in Bilbao in tandem with Saudi Aramco, combining two innovative technologies.

TEXT Kristina Simons

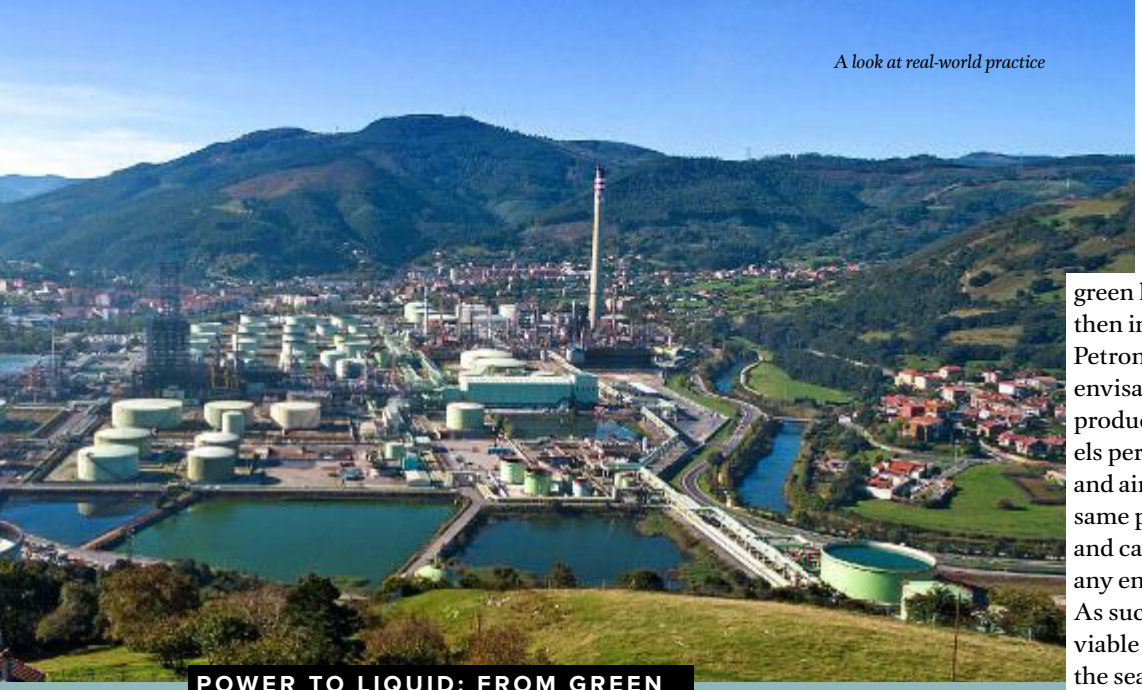


↑ **Future project:** Eighty companies, institutions and research centers belong to the Basque Hydrogen Corridor (BH2C) project

For a long time, the Basque Region was one of the poorest areas in Spain, but this densely populated and highly industrial autonomous community on the northern coast of the Iberian Peninsula has been witnessing an economic upswing in recent years. Here, by the Bay of Biscay, high winds and rough seas are almost ever-present, offering ideal conditions for wind, wave and solar farms. Dozens of renewable energy firms and large electricity producers have settled in the Basque Region. The development of a (green) hydrogen economy in the region is also gaining momentum, for example with the large-scale Basque Hydrogen Corridor (BH2C) project. Eighty companies, institutions and research centres have already joined the consortium led by energy company Repsol and its Basque petrochemicals subsidiary Petronor. The project aims to make the region a European centre for green hydrogen.

Green hydrogen is made by electrolysing water using renewable electricity and represents a key pillar of the carbon-free energy model of the future. For Repsol, green hydrogen is part of its strategy to become a net-zero company by 2050. The company is planning and building several facilities in the Basque industrial centre of Bilbao that serve precisely this goal, including a powerful electrolyser for the production of green hydrogen and a production facility for sustainable synthetic fuels (efuels). As such, Repsol aims to cover the entire value chain, from the production of green hydrogen through to the conversion of CO_2 and green hydrogen into synthetic fuels. 'Technology and the competition of projects such as this enable us to accelerate the energy transition, allowing us to achieve carbon neutrality by 2050,' points out Josu Jon Imaz, CEO of Repsol.

← **On the way to a green hydrogen economy:** The Petronor refinery near Bilbao will in future produce green hydrogen using renewable energy, derivatives of which can also be sold at petrol stations.



POWER TO LIQUID: FROM GREEN ELECTRICITY TO LIQUID FUELS

Synthetic fuels are the result of a two-stage process. Firstly, green hydrogen is generated using renewable electricity. This is done using power-to-gas technology in an electrolyser, where water is broken down into its constituent parts: hydrogen and oxygen. In the second stage, CO_2 is added to the resulting hydrogen in a kind of catalytic converter. This produces syngas, which can be used to make liquid fuels, for instance. One process used is Fischer Tropsch synthesis.

Two steps to achieving synthetic fuels

Repsol and Petronor, in conjunction with the Energy Agency of the Basque Government (EVE) and the Spanish gas grid operator Enagás, are building the electrolyser and a ten-megawatt power-to-gas plant (see info box) in the port of Bilbao, with production of green hydrogen scheduled to begin in 2024. During the current planning phase, Repsol is considering several options in terms of which renewable energies could be used to manufacture the hydrogen.

The green hydrogen will be transferred to the synthetic fuel production facilities that Repsol is currently planning with state-controlled Saudi Arabian company Saudi Aramco. Construction could still get under way by the end of 2022 and will then take roughly two years, costing an estimated 103 million euros. It will be one of the world's largest facilities of its kind and one of the first that only uses green hydrogen and CO_2 as its raw materials. The CO_2 is necessary to convert the green hydrogen first into syngas and then into efuels – and is separated at the Petronor refinery. The current planning envisages that the plant in Bilbao will produce 2,100 tonnes of renewable fuels per year for use in cars, lorries, ships and aircraft. The efuels will have the same properties as conventional fuels and can be used without having to make any engine alterations (drop-in fuels). As such, they will represent a genuinely viable option for the decarbonisation of the sea freight, airfreight and heavy-duty freight industries.

'Technology and the competition of projects such as this enable us to accelerate the energy transition, allowing us to achieve carbon neutrality by 2050.'

Josu Jon Imaz,
CEO of Repsol

Combining innovative technologies

Repsol and Saudi Aramco are deploying two innovative technologies – which will be used together for the first time on such a large scale – for the production of synthetic fuels: firstly, Fischer Tropsch CANS™, developed by British firm Johnson Matthey in tandem with BP, and secondly Reverse Water Gas Shift (HyCOgen™), another Johnson Matthey innovation. Fischer Tropsch synthesis uses catalysts to convert syngas into a variety of gaseous and liquid hydrocarbons at high pressure and high temperatures. These can then be used as synthetic fuels, synthetic engine oils and as raw materials for the chemicals sector. Syngas is a mixture of carbon monoxide and hydrogen – and can be separated from carbon-rich raw materials such as coal, natural gas and biomass. The Fischer Tropsch fixed-bed reactor from Johnson Matthey and BP utilises syngas that has been extracted from industrial emissions, direct air capture (capturing CO_2 from the ambient air), municipal waste and other renewable biomass. With the HyCOgen™ technology, CO_2 and green hydrogen are converted into carbon monoxide using a catalysed process; this carbon monoxide is then combined with additional hydrogen to create syngas. According to Johnson Matthey, combining HyCOgen™ and FT CANS results in a comprehensive and scalable process that enables cost-efficient use for projects of all sizes.

Photos: Repsol (2); DaniFoto/Alamy Stock Photo/mauritius images

Analysis

ELECTRIC CARS TRIGGER 'BRUTAL SOCIAL SHOCK-WAVE'

From 2035, the EU wants to ban the sale of new cars with internal combustion engines. In an interview with the French daily *Le Figaro*, French economic journalist and publicist François-Xavier Pietri warns of a 'brutal social shockwave' to follow. Pietri says the French car industry alone will suffer an 'unprecedented shock'. Companies that supply parts for vehicles with internal combustion engines will have to file for bankruptcy, as will numerous car repair shops because electric cars require much less maintenance. Moreover, Pietri explains, petrol stations will have to close en masse because not all of them can be repurposed as charging stations. Pietri also expects the costs of operating electric cars to rise: 'Due to the Ukraine war, we are now discovering that electricity is a rare and expensive energy.' In France, for example, electricity at charging stations now costs three times more than before the war broke out. There is also the question of individual mobility. 'A trip through France in an electric car is a real ordeal because you're constantly having to look for charging stations ahead of time. Drivers lose the freedom to determine the route.' Electric cars are practical for daily use but hell on long trips. Pietri also warns against exposure to an authoritarian regime like China through a one-sided commitment to e-mobility. Chinese companies control 80 per cent of the mining of cobalt in the Democratic Republic of Congo, Pietri reports, a rare-earth metal that is essential for the production of lithium-ion batteries.

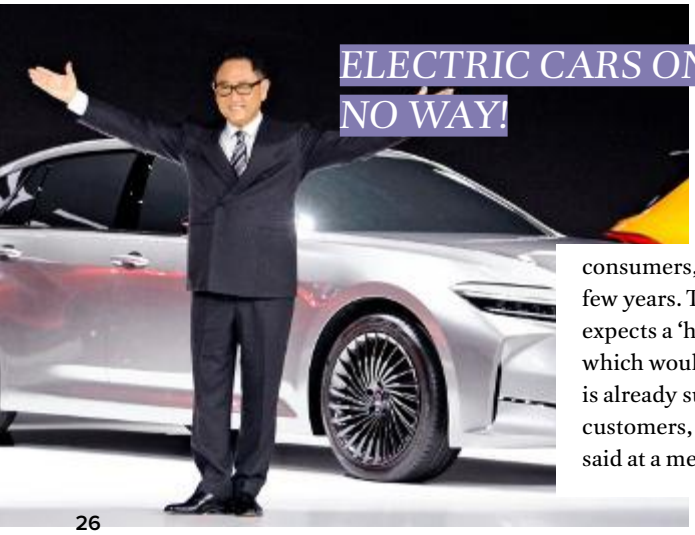
e-mobility

The on-board electronics of electric cars eat up electricity, not to mention the electronics in the chargers themselves. What might seem negligible from an emotional perspective turns out to be a tsunami of costs at second glance. This was demonstrated in a test conducted by the German automobile association ADAC, Europe's largest motoring club with 21 million members. ADAC's engineers compared the charging losses of popular electric cars, including the Renault Zoe, Tesla Model 3, VW ID.3 and Fiat 500e, when they 'tank up' with electricity at a wallbox charging station and at a household socket. In terms of charging, the biggest power guzzler is the rectifier, which is responsible for converting the mains current into direct current. This is especially true when charging at a socket, where the component is in operation for an extended period. During socket charging, up to 30 per cent of the energy is lost in the form of heat. Because of the higher charging power of a wallbox, the losses here are somewhat lower, at five to ten per cent. At an annual mileage of 10,000 kilometres, the additional costs for charging an electric car at a household socket as opposed to a wallbox are around 120 euros per year, as calculated by the German automobile publication *Auto Zeitung*.

ELECTRIC CARS: HIGH CHARGING LOSSES

Transport

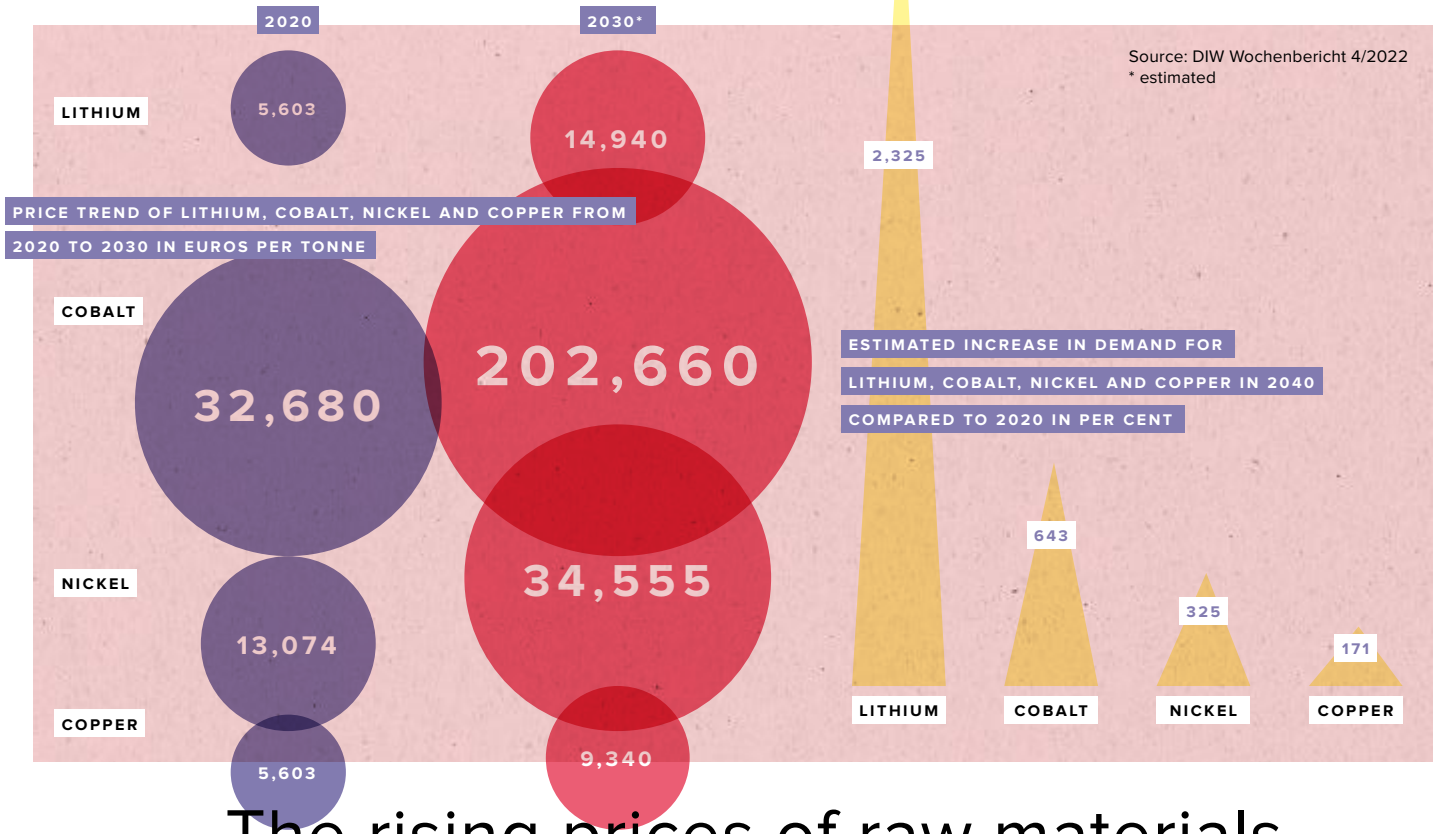
ELECTRIC CARS ONLY? NO WAY!



Many car manufacturers have long since geared their plans for the future toward the exclusive production of electric cars. Not so at Toyota. Head of the Japanese carmaker Akio Toyoda is reluctant to commit to producing a fleet of electric vehicles only, anticipating severe problems for all manufacturers who rely solely on this technology. According to Toyoda, the lack of infrastructure and the high prices, compounded by the habits of consumers, argue against the notion that everyone will be ready for electric cars within a few years. This is further worsened, Toyoda suggests, by the raw material situation. He expects a 'huge shortage' of battery-grade lithium and nickel in the next five to ten years, which would perpetuate the supply chain problems and limited production the industry is already suffering. The goal at Toyota remains to satisfy the 'greatest possible amount of customers, with the greatest possible selection of drive technologies', the Toyota chief said at a meeting with Toyota dealers in the U.S.

Photos: Jon Challicom/Getty Images; imago images/Sebastian Geisler; picture alliance/ASSOCIATED PRESS/Tetsuya Nakamura

→ Raw material prices



... The rising prices of raw materials and the ramifications for e-mobility

SEK

0 —

The EU is backing a ban on combustion engines. But for the politically imposed transition to e-mobility to be possible, materials such as lithium, cobalt, nickel, copper and neodymium are essential. Without materials like these, manufacturers can't build electric cars – they're found, after all, in every electric car battery. However, the war in Ukraine, supply bottlenecks due to the COVID-19 lockdowns in China and rising demand in the wake of the global energy revolution are causing prices for these raw materials to skyrocket. In Germany, lithium, cobalt, nickel and copper are in scarce supply or else unavailable altogether; for this reason, German car producers are forced to import these metals which e-mobility relies on – and put up with the rapidly rising prices. For example, the global average price of battery-grade lithium in *June 2022* was around *71,422 euros per tonne,* almost triple the price in 2021. The price of nickel settled at around *24,155 euros per tonne* in the same period. The price of copper has also risen sharply, with the metal costing around *8,330 euros per tonne* this summer. That's a good 20 per cent more expensive than the previous year. Cobalt also saw price jumps: in the summer of 2022, the average price of cobalt on the raw materials market climbed to around *68,520 euros per tonne.* At the same time, the International Energy Agency (IEA) warns that demand for these raw materials could continue to rise sharply over the next 20 years. These are not great prospects for the affordability of e-mobility.

20 —

40 —

60 —

eFuel alliance

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