

German Wind Power

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Windindustry
in Germany

One step ahead of hackers

How the Germany Cyber Agency plans the future of IT-security for critical infrastructures like wind turbines.

Rolling batteries for the energy transition

E-mobility will take an important role for the future power grids powered by renewable energies.

Funding through tokenization

A piece of a wind turbine for 50 euros, please.

Including contacts to
German experts



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Wolfram Axthelm

CEO of the German Wind Energy Association (BWE)

Germany seeks way to the top

The German government is pushing renewables in general and wind power in particular by passing several extensive legal packages before the summer break. The Renewable Energies Act defines and significantly strengthens the annual targets for the next 20 years. Additionally, renewables are defined as being in the greatest public interest and so privileged among entities of legal protection. A new Onshore Wind Act defines the scope of areas federal states need to provide for wind power expansion by 2026 and 2032.

Russia's war on Ukraine has greatly increased the pressure. Expanding renewables, especially the key player wind power, is the only way out of the energy crisis.

The industry still needs further clarification, as some of the new rulings are not specific enough. However, the three laws underscore the shared to accelerate wind energy expansion. Now, it's up to federal states and local authorities so that Germany can return to the premier league of wind energy.



Mirko Moser-Abt

Head of European Affairs at the German Wind Energy Association (BWE)

Freedom energies

The high energy prices caused both by the steep economic recovery after the corona pandemic and the Russian attack on Ukraine have made one thing crystal clear: renewable energies not only face the climate crises, but also lower electricity prices and foster German and European Energy sovereignty. Scepticism in parts of the society has given way to a new narrative of renewables as "Freedom Energies". This will provide the expansion of wind energy with additional momentum.

However, to cut ties with fossil dependencies, building more wind turbines will not be enough: Germany and its European neighbours will have to expand grids and work on a legal framework that incentivizes investments in sector coupling and energy storage technologies.

Now it is time take the energy transition to the next level and allow renewables to take on even more responsibility for a stable green electricity supply in a modern and sustainable energy system.





Industry News

Maps: Wind power worldwide

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Meeting future challenges today

The German Cyberagentur researches the future of IT-security for critical infrastructure like wind turbines.

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Wind energy and electromobility: The moving batteries of the energy transition

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The future of seafloor data surveying

Unmanned surface vessels revolutionize offshore mapping.

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German wind industry is hiring!

Due to the upcoming wind boom companies are looking for skilled workers.

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Innovative Projects

ADDINOL Lube Oil GmbH – Only lubrication is not enough

Complex demands of modern aggregates do not only require reliable lubrication but also competent advice on the application

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Ideas from Germany

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What does it need for a successful energy transition?

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Making wind energy tangible for the next generation

A unique children's book shows children of kindergarten age how wind energy works.

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Your contacts to German experts



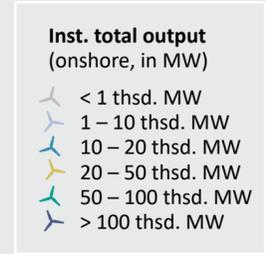
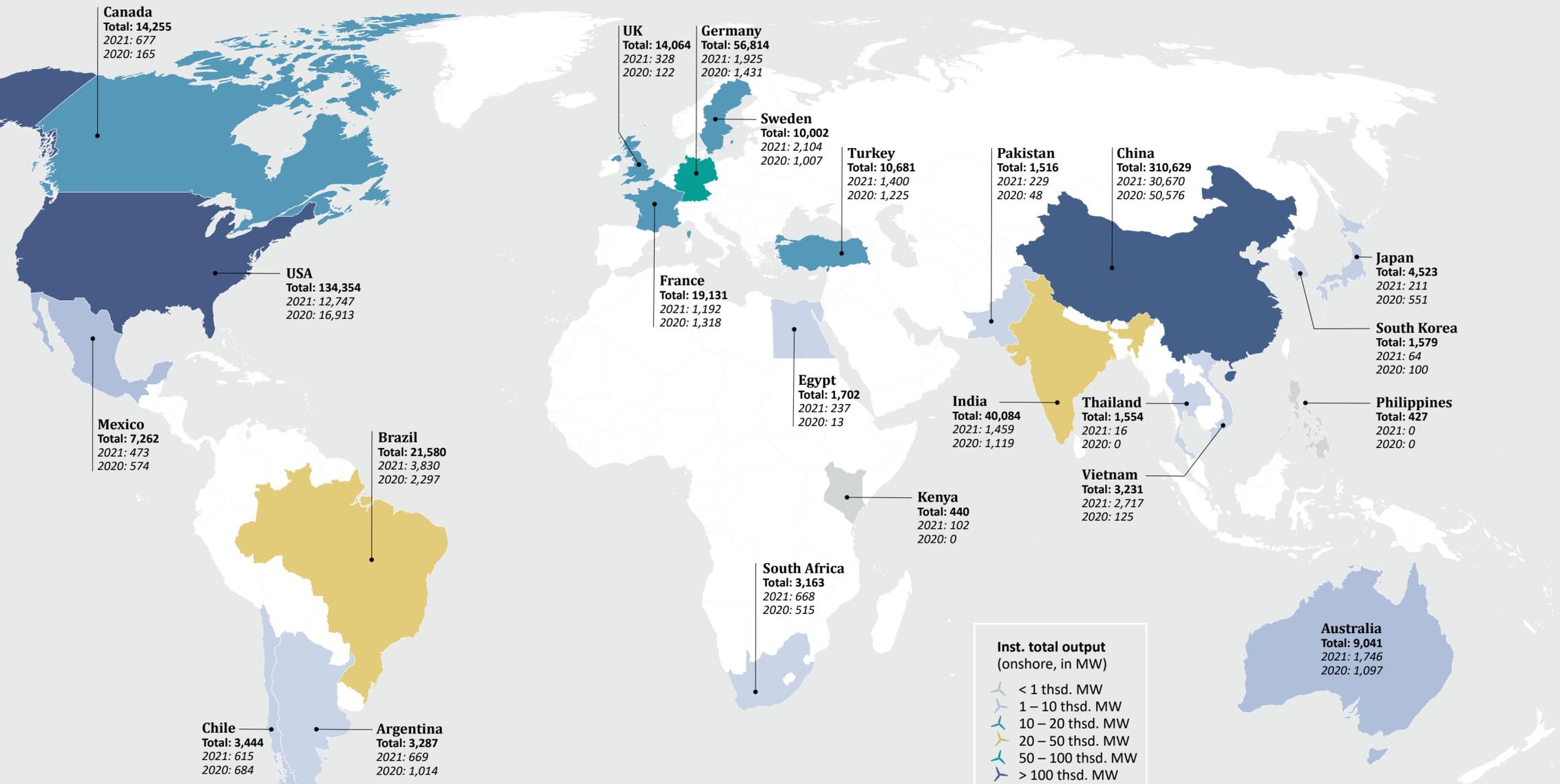
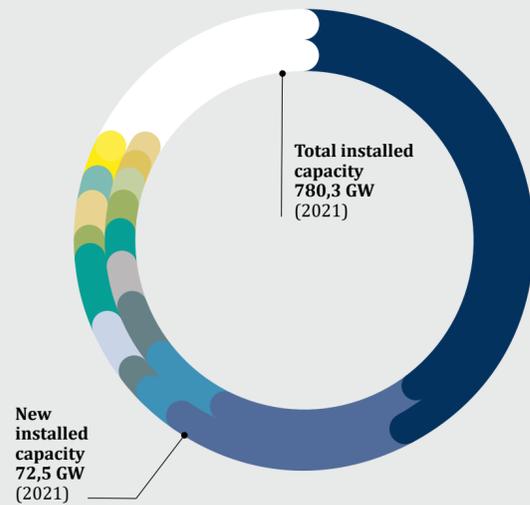
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Industry News

Wind power worldwide (onshore)

Total installed capacity worldwide/
new installed capacity in 2021



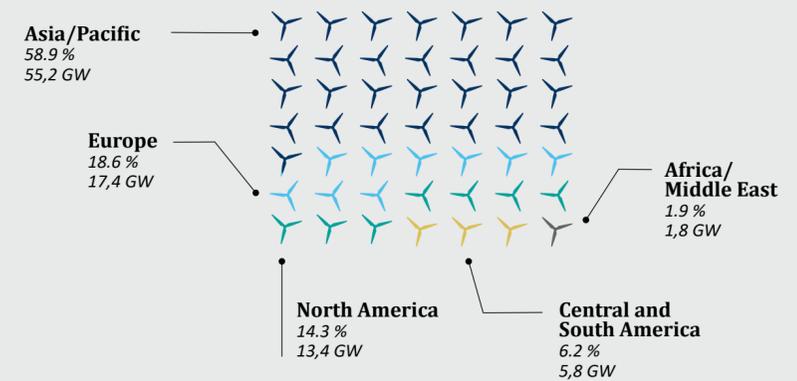
Data: GWEC | Graphical processing: BWE

Regions Share of total capacity (GW onshore, in percent)/share of new capacity installed in 2021 (GW onshore, in percent)

<p>China Total: 39.8 % New: 42.3 %</p>	<p>USA Total: 17.2 % New: 17.6 %</p>	<p>Germany Total: 7.3 % New: 2.7 %</p>	<p>India Total: 5.1 % New: 2.0 %</p>	<p>Brazil Total: 2.8 % New: 5.3 %</p>	<p>France Total: 2.5 % New: 1.6 %</p>	<p>Sweden Total: 1.5 % New: 2.9 %</p>
<p>Vietnam Total: – New: 3.7 %</p>	<p>Spain Total: 3.6 % New: –</p>	<p>UK Total: 1.8 % New: –</p>	<p>Australia Total: – New: 2.4 %</p>	<p>Turkey Total: – New: 1.9 %</p>	<p>Canada Total: 1.8 % New: –</p>	<p>Rest of the world Total: 16.6 % New: 17.5 %</p>

Data: GWEC | Graphical processing: BWE

New installed capacity in 2021 by region (onshore/offshore, in percent)

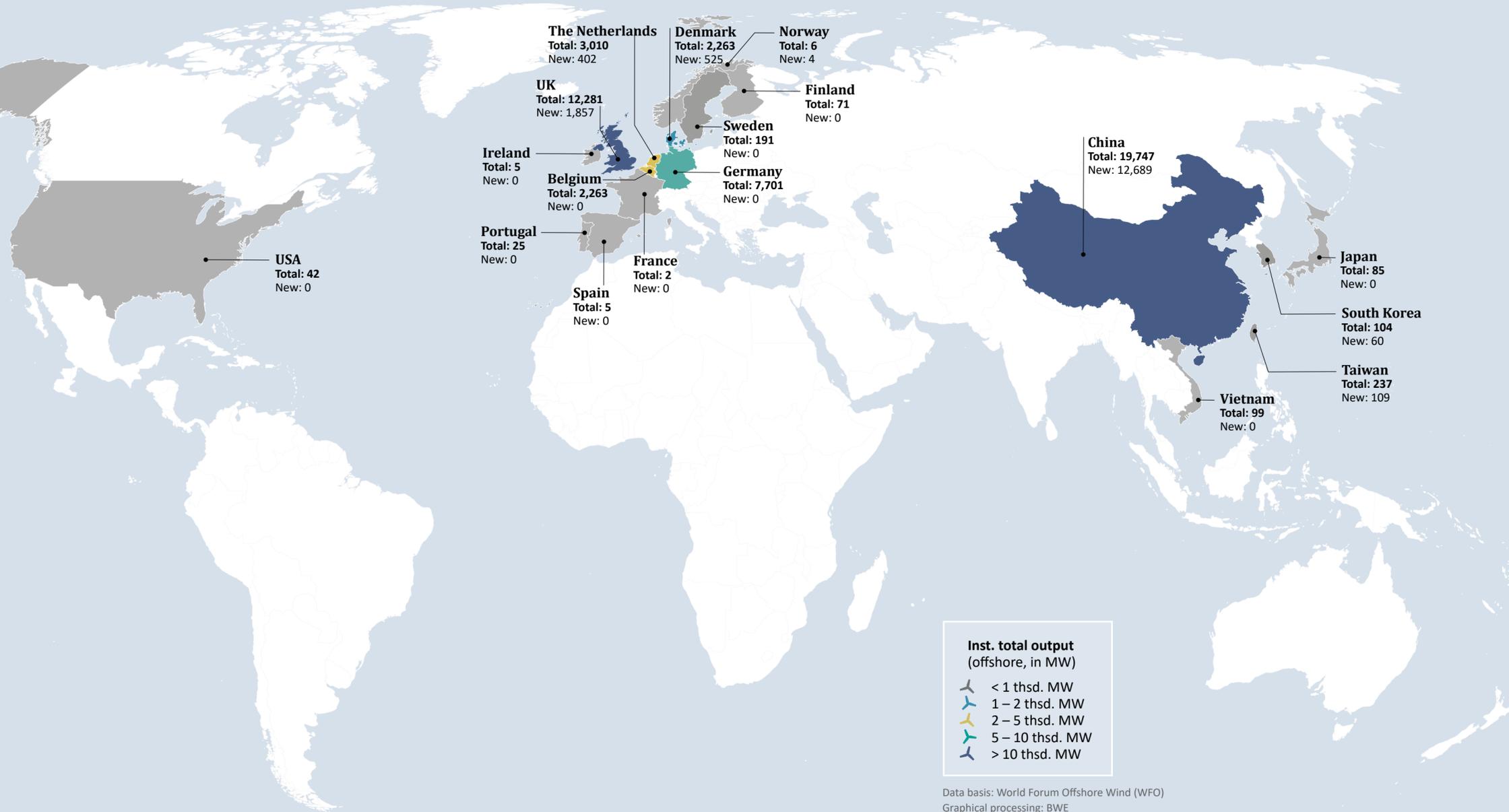


Data: GWEC | Graphical processing: BWE

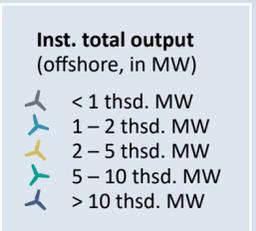
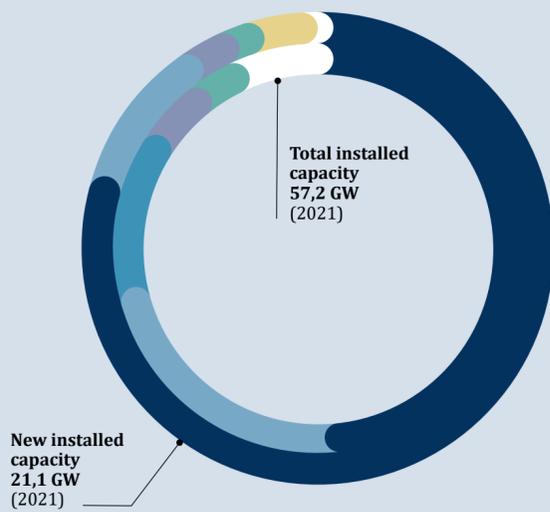


Industry News

Wind power worldwide (offshore)



Total installed capacity worldwide/
new installed capacity in 2021



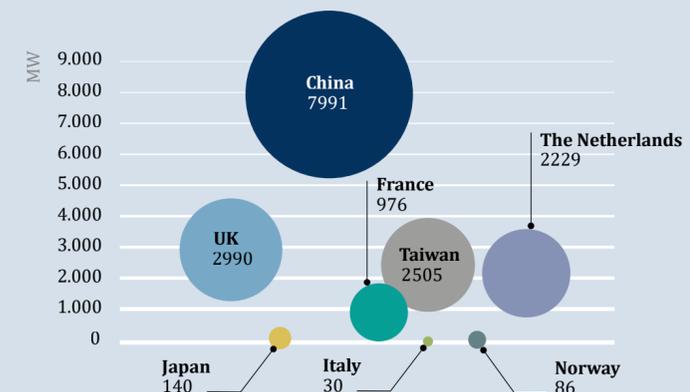
Data basis: World Forum Offshore Wind (WFO)
Graphical processing: BWE

Regions Share of total capacity (GW offshore, in percent)/share of new capacity installed in 2021 (GW offshore, in percent)

<p>China Total: 48 % New: 80 %</p>	<p>UK Total: 22 % New: 11 %</p>	<p>Germany Total: 13 % New: –</p>	<p>The Netherlands Total: 5 % New: 2 %</p>
<p>Denmark Total: 4 % New: 3 %</p>	<p>Vietnam Total: – New: 4 %</p>	<p>Rest of the world Total: 7 % New: 1 %</p>	

Source: GWC | Data basis: Global Offshore Wind Report 2021
Graphical processing: BWE

Under construction by the end of 2021 (offshore top 8)



Data basis: World Forum Offshore Wind (WFO)
Graphical processing: BWE



Meeting future challenges today

The German "Cyberagentur" develops future cybersecurity capabilities for critical infrastructures like wind turbines and new researches new ways of protecting IT and OT.

In recent years, the use of cyberattacks for criminal as well as military purposes has increased. Targets are private companies as well as governmental agencies and critical infrastructures. Their goals range from extracting ransoms to silently infiltrating systems or disrupting operations.

For example, the impact of the use of cyberattacks in the war between Russia and Ukraine could even be felt in such a remote place as Aurich in Germany. A Russian cyberattack had targeted modems that were used for Ukrainian communication. But these modems were also used to connect to 5800 wind power stations in Germany, which were equally affected by the damage the attack caused to the modems.

Fortunately, direct access to these stations was not disrupted and they continued to operate normally. But it was not possible to conduct remote maintenance operations on them. In order to regain full operational capabilities the modems had to be replaced, which took quite a long time because of the worldwide shortage of hardware components. While the effects of the disruptions

were only marginal, it still highlights the need to increase the overall resilience of wind parks and other critical infrastructures in Germany, which is one key task of the newly founded "Agentur für Innovation in der Cybersicherheit", short: Cyberagentur.

Research question: How to improve cybersecurity in the future?

One of the more straightforward research ideas is to simply reduce the likelihood that a system can be infiltrated, and its operation disrupted. Future tools could for example help to automatically detect weaknesses in a system and automatically fix them. In addition, the software could also detect if an attacker has already infiltrated a system and initiate a forensics analysis in order to determine the origin of the attack. While the development and research of such a tool for information technology (IT), operational technology (OT) and IT/OT systems is difficult, it is conceptually similar to how systems have been protected in the past.



A different approach is to develop hardware and software that is inherently secure. While the formal verification of a complex system, i.e. it is mathematically proven to be completely secure, may be impossible to accomplish, it might be possible to develop a barebone system that consists of hardware and software, which is verified. This basic system could then serve as a backbone of more complex systems and software and thus

ensure that it is secure at the most basic level. So far, such a system has not been fully developed yet, which makes it an ideal research question for the Cyberagentur.

What conclusions can be drawn from the wind farm disruption?

In the initial example of the wind power stations, four additional aspects pose interesting research

questions. First, the attack impaired the ability to perform remote maintenance work. Current research in AI is exploring how systems can be self-aware, i.e. how they can monitor their own status and how they can autonomously initiate and perform their own maintenance. Is it possible for such an artificial system to "heal itself" in the future?

Second, repairing the damage involved replacing the affected modems with different models. This exchange proved difficult because of a worldwide shortage of relevant hardware. To retain digital sovereignty, it may be necessary to research novel hardware and build-up national manufacturing capabilities, in our case in Germany. Novel hardware could for example require fewer precious minerals, ideally only materials that are available in the individual country.

Third, the modems were necessary in order to establish communication with the individual wind power stations. This connection is reliant on a functioning space infrastructure. But alternative modes of communication, i.e. independent of space, could increase the resilience and provide

another layer of redundancy. And finally, the wind farms in the future will most likely be located off-shore. It will be necessary to better monitor these parks then, which necessitates the ability to detect anomalies in the air, on the water and below the water and to quickly identify what type of anomaly it is, i.e. friendly or hostile. All these challenges and research questions fall within the prerogative of the Cyberagentur to review, assess and possibly contract research.



Conclusion: Cybersecurity needs to be the golden standard.

The case of the Russian cyberattack has shown that cybersecurity needs to be incorporated into the design and operation of any system. Cybersecurity-by-design has to become the golden standard. The Cyberagentur supports this approach by commissioning high-risk, high-reward research projects that will ensure Germany's digital sovereignty in the future.

Fortunately, the Cyberagentur is not the only actor in Europe dedicated to improving cybersecurity. At the European level, the Joint European Disruptive Initiative (JEDI) launches GrandChallenges that aim to push the frontier of science further. While it is not exclusively focussed on cybersecurity, the digital domain, alongside environment, healthcare, education, oceans and space, is one of the six major societal challenges they have proposed.

On a national level, France for example established its Defence Innovation Agency in 2018. Similarly, the UK launched a Defence Innovation Initiative in 2016, which consists of a Defence and Security Accelerator

as well as a Defence Innovation Fund. What these initiatives and agencies all have in common is their focus on high-risk projects and to emphasise the potential benefit of a research rather than to thwart it by highlighting the potential risks of failure. It is this spirit of going forward and "doing the research" instead of theorising that will ensure Europe's security and prosperity in the future.

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Introducing the Cyberagentur

It is the mission of the Agentur für Innovation in der Cybersicherheit (Cyberagentur) to contract disruptive research projects in the field of cybersecurity and related key technologies. It thus finances research with a horizon of ten to 15 years that is strategically important for Germany's internal and external security. The agency was established by the federal government as an in-house company under the joint leadership of the Federal Ministry of Defense and the Federal Ministry of the Interior and Community. Projects are commissioned that are highly innovative but at the same time involve a high level of risk with regard to achieving its objectives.

While the specific cyberattack on the modems of an energy provider is at first glance an issue for the Federal Office for IT security (BSI), which was indeed involved straight away, it also pertains to the work of the Cyberagentur. Several elements of this attacks and its aftermath present key challenges for the future of our security and the capabilities of security actors in Germany. These challenges are:

- How can we better protect our critical infrastructure against cyberattacks?
- How can we react faster to a cyberattack?
- How can we improve our ability to recover from an cyberattack?

While there are immediate measures, e.g. as discussed and proposed by the BSI, that can be taken to generally maintain a high level of security for critical infrastructure providers, a look into the future presents possibilities and opportunities. However, these need to be pursued now to reap the benefits then. So, what are possible answers to the three questions and how does the Cyberagentur pursue these answers?

Author

Dr. Gerald Walther
Head of Department Secure Systems (acting) at Agentur für Innovation in der Cybersicherheit GmbH



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Wind energy and electromobility: The moving batteries of the energy transition

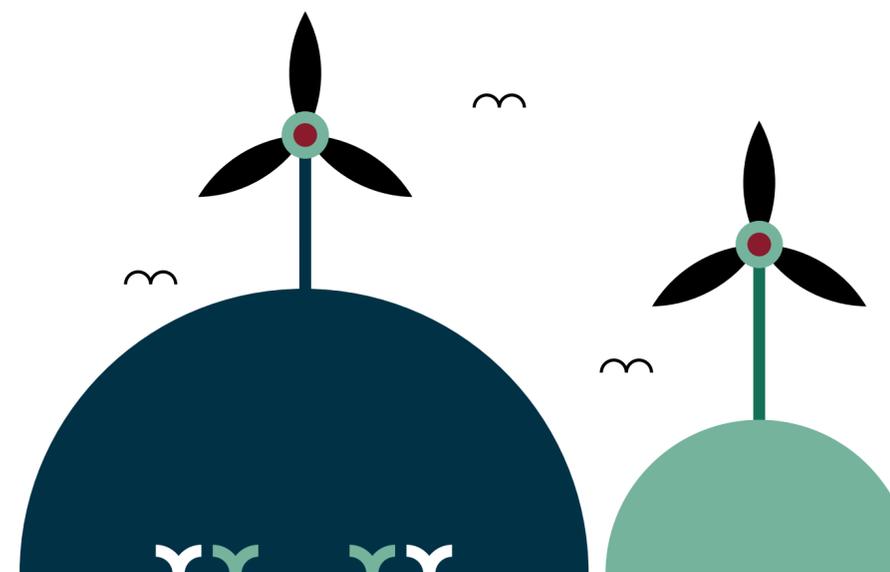
Electric vehicles are only sustainable when charged with green electricity. But beyond that, they can even make the power grids fit for the worldwide energy transition.

Wind energy and e-mobility are highly debated topics in the context of the energy transition. The EU's climate protection goals and the most recent plans to become independent from Russian gas, oil and coal by 2027 underline the necessity of promoting renewable energies in general. The use of fossil fuels for vehicles needs to be reduced. However, if electric vehicles were solely charged with power generated using fossil fuels, nothing would be gained. In order to have the desired climate-friendly effect, green electricity – electricity that is produced 100 % from renewable energy resources – should be used to charge electric vehicles. Wind energy will play a substantial role in this. In turn, the batteries of electric vehicles could serve to counter effects stemming from the volatile generation of wind power depending on the varying wind speeds. In the following, we will show which aspects should be considered when linking wind power and e-mobility.

Thinking charge points and wind farms together

In Germany the construction of wind farms is highly controversial in rural areas. A lot of permits for wind farms are challenged in court by neighbouring residents. Thus, increasing local acceptance is of great importance for wind entrepreneurs and politicians. Often, the erection of charging points is on the according wish list of municipalities. However, in the example of Germany offering any measures that are not materially related to the permit procedure is difficult. Narrow limits are set in that regard by criminal law on corruption. Thereafter, one may not promise an advantage for an official act. Although Sec. 6 of the German Renewable Energy Sources Act does allow financial participation by municipalities, this only refers to payments and not to any other benefits. In this respect, community participation in wind turbines is very narrowly conceived.

Thus, if the project developer wants to combine the advantages of renewable energies and e-mobility, then it makes sense to offer an overall concept from the outset that covers both the installation of wind turbines and charging stations, so as not to create an inadmissible connection afterwards.

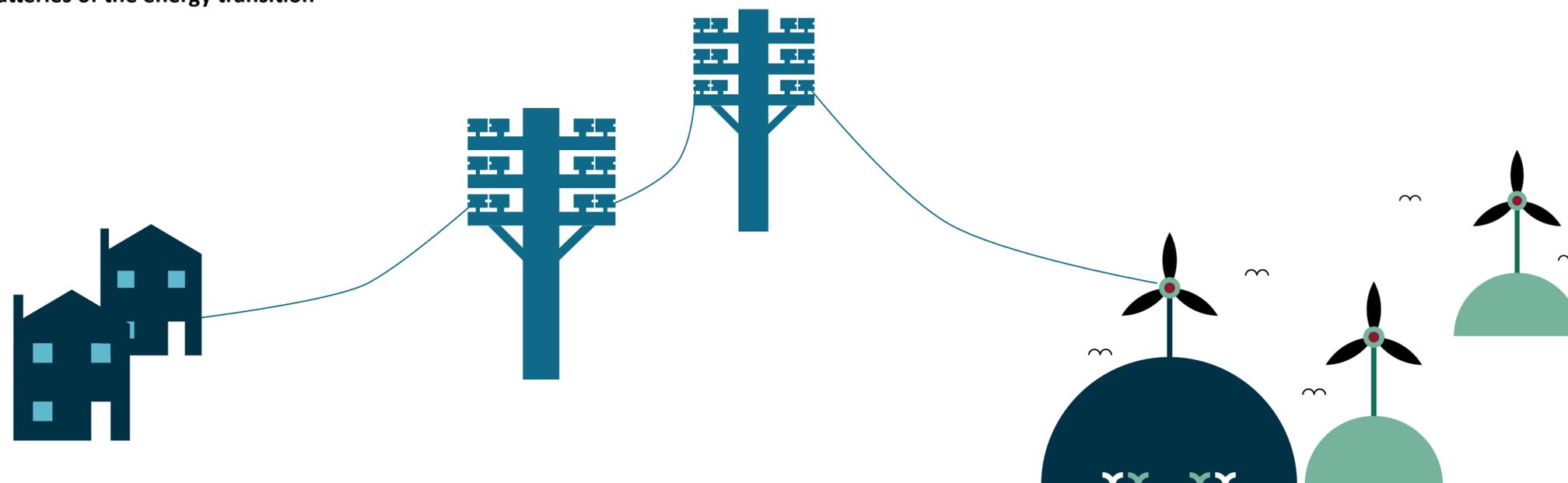


Wind projects and e-mobility can have a great outcome for municipalities – if the legislation takes them into account and they are planned together. © Osborne Clarke

To achieve the emission reduction goals, the power supplied to electric vehicles should be produced by renewable resources. Supplying the charge points with non-renewable electricity as available in the public grid would not be sustainable. It is worthy to note in this context, that public grants are oftentimes linked to the precondition that green electricity is used for the charging of the electric vehicles.

Where does the energy really come from?

The most common way in the European Union to source green electricity is by sourcing so-called "grey electricity" and to buy so-called "guarantees of origin" (GoO). These GoO prove that a certain amount of electricity has been produced by renewable power plants, e.g. in Norway. Most offers for the delivery of green electricity are based on the supplier buying such GoO. However, more and more customers, in particular big corporate players are looking to source green electricity from specific renewable energy facilities, e.g. via the conclusion of power purchase agreements (PPA) for the offtake of the renewable electricity generated in specific plants.



There are different ways to source green energy to assure that it is really green energy: Guarantees of origin (GoO), PPAs or regional evidence register. © Osborne Clarke

A kind of in-between alternative to source renewable electricity is to buy the electricity from suppliers offering electricity generated in the region as evidenced by the regional evidence register (Regionalnachweisregister). The establishment of such register and the according marketing of such "regional renewable electricity" was one of the measures to increase general public acceptance to new wind farm projects. Sourcing such regional renewable electricity would also enable charge point operators to forego to source energy that is made green by the "long-distance" import of GoO.

Grid-serving charging:

Charging when the wind blows ...

Volatile energy generation from wind farms and electric vehicle charging are each a stress factor for electricity grids which are best solved together: Distribution grids are neither designed for the feed-in of volatile renewable electricity nor for the simultaneous charging of a (very) high number of electric vehicles. The load of two electric vehicles charged at home can sum up to the load of a usual four persons household. This demonstrates the challenges the distribution grid is facing by the shift to electric vehicles. The increasing share of volatile renewable energies is a challenge for grid operators leading to peaks and valleys in the energy production.



Some of the according issues could be resolved by grid-serving charging of electric vehicles. Electric vehicles would preferably be charged at times with high renewable electricity production. Moreover, electric vehicles would not be charged at full load at the same time there is other demand (e.g. when people come home from work). However, in order to have grid-serving charging, communication units are vital.

In Germany, this communication unit is called smart meter gateway, which can be integrated into the electricity meter. This device would collect and coordinate all the information necessary for the smart charging process, such as the current load of the electricity grid, and forward it to the home energy management system. In this way, charging power, time and duration could be regulated individually for each car. It is worthy to note that grid-serving charging is subsidised in Germany by lower grid fees.



Electric vehicles can be "rolling batteries": Loading at sunny/windy times, feeding the grid, when its necessary. © Osborne Clarke

... and vehicles used as batteries in times of wind lulls.

Moreover, grid-serving charging could also be an answer to the storage problem of the strongly weather-dependent renewable energies. Electricity peaks could be "absorbed" by the batteries of the electric cars and fed out of the battery for consumption at a later point in time: In addition to using the stored electricity to move the vehicle itself, the stored electricity could be used to supply buildings during periods of low renewable energy production and, thus, high energy prices ("vehicle-to-home"). Furthermore, electric vehicles could also feed the electricity into the grid ("vehicle-to-grid").

Both use cases are also referred to as "bidirectional" charging which can help to master the energy transition. 10 million electric vehicles have 400 – 500 gigawatt hours of storage capacity. The smart integration of this potential of electric vehi-

cles into grids will make an important contribution to "shave the peaks and fill the valleys" of the fluctuating electricity generation of renewable energies. Electric vehicle charging and volatile energy generation taken as separate asset classes are deemed to pose issues for the grid stability. Viewed holistically, the assets could – at least in part – provide a solution to such issues.



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The potential is there, now we must realize it. However, there still is some way to go towards a comprehensive market design and regulatory framework. This goes, in particular, for grid-serving charging and vehicle-to-grid solutions built also to the linking of regionally generated renewable electricity with local or regional offtake in charging points. Nonetheless, the companies Next Kraftwerke and Octopus Renewables are pioneers in the field described above. Next Kraftwerke pools electric vehicles to offer flexibility to the grid in the Netherlands. Octopus Renewables offers their customers in the UK lower electricity

fees if they adapt their energy consumption to the production of renewable energy. In Germany, the great breakthrough of such business models highly depends on the rollout of smart meters which enable the control of the electric vehicles' charging but there is a huge potential in the most populated and economical strongest state of the EU.



If we think about the grid of the future, we should use the synergies that e-mobility and renewable energies offer. Challenges of one technic can be compensated by others.
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Authors

Dr. Karla Klasen
Associate at Osborne Clarke



Dr. Alexander Dlouhy, LL.M
Partner at Osborne Clarke



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The future of seafloor data surveying

Unmanned Surface Vessels can deliver vital data for offshore wind farm development and maintenance at a fraction of today's cost.

Germany's so-called "Easter Package" has made acquiring new permits for offshore wind developments faster and reduces delays from legal challenges, so new capacity will become easier to establish. The Package included an increase in offshore wind production by 30 GW by 2030. Already, Germany's offshore wind targets were increased last year to 20 GW by 2030, so the new targets represent an incredibly significant increase, just as the dust settles on the last one.

The signs point to offshore – not just in Germany
Barring any further target increases, circa 10,909 new wind turbines are set to be installed offshore Germany by 2030 to deliver the desired 30 GW boost.

The vast number of new turbines needed also shines the spotlight on German industry and innovation in diverse sectors. This includes marine survey, a commercial service that planners,

engineers, prime contractors, and operating companies depend upon for accurate underwater data that is necessary for safety, efficiency, and cost reduction at every stage of an offshore wind farm's lifecycle.

... and this increases the demand for offshore data analysis. Hydrographic survey contractors acquire high resolution data to build a detailed bathymetric (seafloor) map of a proposed wind farm site to standards set by the International Hydrography Office (IHO). Surveys will also be conducted prior to, during and after the installation of pilings and turbines, for cable routing and for unexploded ordnance (UXO) searches. Once the wind farm is operational, data will be required periodically over the 20–30-year lifecycle for use in e.g., condition-based maintenance systems.

As with all aspects of wind farm operations & maintenance, the cost of bathymetric data is a constant pressure. The marine survey industry must continue to optimize and innovate to accommodate the growth in offshore wind and the data it requires. Autonomous and Unmanned Surface Vehicles (USV) will play a key role.

Changing the game with Unmanned Surface Vessels (USV)

Manned survey vessels can cost anywhere from a few thousand Euros to 150K per day, with a tangible portion of these costs going towards the human element; think cooks, living quarters, training, wages and benefits, welfare and safety, telemedicine and even Netflix. But with vessels designed to never have a human on board, both CAPEX and OPEX can be radically reduced.

Achieving a reduction in the cost of marine data by using USVs requires several pre-requisites in both technology and strategy, however. The first is vessel design. Today's commercial survey USVs are based on the workflows and physical design of traditional survey vessels. They can operate with-



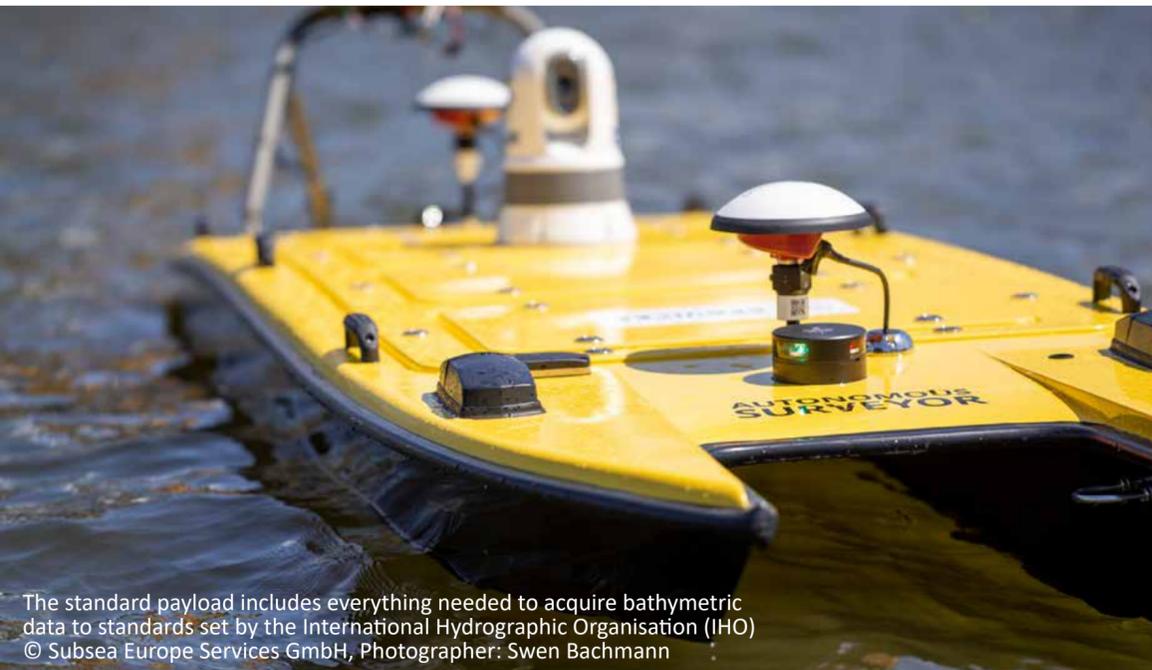
out a human on board but are restricted by operational norms in that they are slow and not highly manoeuvrable.

Autonomous vessels with real-time response

The most effective approach is to deploy smaller, faster, and more agile unmanned platforms. The rationale being that a nimble USV can adapt to operational demands quickly, using all-electric propulsion for clean and lower cost running, while

navigating autonomously in both transit and during surveys is a positive step towards "de-manning" survey operations.

To truly remove the human-from-the-loop, the hydroacoustic package – the system that collects the data – must also feature AI powered autonomous operations that can inform the USVs own autonomy controller of actions to take based on its own real-time results.



The standard payload includes everything needed to acquire bathymetric data to standards set by the International Hydrographic Organisation (IHO)
© Subsea Europe Services GmbH, Photographer: Swen Bachmann

USVs with the required autonomous capabilities are in place and more intelligent survey systems are just around the corner. Once a new generation of multibeam systems arrives, a further advantage of the next generation USV approach is that they will be able to boost the speed at which a survey is conducted.

Today's average survey speed is around 4-6 knots (circa 10 km/h) due to the limitations of multi-beam echosounders and associated technologies,

but new hydroacoustic systems able to produce as high-quality data survey speeds exceeding 16 knots (Circa 30 km/h) should be available within 2022. This means a fast USV capable of hitting the survey system's speed limit can survey three times more area than a slower manned or unmanned vessel incapable of maximising the systems full capabilities.

Creating new workflows: 24-hour-fleets and "Mother Ships"

When the above technology prerequisites are met, new workflows can be introduced. Fully autonomous operation will see USVs operating on their own for an entire day, returning to base to transfer data (or uploading the data via satellite immediately), and then going back out again on swapped-out or recharged batteries – all while collecting commercial quality bathymetric data, on spec. An entire fleet could operate 24 hours a day to build an extensive data library ready for immediate application to any engineering projects on demand.

Another scenario is the use of Vessels of Opportunity or "Mother Ships". A wind farm service vessel moving engineers between turbines day in, and day out, could for instance, be the permanent home for several small and agile USVs. The vessel would only need a small deck crane as a launch and recovery system and no real expertise on board, other than training for safe deployment and retrieval.

SOLUTIONS FOR LOW VIBRATION

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Further, it has already been demonstrated that operating such next generation USVs in swarms can increase savings exponentially. Multiple interconnected USVs can independently go about their business of sucking up enormous amounts of bathymetric data with minimal human intervention and oversight, essentially commoditizing marine data for the end-user.

The singularity

The future of hydrographic data acquisition could be revolutionized with USV. AI powered USVs working alone with AI powered hydrographic sen-

sors, producing ready to use bathymetry data could cost a fraction of what conventional processes cost. In an ideal world where marginal costs are optimised and infrastructures, hardware and software are 100 % robust and failsafe, we can predict that a day's worth of survey data today costing 12k Euro to deliver via a medium sized survey vessel with full complement of crew and surveyors, to be accessible to end-users for as little as one Euro in the future.

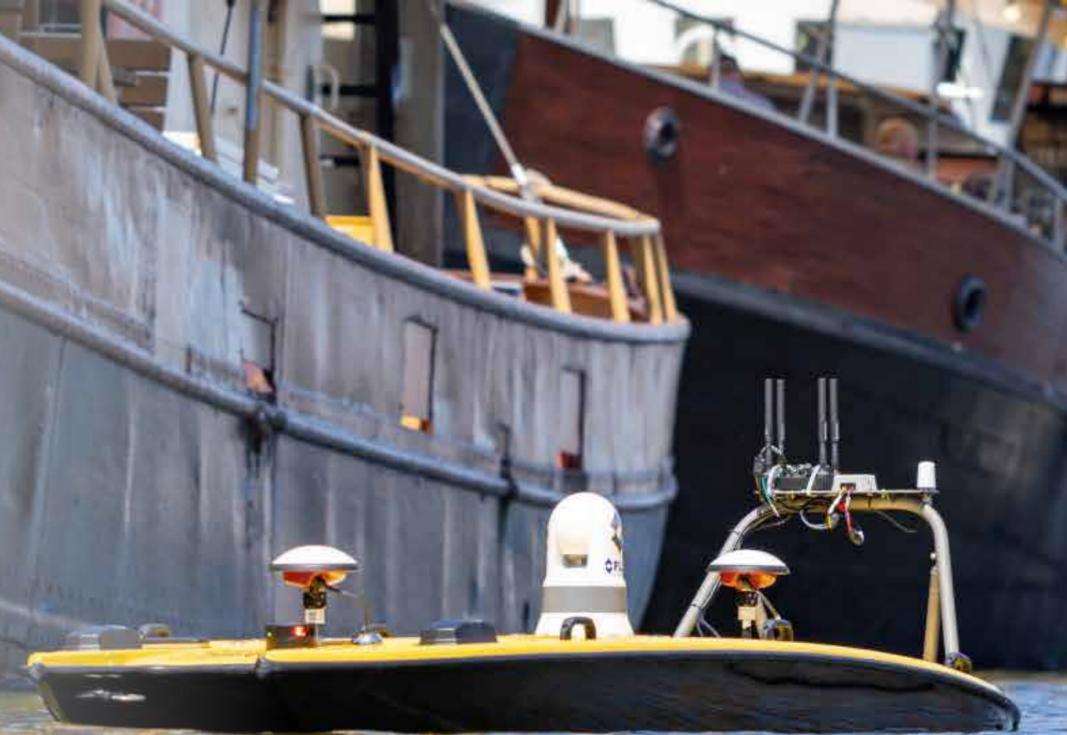
This is the singularity. With USV data acquisition at such a low cost, surveys can be done without a commission, and this allows the industry to flip from being a reactive service only, to also offering Data-as-a-Service. So, when any offshore wind stakeholder needs bathymetric data for new or existing projects, it will be available online and at an unthinkable lower cost than today. All in all this would be a big support for the future offshore wind industry and the energy transition worldwide.

Authors

Daniel Esser
Managing Director at Nicola
Offshore



Sören Themann
CEO at Subsea Europe
Services GmbH





Industry News

German wind industry is hiring!

German wind companies are looking for skilled workforce facing the high new targets for wind energy – and the BWE supports them with its new initiative.

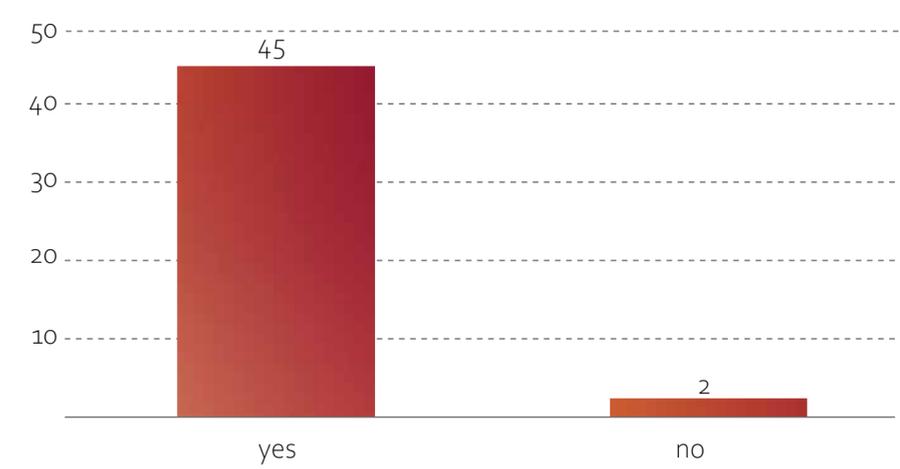
The wind has finally changed and the German wind industry is back on its feet. After the record expansion in 2017 with over 5 Gigawatt (GW), expansion rates slumped dramatically due to political mismanagement. In 2021 a new social-green- liberal coalition came into office, who is determined to "dare more progress", as the headline of the coalition agreement states. And in 2022, the green Minister for economy and climate protection Robert Habeck came clean with his plans for a green energy transition: Starting in 2023 with 12,84 GW. Germany will award 10 GW of wind energy each year in the tender rounds up until 2030.

The need for green energy rises stronger because of the Russian invasion

The so-called "Easter package" will be followed by the "summer package", in which the allocation of wind areas, planning procedures and nature conservation will be addressed and facilitated. This corresponds with the EU's climate and green energy ambitions, which have strongly increased since Russia's invasion of Ukraine and the desire to become independent of Russian gas, oil, and coal imports.

Is your company currently looking for new staff?

Source: representative survey among 47 member companies of BWE, 2022





400.000 additional jobs could be created in Germany
 Germany is on the way to become Europe's front-runner in the expansion of green energy, but we won't be able to accomplish it without skilled workforce. That is why the German Wind Energy Association (BWE) in cooperation with its members has launched a job initiative in the beginning of 2022. German wind energy companies are hiring, and, in many fields, they are already struggling to find qualified workers. And it is going to become even more serious: A recent analysis of Allianz investment estimates, that the "Easter

package" has the potential to create more than 400.000 additional jobs in the renewable energy sector in Germany up until 2032.

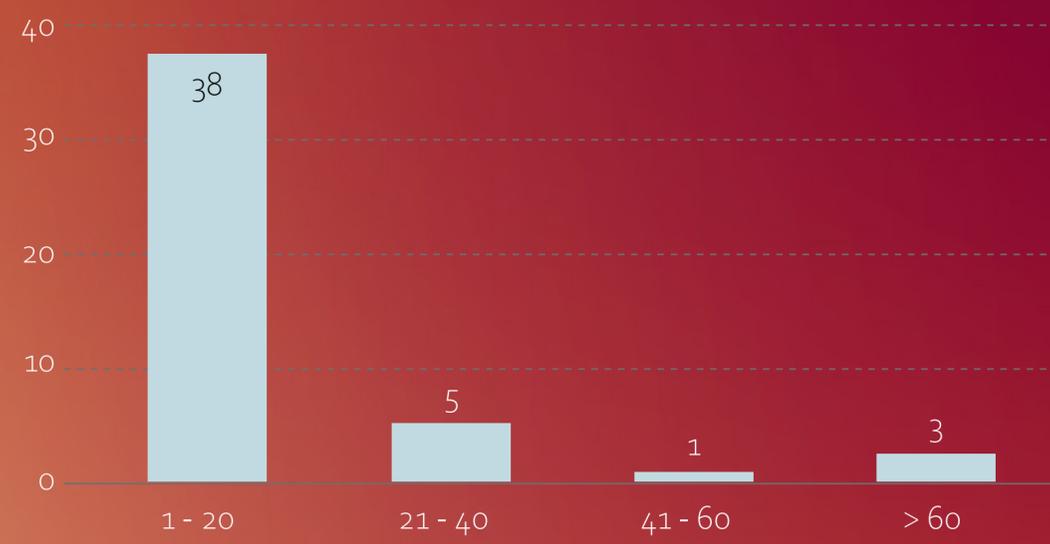
The BWE job initiative: Inform about the situation and find solutions

The job initiative therefore has two goals: First one is to inform the public about the situation in the wind energy sector and to inspire young people, students, professionals, and career changers to pursue a professional career in the field. It is important for us to highlight, that the industry is inclusive and multifaceted: planning wind energy projects from in- and outside the office is as important, as finance, software developing, service staff, workers in production, technicians, and industrial climbers.

The second goal is to gain more information on what the companies need specifically and to articulate those needs towards politicians and public representatives, to attract more support and fundings for campaigns and educational programmes. What seems clear already is that the current and future demand of skilled workers cannot be satisfied by the German labour market alone. Most German wind companies already work internationally and are constructing projects across Europe, Africa, the middle East, and Latin America.

How many positions are currently vacant in your company?

Source: representative survey among 47 member companies of BWE, 2022



Your Future workplace: Europe's biggest economy

The ambitions of the new government and the EU's ambition to replace Russian fossil fuels with renewables create an enormous potential for investments, added value and new jobs. Therefore, we need skilled workforce from abroad. And as Europe's biggest economy with one of the oldest welfare states, most companies can offer financial security and additional incentives that many qualified internationals are looking for.

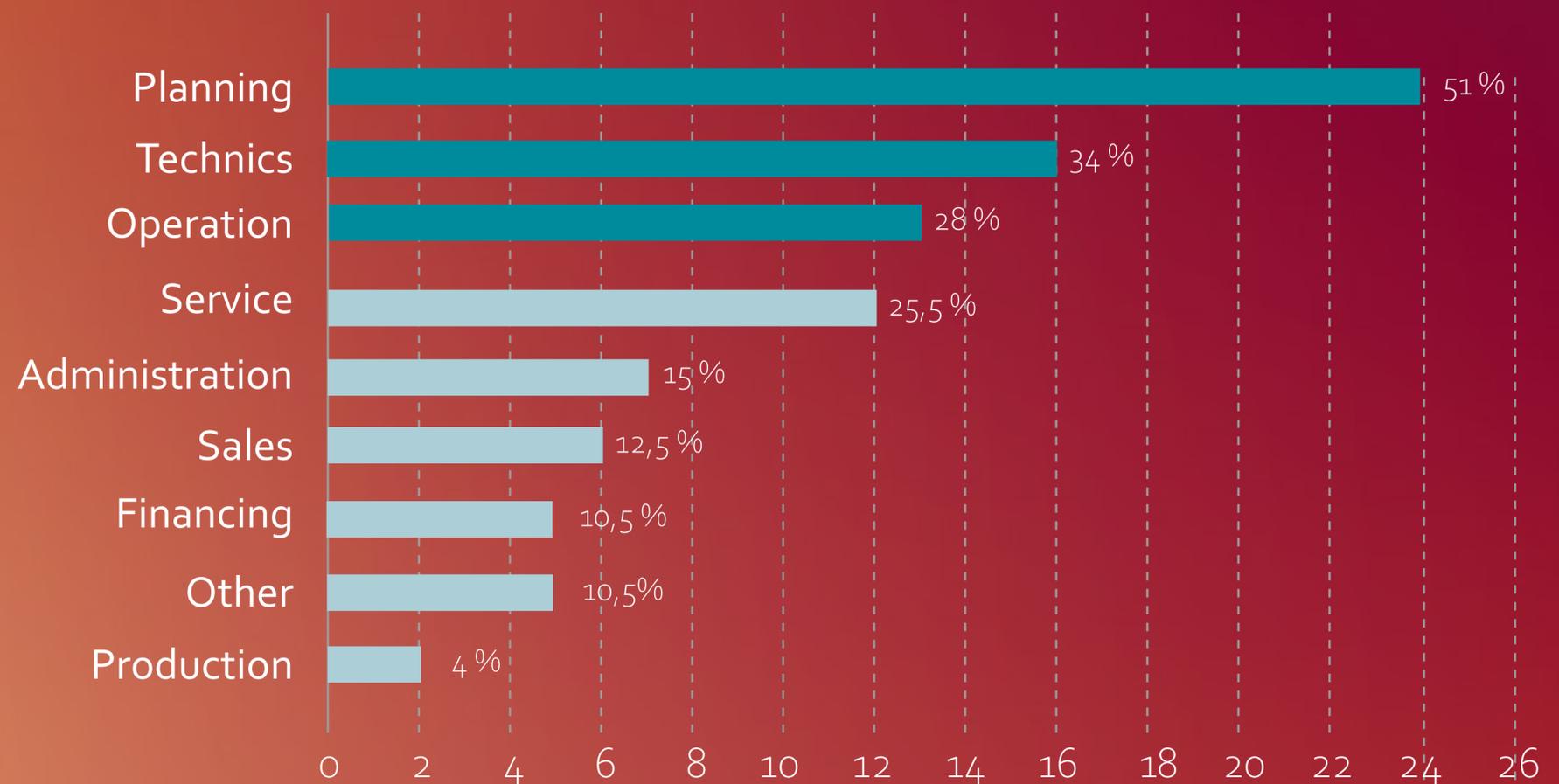
Author

Wolfram Axthelm
CEO of the German Wind
Energy Association (BWE)



In which areas are you mostly looking for qualified workers?

Source: representative survey among 47 member companies of BWE, 2022





Get to know the German wind industry

On the following pages, German companies from the wind industry present their latest and most innovative products and services.



ADDINOL Lube Oil GmbH – Only lubrication is not enough

Complex demands of modern aggregates do not only require reliable lubrication but also competent advice on the application

Nowadays, lubricants are rather considered as construction elements because the demands in modern plants and units exceed mere lubrication, protection and cooling. Depending on the branch of industry, requirements on the lubricants applied are versatile, complex and high. With increasing complexity, it pays off for operators and maintenance engineers to have a reliable and experienced partner supporting the selection of the right lubricant and accompanying the application with sound advice for efficient and trouble-free operation.

Long-standing history and experience

ADDINOL Lube Oil GmbH is one of the few medium-sized companies in the German mineral oil industry acting independently of any large business group and has worldwide distributor partners in more than 120 countries and on all continents.

History dates back to 1936. In the former GDR, the Mineralölwerk Lützendorf, which is the predecessor of the ADDINOL Lube Oil GmbH, has been a leading developer and supplier of high-performance lubricants for such versatile applications as engines, turbines, compressors and many more, for former Eastern bloc countries.

After the German Reunification, the ADDINOL Lube Oil GmbH has been formed and over the years has developed to one of the leading suppliers for high-performance lubricants applied in automotive and industry. In 2019 the company has been assigned the title "Worldmarket Leader Champion" by the University of St. Gallen for their biogas engine oils and specific high-performance and high-temperature lubricants and has been holding this position since.

Competence in Research & Development

Shortly after the foundation of the company in 1936, the first in-house laboratory was established and the Mineralölwerk Lützkendorf soon became one of the leading scientific facilities for mineral oils in Europe. It has been pointing the way ever since. Until today, the ADDINOL Lube Oil GmbH follows this long-standing tradition of developing state-of-the-art lubricants and keeps setting standards.



Now and then:
Competence in Research & Development

©ADDINOL Lube Oil GmbH

The company-owned in-house laboratory in Leuna is equipped with high-tech instruments for analysis as well as a selection of technical equipment for in-house examination. In close cooperation with our applications advice service, internationally leading OEM and research institutes, the experienced team in Leuna develops state-of-the-art lubricants and greases tailored to the specific demands of industries such as food and beverage, packing production or energy generation.

Sound advice for optimum results

The extensive product range of the medium-sized lubricant manufacturer from Leuna, Saxony-Anhalt, is accompanied by sound technical advice and comprehensive support. "We support our customers and partners in the selection of the optimal lubricant for their application and provide advice for the change of lubrication in the plants. Here, not only the respective conditions and requirements have to be taken into account,

but also possible incompatibilities with previously used lubricants must be carefully checked. This helps to avoid problems and irregularities in operation", explains Dr. Robert von der Aa, Head of Application Technology. The experienced experts are available for any questions or problems that may arise during operation. There are also internal training sessions for partners and customers on a regular basis.

"We at ADDINOL aim at 360° service accompanying the application of our lubricants."

Dr. Robert von der Aa,
Head of Application Technology at ADDINOL
Lube Oil GmbH

Added value and sustainability with ADDINOL lubricants

The performance of ADDINOL lubricants far exceeds the minimum requirements of DIN standards or manufacturer specifications. Therefore, ADDINOL gear oils, gas engine oils or chain lubricants achieve a real added value for plant and operator even under difficult operating conditions. Oil is not a renewable raw material and the efforts are clearly directed towards achieving significantly longer service lives. High-performance gear oils of the ADDINOL Eco Gear series, for example, ensure the reliable functioning of gears in industry and in wind power plants for many years. And the service lives of ADDINOL gas engine oils exceed those of conventional gas engine oils by up to 50 %.

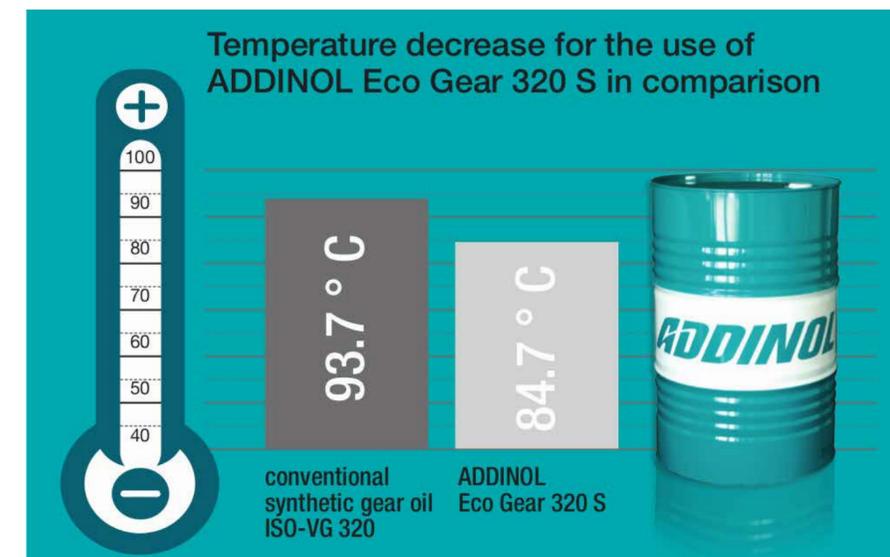
Efficiency and plant effectiveness are another important factor of product performance.

ADDINOL high-performance lubricants are particularly effective tools for saving energy and increasing plant efficiency. In this way, they help to conserve resources and reduce operating costs at the same time – a clear benefit for the operators.

Example: Longer oil service life with ADDINOL Eco Gear

As a rule of thumb (Arrhenius law) for every 10 °C rise in temperature, oil ageing doubles or the oil application time halves. Thus, every degree Celsius by which the oil temperature is lowered matters! This applies in particular to gear oils that are to remain in use for a long time.

At a double belt drive of a press line in wood-based materials industry in Germany oil sump temperature could be reduced by 7 to 9 °C on average by using ADDINOL Eco Gear 320 S compared to a conventional gear oil based on polyglycol due to the low friction coefficient achieved.



©ADDINOL Lube Oil GmbH

Contact

Dr. Robert von der Aa
Head of Application Technology
at ADDINOL Lube Oil GmbH

Phone: +49 3461 845-0





Wind turbine tokenization – hype or highly promising?

Wind energy remains an attractive asset (not just in Germany) – especially when new ideas like tokenization make it more accessible.



More than any other form of financing, tokenization lowers the entry barriers for investors © metamorworks – stock.adobe.com

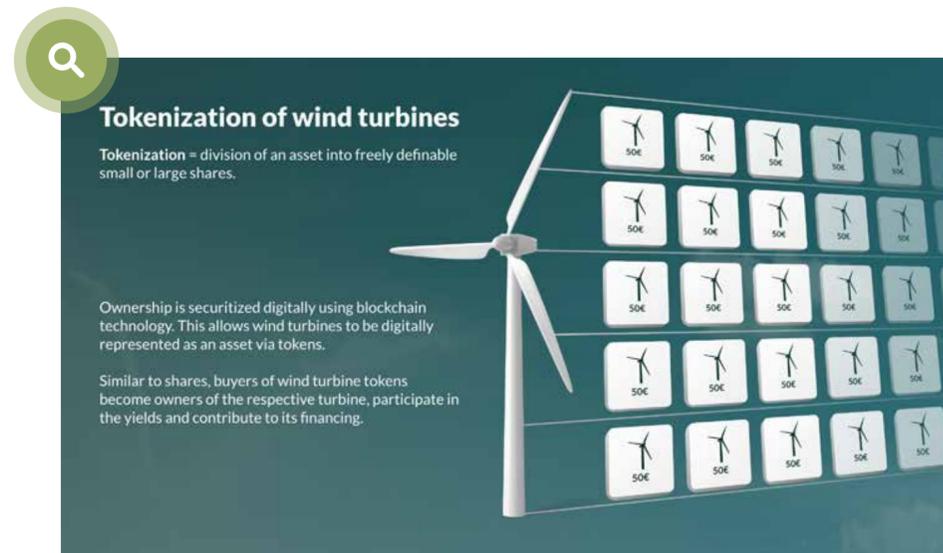
Ever larger and more powerful wind turbine models, ever lower electricity production costs, ever greater demand for renewable energies and a never greater social and political will to abandon fossil energy sources – the basic conditions for German wind energy are promising. In addition, wind is the most important source of renewable energy in the German electricity mix, and the trend is on the rise.

In order to keep the conditions promising, the general public's acceptance of wind energy must be upheld. A suitable instrument for this can be the opportunity for private individuals to participate in wind energy projects in a direct, uncomplicated, flexible and transparent way, even with low sums. The range of investment opportunities spans from bonds and shares to direct investments, profit participation rights or subordinated loans. However, practically none of them can combine all the aforementioned attributes at the same time.

Conventional investment methods are inflexible or just indirect

Closed-end funds or direct participations may offer a direct co-ownership including profit sharing. But this is at the sacrifice of flexibility, as the term of such investments is at least ten years. Also, the entry hurdle for small investors is also quite high, as a rather high investment sum is necessary.

The purchase of wind energy equity funds as well as shares in individual wind energy companies is more flexible and possible with considerably less capital investment. Those who invest in shares of Vestas, Nordex & Co ideally benefit from positive price developments or dividends and also invest directly in the business models as well as in the current and future projects of the companies, but not in a specific wind project.



Similar to stocks, wind turbines can be tokenized into many small pieces at a specific nominal value © wind-turbine.com

A new way of investing in wind energy: tokenization of assets

Just as wind turbines are evolving technologically, new digital technologies are bringing a new breeze to the investment market and opening up entirely new investment opportunities. We take a closer look at one of them here: tokenization. It has the potential to fundamentally change the entire financial industry and capital markets. It enables real assets to be digitally partitioned and represented in many small units which can then be traded via the blockchain.

What is a token?

A token is a digitized representation or transfer of an asset to the blockchain. In the tokenization of assets, for example physical or digital art objects, classic or luxury cars, real estate or other tangible assets, several tokens are created from these, which can have a certain value. Likewise, a digital securitization process takes place during tokenization which regulates the ownership of assets or rights, like the ownership of a share.

Why should assets be tokenized at all?

In theory, all assets that can be traded could also be tokenized. However, many assets are usually illiquid and mostly hardly or not at all movable, especially real estate or – to stay with the topic – wind turbines. Another factor is high prices, which is why they are only available to a limited number of potential investors. This can change with tokenization. The digital denomination into freely definable small fractions lowers the hurdle for an entry into a planned or already running wind energy project. Even investors with a small budget can thus become co-owners of wind turbines, contribute to their financing, and participate in their returns.



Tokenization of wind turbines – a talk with tokenization expert Prof. Dr. Carsten Hahn

One of the initiators of a wind energy tokenization platform: Prof. Dr. Carsten Hahn
© Photo: Prof. Dr. Carsten Hahn

Tokenization is currently gaining huge momentum in the real estate and art markets, as well as in the area of luxury items. In terms of solar energy, too, the first energy providers have already tokenized their solar plants. When it comes to wind turbines, there's already a platform that aims to bring together wind turbine operators with citizens and companies as investors. One of its initiators is Professor Carsten Hahn from the University in Karlsruhe, where, among other things, he is intensively involved in the research and development of platform economics and platform business models.

Professor Hahn, the tokenization of wind turbines: Is this the future?

The financing form of tokenization is still quite a new discipline. The advantage is that it can still be shaped and doesn't have to follow

rigid structures and rules. And I am not talking about government regulations. These are already largely defined by the EU. In many forms of financing, it's the banking system that has become an innovation-hostile construct clinging to old rules.

What are the major advantages of tokenizing wind turbines over other types of investments?

First, you can specify granularity through the number of tokens per asset. Second, tokens can't be manipulated through blockchain technology. Third, no banks and their overhead or additional costs are needed for the sale or acquisition of tokens.

Are there currently hurdles in Germany or elsewhere that make the tokenization of wind turbines difficult?

The tokenization of plants is still at a very early stage both in Germany and in the EU. However, there are already initial projects. For example, the Austrian energy provider "Wien Energie" has tokenized its solar plants, so it's

basically possible in the EU. A big challenge is the awareness and acceptance both among owners of the wind turbines and potential investors. A lot of work and creation of trust still needs to be done.

How can I participate as an investor owning wind turbine tokens?

Every wind turbine owner profits from electricity production and sales. If he has tokenized his wind turbine, all token holders profit from the sale of electricity in proportion to their purchased tokens and the total tokens. Electricity production can also be tokenized. This is then a production token representing the energy produced. It would also be possible to combine both tokens, for example to transform the production token into an asset token, like the return on an investment fund, which you can also transform into more fund shares. Basically a two-circle system of tokens.

How can one imagine the pricing of tokens?

There are several influencing factors. First, the demand. If the wind turbine is an



One idea ahead: The energy produced by wind turbines can also be tokenized
© wind-turbine.com

attractive asset, the price will rise. Second, the supply. If there are many comparable wind turbines, the price will fall. Third, the expected lifetime of the turbine. Over time, the price will decline, similar to a time bond because of the finite expected returns from electricity production. Fourth, the condition of the plant. If it's well maintained and the condition is good to very good, the price of the token will also increase. Fifth, the energy market price. If there's an oversupply of renewable energy, the price of the plant's token will fall.

What does it take for a successful tokenization project?

The wind turbine owner must be willing to tokenize his turbine. Then he must decide how many tokens should represent the turbine and must determine how many of the generated tokens he wants to sell. Not to forget that also investors must be found. That's why the entire process should be moderated and carried out by a tokenization platform, because the individual wind turbine owner would be overwhelmed by it.

Prof. Hahn, thank you very much for the interview.

Promising prospects, but still much to be done

Tokenization brings many advantages for investors like no other in the wind energy sector. An asset that is inherently rigid and otherwise available to a narrow audience is now becoming liquid and thus worldwide accessible to investors with smaller budgets. They become co-owners of wind turbines and benefit directly from their returns. But tokenization is also a new way for wind turbine operators, municipalities or other stakeholders to collect investor capital and gain access to liquidity without having to go through many detours. This lowers the barriers to entry into wind projects for both investors and issuers.

But: tokenization of wind turbines is still in its infancy and must prove its advantages in practice. Likewise, there is still a lot of work to be done to dispel the reservations and concerns of more conservative and digitally less affine investors until a sentence like "A piece of wind turbine for € 50.00, please!" becomes the norm. If tokenization has what it takes to make the financing of wind projects faster and more flexible and to realize the construction of wind farms that otherwise would

not have come about, then it brings the great chance to push the worldwide energy transition, to bring new ways of industrial participation and the move toward to get a step further to climate neutrality.

Author

Dragan Popovic
Content Marketing Manager
at wind-turbine.com



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What does it need for a successful energy transition?

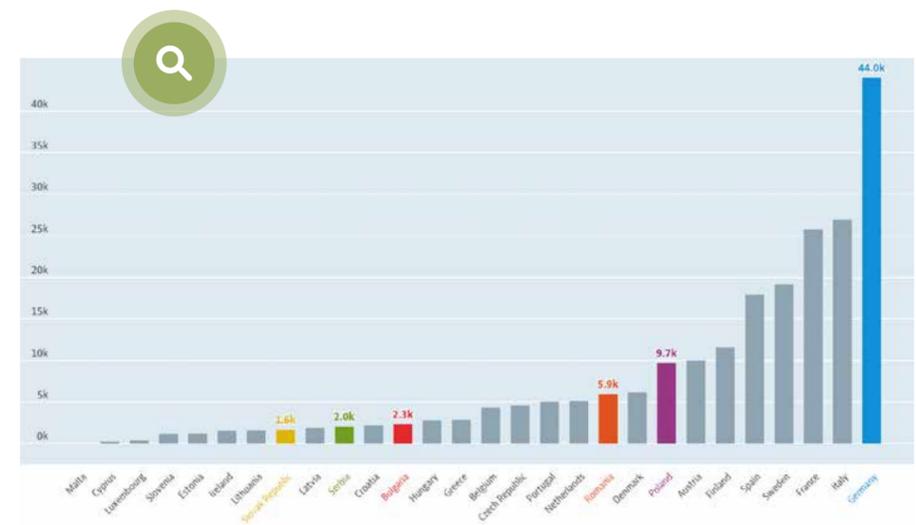
There is no master plan but there are points, that are essential for succeeding in energy transition. Using Germany as an example, we will take a closer look at some of them.

There is no master plan but there are points, that are essential for succeeding in energy transition. Using Germany as an example, we will take a closer look at some of them.

We are still a long way from seeing a pollution-free world. While there are many reasons behind this, one of the major causes is the inability of world nations to hit their national energy and climate plans (NECP).

Eastern European countries like Serbia, Romania, and Poland failed to keep up with the European Commission's green energy targets for 2030. According to the Energy Transition Index ETI 2021 the governments of these states are far behind in terms of planning and execution. This opens new possibilities for German wind developers to use their expertise to uplift their fellow European states.

This graph shows, how much renewable energy the different countries generate in comparison to tonnes of oil, that would be needed to produce the same amount of energy. Even if Germany got a much bigger industry and population, that relativizes the numbers a bit, you can clearly see the difference to other countries in Europe.



Source: OECD

This article investigates how Eastern European nations can profit from the experience of German wind developers and their know-how to accelerate their clean energy transition.

Early promotion of renewables by law

Germany's transition into renewables has multiple aspects that deserve worldwide attention. Germany's renewable energy output surged from 20MW to 7747MW (offshore wind energy) between 1988 and 2020. The country's planning, skillset, the execution is worth looking into.

The German support policy of 1990 triggered the growth of wind and solar energy sectors across Europe. Following this, many European countries took up initiatives for renewable energy expansion.

Even though these countries all had their own share of ideas, it was the 1990s German support



policy that became the main driver for exponential growth in the wind and solar renewable sector.

In 1988, Germany introduced the feed-in-law and in 2005, it rapidly reduced subsidies for renewables. The nation's renewable energy sector grew massively during this period. This growth set a global standard for curbing CO2 and methane emissions. The feed-in law didn't use the public budget funds but imposed them on the suppliers and the customers. The premiums were calculated annually as a percentage of the mean specific revenues for all the electricity sold via the public electricity grid. The remuneration changed every year because the energy generated and supplied was different every year. From the year of announcing feed in law, there were lot of subsidies given to promote the RES such as 1000 roof program (for PV), 250 MW wind program, 100,000 roof program of 2003 (300 MW). The subsidies provided had a good impact on the growth of RES and as time progressed the Government reduced the initiative of subsidies because people had accepted the technological growth.

The factors that pushed the German energy transition

Germany's governmental policies positively influenced people regarding the change from traditional energy to renewables. The following factors played a key role in the renewable energy transition:

- Investment subsidies
- Soft loans
- Tax allowances
- Feed-in tariffs

The German government's positive approach allowed developers to introduce their ideas into the market. The nation had clear intentions regarding the global cause and allocated adequate funding for the same. This allowed developers to utilize their skills to the fullest.

Germany's renewable growth has been sluggish for the past 3 years. However, it still provides the best working example of renewable growth. Taking a cue from Germany, other countries accelerated their renewable energy transition using these strategies:

- Feed-in-laws
- Coalition of 2 political parties during emergency
- Termination of demarcation treaties
- Eco-tax reforms

The ideology of feed in-laws, a coalition of two political parties at the time of emergency, end of demarcation treaties, and Eco-tax reform are some of the examples that other countries have considered to speed up their growth in the renewables.

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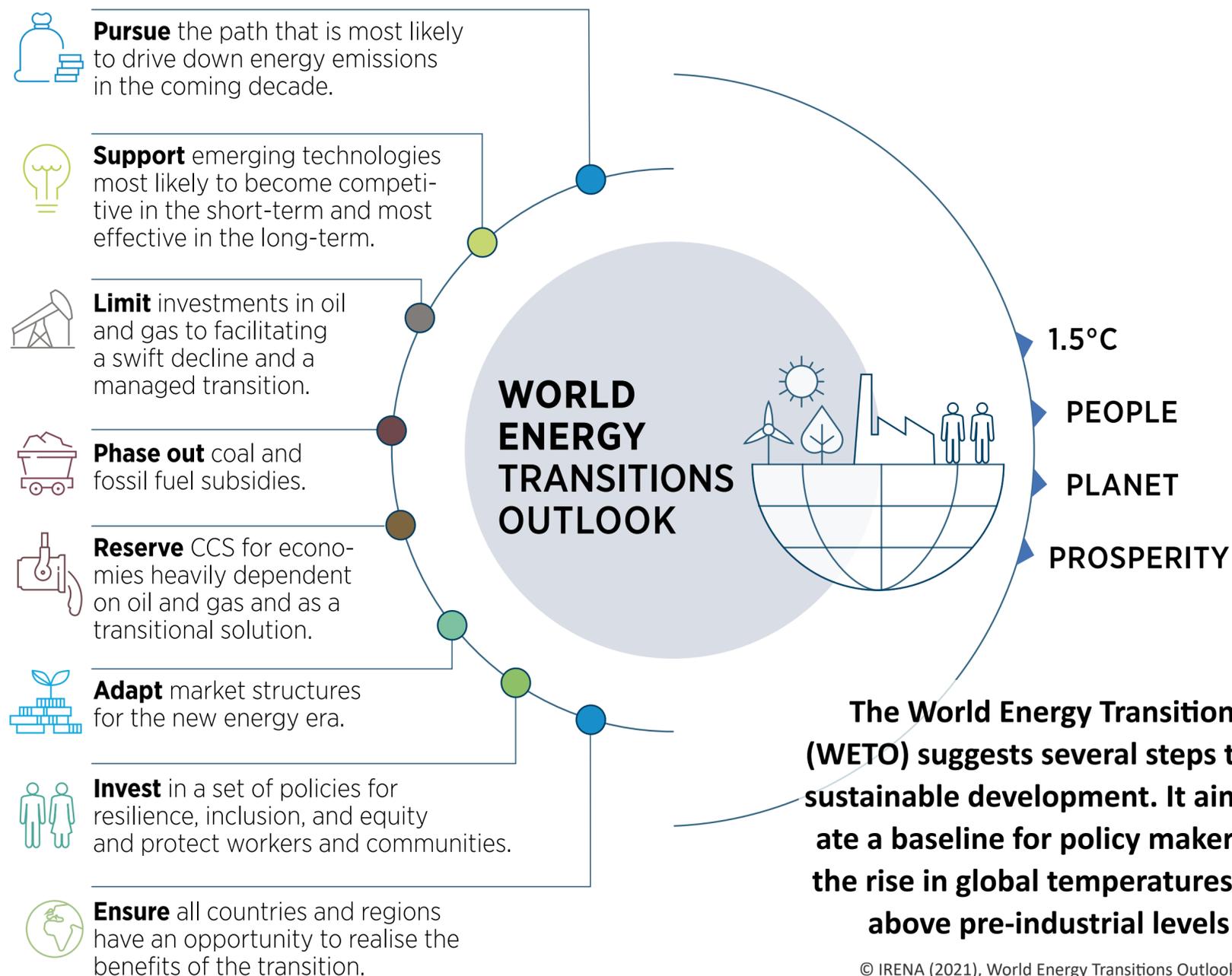
Nuclear phase-out pushes renewable energies

Economic pressures, industry lobbying, competing policies, and political short-sightedness have been the biggest challenges to the clean energy transition.

The political coalition of red-green parties in 2003 to launch the Energy supply act and phase out nuclear power was a big leap for renewable energy growth in Germany. The nation will phase out its last working nuclear power plant by the end of 2022. Eastern European countries like Romania, Ukraine, and Slovakia need to take a similar leap to phase out nuclear power and bring in more renewable energy.

Croatia is on the same path as Germany, with plans to phase out its nuclear power plant (a Slovenian power plant co-owned by Croatia) by the end of 2023. Market forces alone cannot bring the desired changes. Hence there must be strong policies in this direction initiated by governments. Many nations have stringent environmental protection laws in place. This includes rewards for those who cooperate and strict punishments for violators.

Guiding framework of WETO theory of change



Policymakers set the goal, stakeholders shape the path

Once the first key player, the government, leads the way with a framework, it is up to the developers to help achieve the targets by developing people skills and integrate new collaboration technologies.

The Stakeholders being the followers of the framework provided by the government need to be skillful to bring the initiative into action. They need to know the technological advancements, people mentality, acceptance of the change, and more over the required data from the matured countries.

The total energy generation of countries like Croatia, Poland, and Germany are taken here for a comparison. Poland has a wider dependency on coal and other sources of energy, whereas Croatia has more dependency on oil and gas compared to Germany. Even though the percentage of dependency on RES is less in Germany the decision to rule out nuclear energy and the NECP draft uplifts the RES to 30 % by the end of 2030.

While the mature nations try to eliminate non-renewable energy, countries like Romania and Slovakia are investing more money to build nuclear power plants.

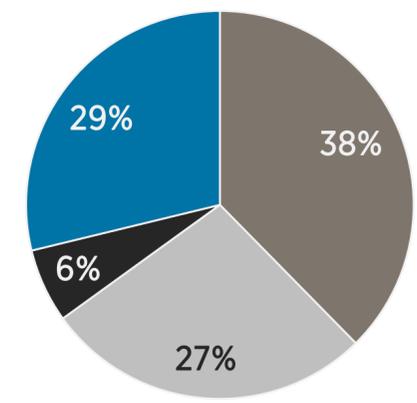
Poland is another example where renewable energy growth is lagging. The country generates over 55 % of energy from coal which is certainly not the best practice during times of growing environmental concern.

Markets in every country are different and hence the approaches must be different. In case all

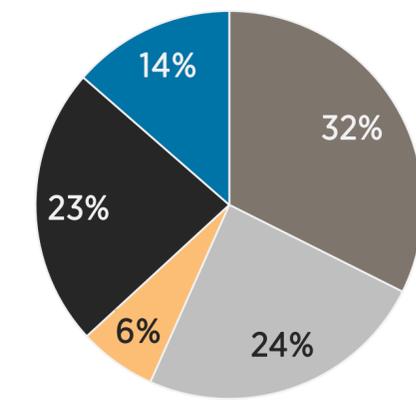
groups of the society are not pleased, projects worth millions can go to waste.

While innovations are crucial to bringing changes, society needs to stay satisfied as well. To do this, governments can bring in rewards for renewable energy generation and give incentives to the communities nearby the energy generation units. The pick out example is giving 0.2Cent/KWh for 20 years to the community allowing to construct wind parks. The other one is giving electricity generated from the wind park on a reduced tariff to the community.

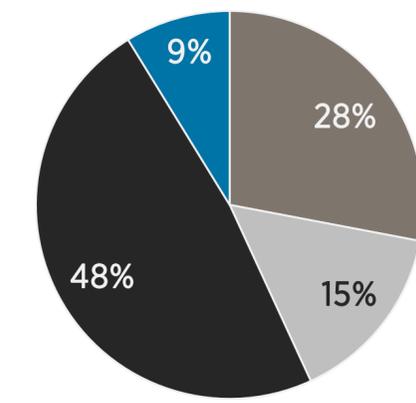
Croatia



Germany



Poland



- Oil
- Gas
- Nuclear
- Coal + others
- Renewables

© IRENA (2021), World Energy Transitions Outlook: 1.5°C Pathway

A sustainable future is built on "all-level communication"

A thorough understanding of the political situation, social sentiments, and cultural differences is necessary for a smooth path ahead. Besides, governments should prioritize the following:

- Learning about the economic stability of the new market and the future needs of the market
- Formulate detailed action plans based on the market research
- Provide adequate funding for innovations

- Understand how other nations successfully transition to renewable energy and apply the insights while formulating action plans

At the end of the day, it all comes down to collaboration on all levels – among individuals, investors, political parties, or multinational companies. The Paris agreement, National energy and climate plans, and the European Commission call for international coordination. Innovation with a collective sense of commitment can realize an effective and growing energy transition, new industry sectors and a sustainable future for our planet.

Authors

Denish Melit David
Process Engineer at
XVentum GmbH



Serge Hauser
Head of Sales at
XVentum GmbH



HUSUM WIND

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> On- and Offshore

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Evoblade: Upgrade your rotor blades.

Evoblade is a German start-up that develops aerodynamic retrofits for rotor blade optimisation as well as innovative small wind turbines.

Our start up spun off from the Institute of Aerospace Technology at the City University of Applied Sciences in Bremen in 2016. EvoBlades retrofittable "EvoFlap" spoiler, which we developed in a joint project with Deutsche Windtechnik, improves the aerodynamic flow around the root of the blade, which improves efficiency and ensures maximum performance of the wind turbine. The startup Evoblade emerged from the project which was supported by Wirtschaftsförderung Bremen GmbH. Another project partner was the Institute of Aerospace Technology (IAT)'s Wind Turbines Department at the City University of Applied Sciences in Bremen.

Improve what matters: rotor blades

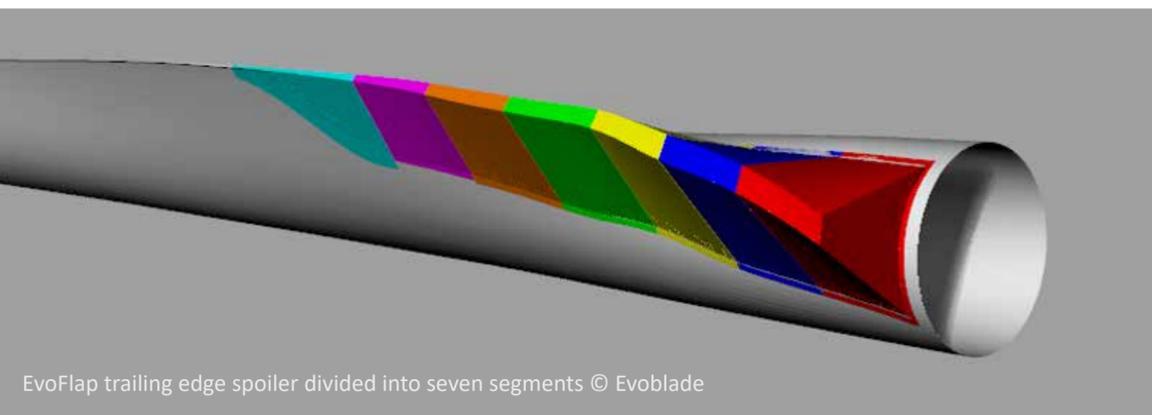
The technical and economic performance of a wind turbine is determined by the rotor blades. With the development and optimisation of the retrofittable flow element, we have achieved a significant improvement in the properties of both new and existing systems.

The results of a side-by-side comparison show an increase (annual increment) in the Annual Energy Production (AEP) of 6 % at a reference wind speed of 7 m/s. The "EvoFlap" trailing edge spoiler has significantly improved the performance of the pilot wind turbine (NEG Micon NM 82).

The spoiler can be fitted or retrofitted on all wind turbines with a slim blade root profile. We adapt the flow element individually for the respective blade type.



Installing the EvoFlap © Evoblade



And: we want to go further with retrofittable improvements

EvoBlade is currently developing other retrofittable performance-enhancing aerodynamic components including:

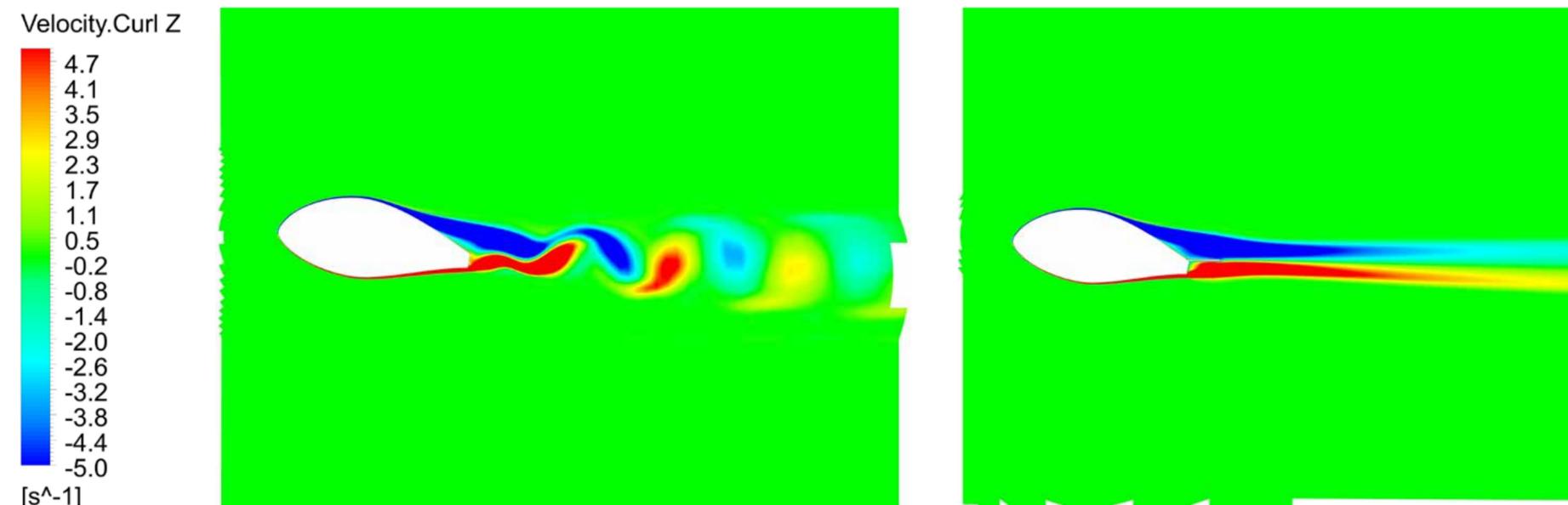
- An aeroelastic flap for the trailing edge of the central rotor blade profile
- A wing fence with an integrated flow channel to reduce radial flow at the blade root
- A simple trailing edge spoiler for the blade root area

Our development focus for all of the above is on passive flow elements that do not require actuators and are therefore cost-effective and maintenance-free. All aerodynamic retrofits are mounted on the installed rotor blade.

Our engineering team takes the energy transition and sustainability very seriously, which is why we are also focusing on small wind turbines.

"Our flow element is made of glass-fibre reinforced plastic, constructed in sandwich design and is therefore very light but at the same time extremely robust. Depending on the service life of our spoiler, the service life of the rotor blade can be extended by up to two and a half years"

Dr.-Ing. Frank Kortenstedde,
founder and CEO of EvoBlade



Reduced turbulence at the rotor blade root with EvoFlap © EvoBlade

Small vertical wind turbines for buildings

We are currently developing an innovative rotor for small wind turbines with a vertical axis as the basis for a wind energy module. The rotor utilises resistance and buoyancy and is planned for use on new and existing buildings.

We have kept the system design as simple as possible to minimise potential fault sources and to ensure a long and low-cost service life. The vertical axis system makes the rotor independent of the wind direction. Due to the modular design, the number of rotors can be adapted to the local energy demand and available space. We plan to use different rotor sizes to cover a comprehensive range of bespoke requirements.

Author

Dr.-Ing. Frank Kortenstedde
founder and CEO of Evoblade



Small wind turbines arranged as a wind energy module © Evoblade

Conclusion Evoblade's core expertise is in aerodynamics and flow simulation as well as the development of flow elements for optimising and increasing the performance of wind turbines. We also focus on the development of a decentralised and complementary energy supply using small wind turbines based on reliable technology.



Small wind turbine with stacked rotor © Evoblade

Making wind energy tangible for the next generation

Thomas Simons has written a book for kindergarten-aged children about wind energy.

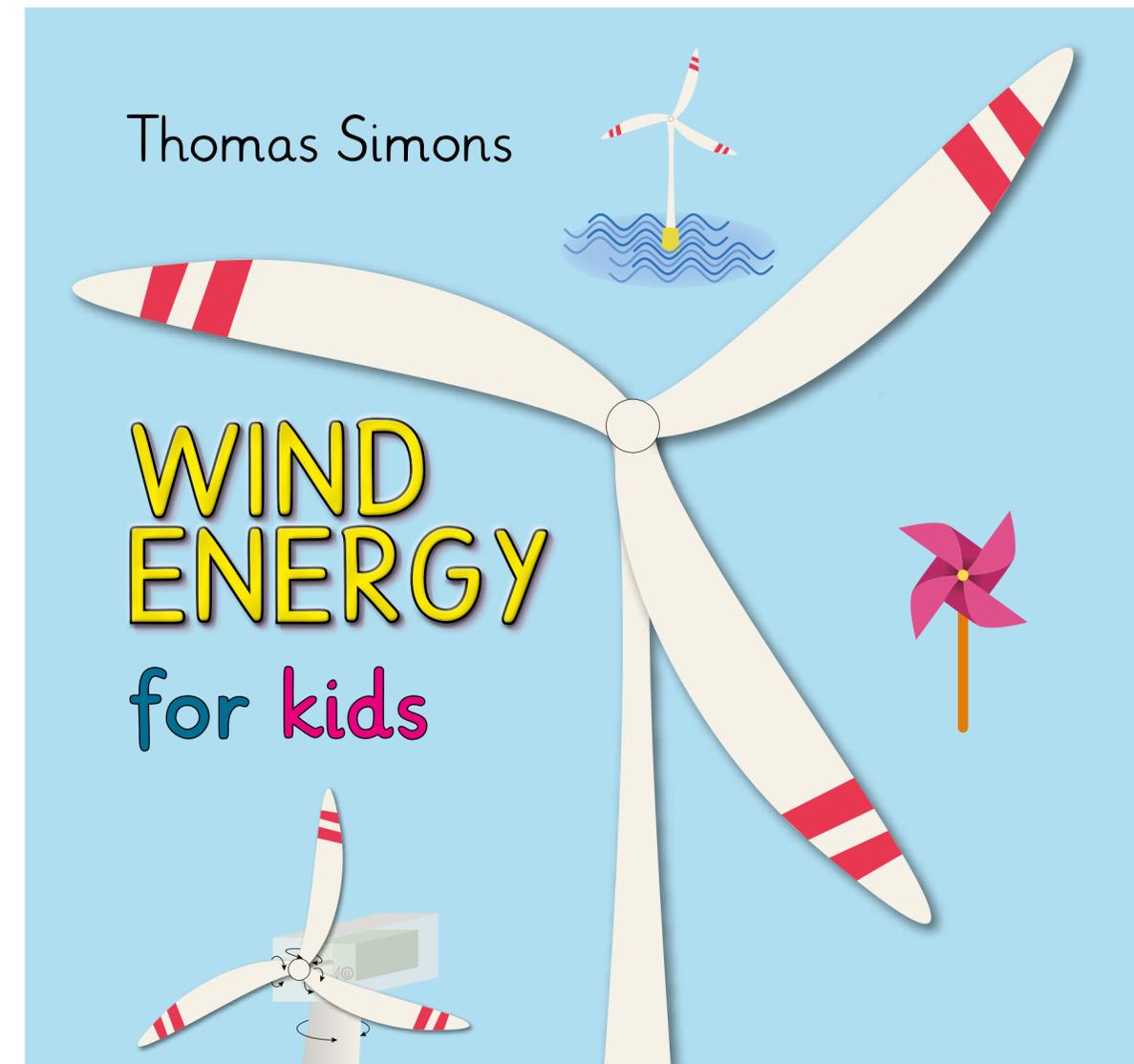
"This is wind. Wind has the power to move things."

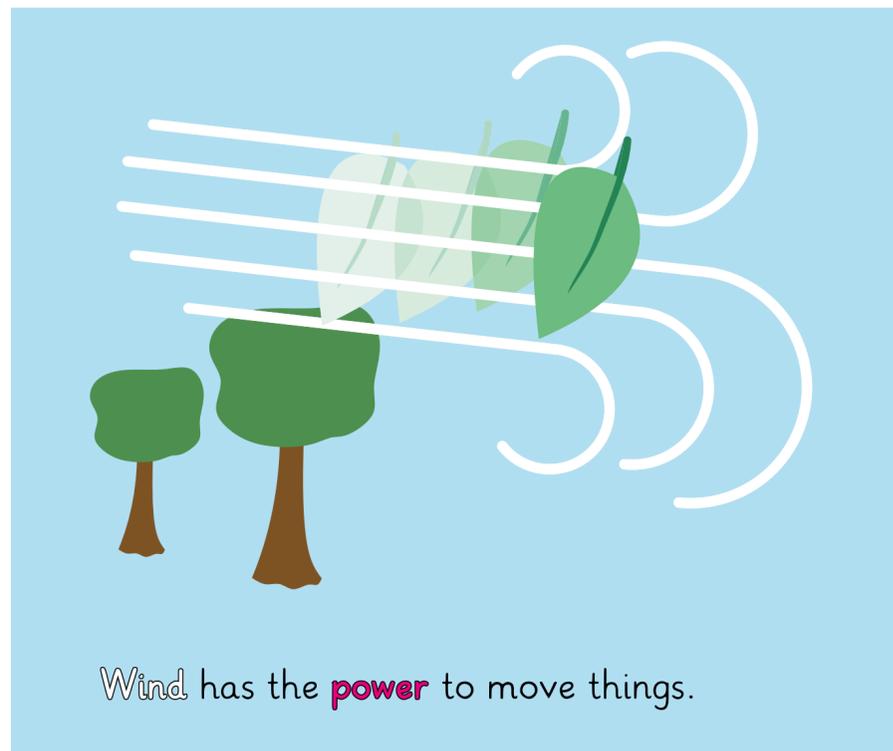
The explanatory book "**WIND ENERGY for kids**" by **Thomas Simons** begins with a simple sentence. And we can use this power to make light bulbs glow. What is obvious for adults, the book author explains for children from the age of 4 in simple words and using examples from their world of experience. In his book, he starts with pictures of gusts of wind blowing away leaves and driving a garden windmill, as children know it from their everyday lives. Then he turns to how the power of the wind can be used to generate electricity through wind turbines and generators. The book **WIND ENERGY for kids** illustrates all this in a very clear and comprehensible way.



Dad, what are you actually doing at work?

Thomas Simons is not a classic children's book author. He has a degree in natural sciences and actually works in the field of project promotion for offshore wind energy. But because his daughter, aged four, kept asking him questions about his work and wind energy, he became skilled at explaining the subject in a child-friendly way early on. When two of his colleagues finally had





children, he had the idea of collecting his stories about wind energy, which had previously only been formulated for his daughter, in a book. "WIND ENERGY for kids" was born.

Not a classic children's book

Initially, the book was intended only for him and his colleagues, to make it easier for them to explain to their children how wind energy works. But Simons wanted this topic to reach even more

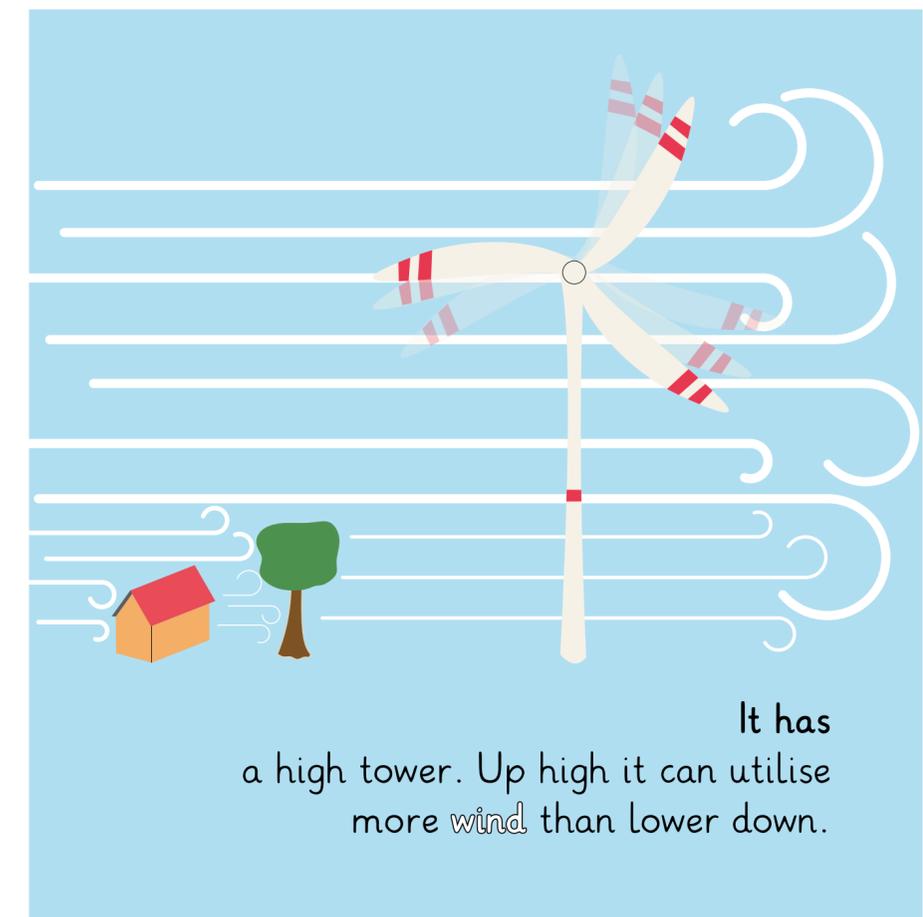
children – and ran into unexpected hurdles. He wrote to more than 40 publishers before finding "Spica Verlag", a small publisher willing to publish the book. "I think my book doesn't fit into the classic children's book segment for many publishers – after all, there is no likeable main character. For such young readers, my book is relatively unique on the market," the author says in response.

Together with the publisher, Simons developed the finished book from the original manuscript. Texts and graphics were designed entirely by him. "When it came to layout, the professionals from the publishing house then put the finishing touches on the book."

Simons: Children can draw their own conclusions early on

As a natural scientist, it was important to Simons to present the topic as value- and morality-free as possible and in a more factual and analytical way. "Children are good at drawing their own conclusions early on, you just have to trust them to do so," he says. For him, it's not about contrasting fossil fuels with wind energy as evil personified,

but explaining how wind energy works and what it can do. And also to say that wind turbines bring their own unique challenges, such as nature conservation ("Sometimes wind turbines are switched off, so they do not endanger bats and birds.") and air traffic safety ("... it has red flashing light, so that no planes fly into the wind turbine.").





The longest rotor blade is as long as a soccer field

The first half of the book describes Simon's characteristics of wind energy, such as how rotor blades work, why wind turbines have tall towers, and that there are also offshore wind turbines. In the second half of his book, he explains the ratios of turbines with units of measurement that children can easily understand: The world's longest rotor blade is about the length of a soccer field, a nacelle with generator weighs more than 16 elephants, and an offshore wind turbine produces about as much electricity in one day as 19 households use in a year. In addition, maps in the book show wind turbines per country in different sizes, where how many wind turbines are located on land and at sea. With these easy-to-grasp quantities, the book manages to make wind energy concisely tangible – and not just for children. "Especially with the comparisons, many adults are also surprised. Many have no idea of the size of modern wind turbines or even the number of turbines," Simons says of this section.

From the children's room to the world

In May 2020, the first edition of WIND ENERGY for kids was published in German. This was very well received in Germany. Because his publishing house received requests for "branded special editions" in other languages and produced these for customers, Simons grew the idea of publishing the book on the open market in other languages as well.

 Advertisement for BERDAN CIVATA B.C. featuring a wind turbine and various components like blades, towers, and nacelles, with the text "ONE STOP SHOP From Foundation To Blades". The ad highlights the company's fully integrated factory and more than semi-century of experience in the sector.

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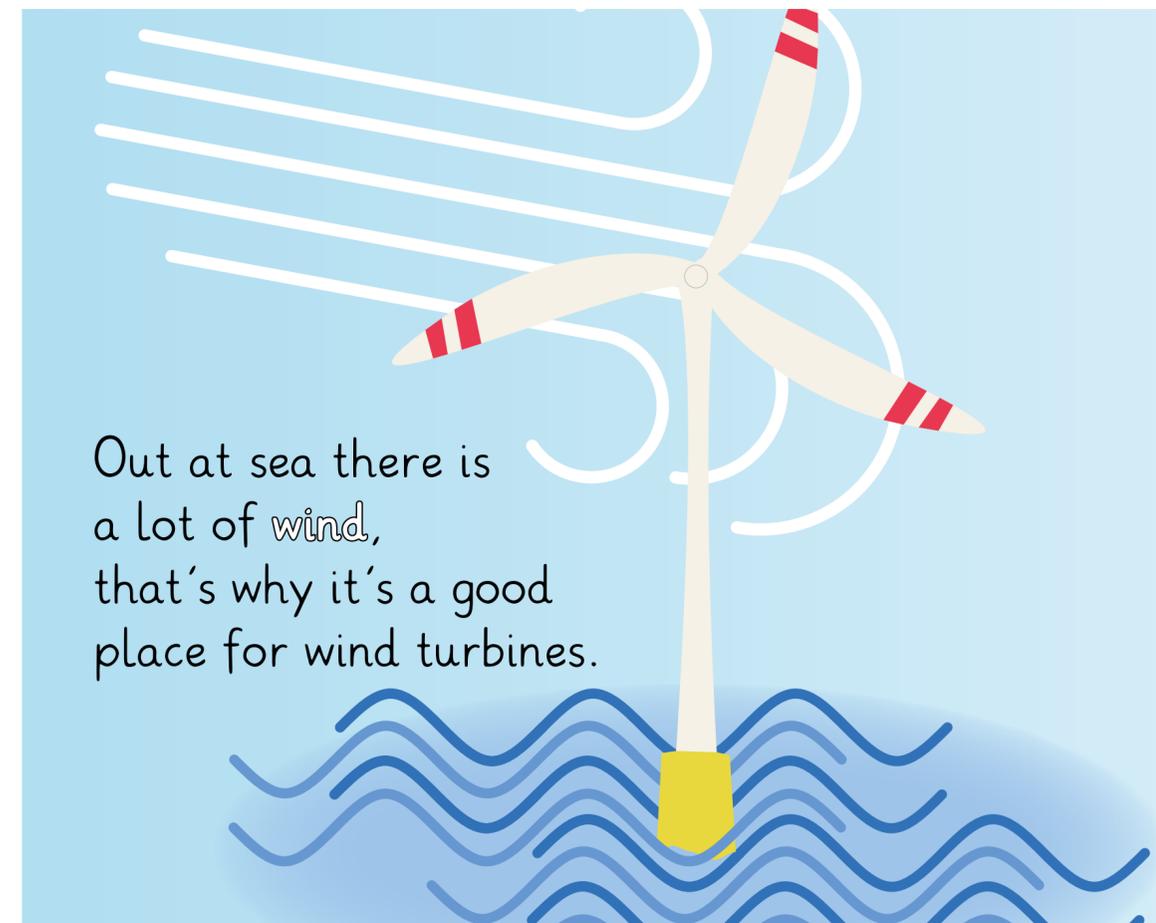
www.berdancivata.com

First came the English edition in January 2022, followed by the Polish edition the following March and the Dutch edition of his book in June 2022. "I am particularly pleased about the partner for the Dutch version. We developed this together with the great project 'Offshore Wind for kids'," explains Simons. Further translations are currently planned, including into Chinese. "We are always looking for cooperation partners who are interested in special editions of existing languages or even new languages." Several thousand copies in various languages have already been sold in this way.

Making wind energy tangible.

With his book, the author succeeds in explaining complex facts about wind energy to children in a simple and tangible way. Now that wind energy is once again taking center stage in Germany, Europe and around the world, and we will hopefully see more wind turbines in the future, it is important that the next generation also knows early on what is actually happening there on a large and small scale. "This is wind. Wind has the power to move things." This simple sentence, which begins Thomas Simon's book, explains to children that wind has a power that we can harness. And for an adult reader, it expresses the possibilities we can draw from it for the future.

WIND ENERGY for Kids (ISBN: 978-3-98503-034-7)



Author

Frederick Keil
Editor-in-chief at German
Wind Power Magazine





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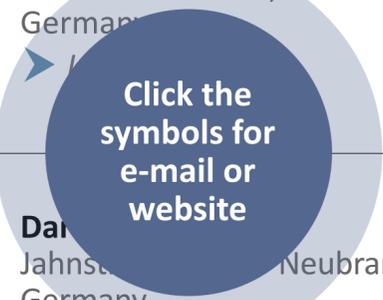
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Sept
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How wind turbine parts will become fully recyclable in the future.

Back to the roots

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Best of both sides

Can hybrid power plants take an important role in the renewable sector?

Sometimes we change our plans and find newer, better and more exciting topics. Therefore, the content and the look of the next issue may change a bit than we announce here.

BWE-
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Contact / Imprint

Publisher

German Wind Energy Association (BWE),
EUREF-Campus 16, 10829 Berlin, Germany

President: Hermann Albers

Person responsible for content in accordance with
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Editorially responsible:

Thorsten Paulsen

Editor-in-chief

Frederick Keil, f.keil@wind-energie.de

Tel.: +49 30 212341-176

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Editorial office

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BWE-Service GmbH

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Klaus Barkeling
k.barkeling@wind-energie.de
Tel.: +49 30 212341-177



Nikos Fucicis
n.fucicis@wind-energie.de
Tel.: +49 30 212341-178



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