

German Wind Power

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Windindustry
in Germany

WindEnergy Hamburg

The world's leading trade fair opens its halls again in September 2022 for the first time since the Covid pandemic.

Recyclable rotor blades

New processes are paving the way to a circular economy for the wind turbine components, which are difficult to recycle.

Power-to-heat storages

New technologies can convert renewable electricity into green heat, store it for later use, and reduce wind turbine downtime.

Including contacts to
German experts



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Wolfram Axthelm

CEO of the German Wind Energy Association (BWE)

The German wind industry takes off

Our industry has prospects! The German market, so important as a driver of innovation, is returning. We are now quickly leaving difficult years of stagnation behind us. The prospects for onshore wind energy are excellent with the legally anchored tender volume of 12,840 megawatts in the coming year and 10,000 megawatts each from 2024. Offshore, too, the line has been raised sharply. With the recognition of the overriding public interest and the priority in the consideration of protected interests, important preconditions have been created for actually achieving the politically set expansion volumes. Germany is thus sending the right signals in the midst of a serious fossil energy crisis: it needs a rapid and significant expansion of wind energy as a key source of power.

At the world's most important industry meeting, WindEnergy Hamburg, the industry underlines with many new innovations in plant technology and for sector coupling, green hydrogen, in the area of service and maintenance and in digitalisation, AI and IT security: We are now taking off!



Bernd Aufderheide

President and CEO of Hamburg Messe und Congress GmbH (HMC)

Finding solutions in challenging years

Climate change, pandemic, supply chain disruption, the Ukraine war and the resulting energy crisis – we are living in troubled times. All industry sectors are affected, and we as a trade fair company have seen two difficult years, as well. Together we are now called upon to address major challenges. The more important it is for all of us to be creative and flexible in finding solutions.

I am therefore more than happy that we are once again able to provide a stage and a place for interaction to the wind industry this year and, after a four-year pause, organise a new WindEnergy Hamburg trade fair in our exhibition halls. Under the heading "It's time to put climate first", it is paired with the new H2EXPO & CONFERENCE as a perfectly matched event taking place in parallel. When 30,000 people from around the world gather for four days of lively discussions and knowledge transfer, I certainly hope that new solutions to the problems of our time will be the result, and that this industry, which can do so much to overcome our global problems, will truly get a second wind.





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WindEnergy Hamburg features the new H2EXPO & CONFERENCE

The world's leading wind industry event starts with a new forum for Green Hydrogen and free access to conferences.



WindEnergy Hamburg will open its doors again in September 2022. © Hamburg Messe und Congress

Under the heading "It's time to put climate first", WindEnergy Hamburg will for the first time since 2018 be the global meeting place for the onshore and offshore wind energy industry from 27 to 30 September 2022. In ten exhibition halls totalling 68.500 square metres, more than 1,400 national and international exhibitors from 40 nations will showcase the latest products, services, and trends. Roughly 30.000 participants from over 100 countries are expected to come to Hamburg to explore the wind industry's entire value chain and get a comprehensive overview of the status, development, and future of the global wind market.

The new H2EXPO & CONFERENCE makes hydrogen the top topic.

For the first time, the H2EXPO & CONFERENCE will take place in parallel with WindEnergy Hamburg to highlight the full spectrum of hydrogen technologies. What is more, for the first time the conference programme of the world's leading wind industry expo will be open to all visitors free of charge, right in the middle of the exhibition halls.



The new platform for the generation, distribution, and use of Green Hydrogen
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An international forum addressing the generation, distribution, and use of Green Hydrogen, the H2EXPO & CONFERENCE makes its debut as a new major feature added by Hamburg Messe und Congress. Hall A2 on Hamburg's exhibition campus will be the site of a captivating four-day networking platform. In the networking areas and

at side events, stakeholders from business and politics will share knowledge and views about the latest trends and the future of the international hydrogen economy. H2-technology providers from around the world will present their solutions and innovations and showcase their projects. Leaders from the political, scientific, and business worlds will be present on the conference stage to discuss topics such as regulatory issues, technologies, and the future of Green Hydrogen.

Green Hydrogen is the key to a successful industrial decarbonisation.

Key topics on the agenda include business perspectives, energy transport and storage, regulations, government programmes and markets. Bernd Aufderheide, President and CEO of the Hamburg Messe und Congress GmbH, stresses: "We cannot achieve a successful energy transition unless we use renewable energy on a broad basis. Green Hydrogen is the most essential resource for our future, and key to successful industrial decarbonisation using affordable energy. Through our H2EXPO & CONFERENCE we are providing a platform to the rapidly growing hydrogen economy

and demonstrating that by combining eco-friendly technologies we can make affordable energy available for all aspects of our daily lives."

Four open stages to hear about the newest wind industry topics

For the first time, the popular WindEnergy Hamburg conferences will take place on four open stages right in the middle of the halls free of charge to enrich the trade fair experience with the knowledge of thought leaders from industry and science. Accompanying the expo, conference sessions featuring top-ranking experts will address the industry's current key topics.

Furthermore, at the "Global Markets Theatre" organised jointly with the Global Wind Energy Council, visitors can learn more about the many opportunities harboured by major and emerging wind industry markets. Key topics include COP27, nature and biodiversity, new technologies, and the threat of disinformation.

Meet industry and government representatives at the new H2EXPO stage

The new "Horizons Stage" will host informative sessions with key industry and government representatives who will comment on current topics associated with the wind industry – organised in conjunction with WindEurope, the German Engineering Industry Association (VDMA), the German Wind Energy Association (BWE) and other partners. The following topics will be covered: Finance, Power Purchase Agreements (PPAs), market updates for UK/FR/ES/PL/SE/the Baltics, supply chain challenges, floating offshore platforms, rotor blade recycling and pathways to a circular economy, trends, and innovations, the future of wind energy technology, expansion pathways for wind power, and the evolution of supply chains.



Exploring new horizons: It's time to put climate first!

Be sure to take part in the world's biggest and most important business platform for the onshore and offshore wind industry!

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At the "Speakers' Corner" exhibitors will present their latest product highlights and exciting innovations. For example, they will address the use of cargo drones for logistics applications around wind turbines or to avert and manage risks associated with storms and lightning in the wind power sector. What is more, at the recruiting forum on Friday of the expo week, WindEnergy Hamburg exhibitors will introduce themselves as employers, outline career and training opportunities, and offer specific job openings.

The H2EXPO & CONFERENCE stage will be entirely dedicated to the hydrogen economy. Top-ranking speakers from politics, business and science will discuss current topics, such as regulatory issues, technologies, and the future of green hydrogen.

Author

Andreas Arnheim
Project Director of
WindEnergy Hamburg



The focal topics on the agenda revolve around business perspectives, energy transport and storage, regulations, government programmes and markets.

For a full programme overview look at our website. We look forward to seeing you at WindEnergy Hamburg!





Industry News

German Wind Power Magazine on the WindEnergy Hamburg Expo

The largest wind energy trade fair is back – and the German Wind Power Magazine is there together with other products of the BWE Service GmbH!

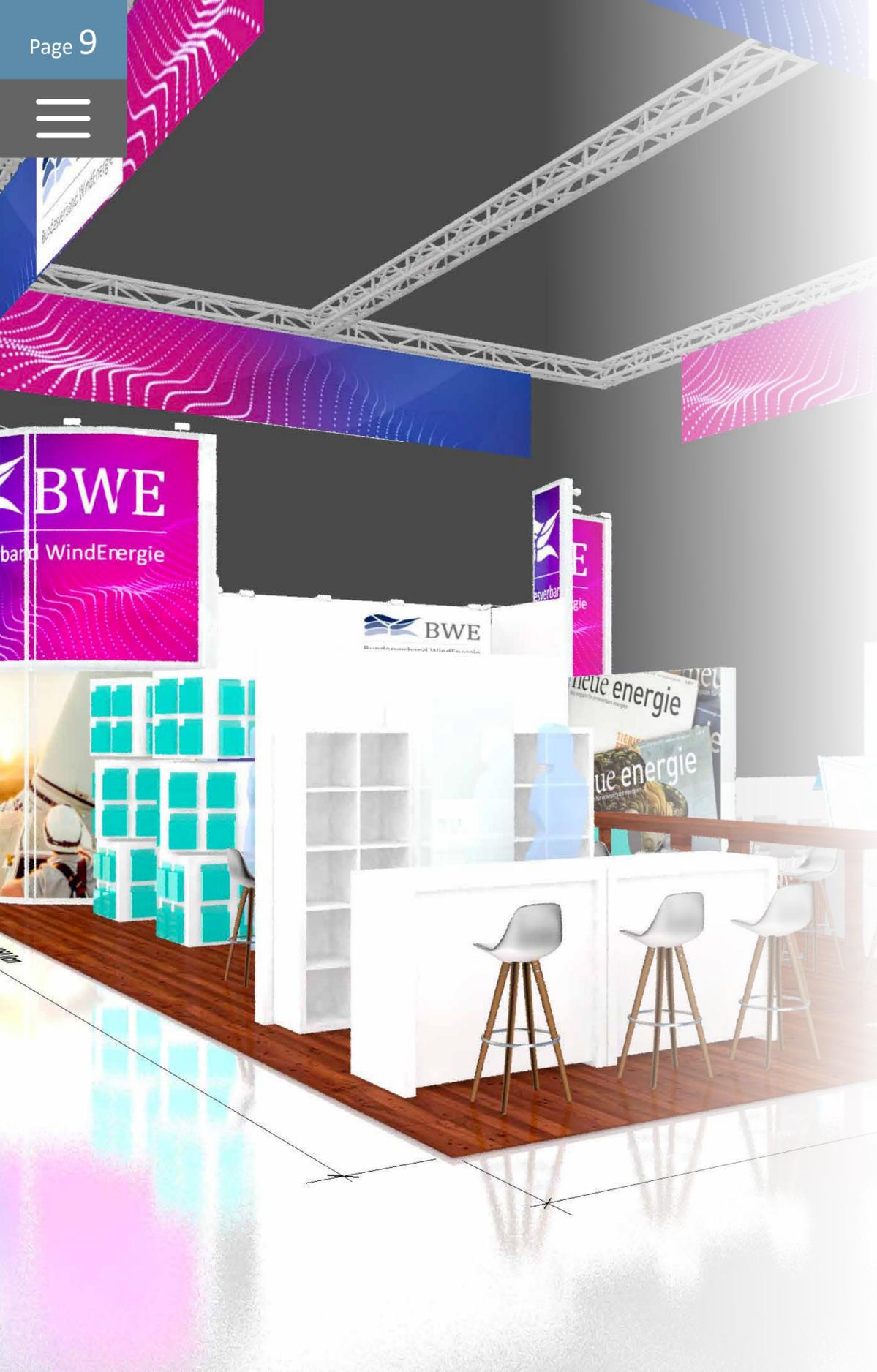
On September 27th the big international wind fair WindEnergy Hamburg opens its doors again after four years. A date that not only attracts the international wind industry to the German metropolis, but also the international magazine of the German Wind Energy Association (BWE), the German Wind Power Magazine! The trade fair is an essential component for the wind industry and shows up close and tangible what innovations and ideas the German wind industry is producing. In this sense, the trade fair and the German Wind Power Magazine have the same goal – even if the magazine appears more often than the trade fair takes place.

At the booth of the German Wind Energy Association, you can read this and past issues of the magazine in a special setting at our digital station and

get to know other print and online publications of the BWE Service GmbH – available digitally and as mailings. In addition, you can find out about the BWE's numerous events and training courses.

As was the case at the last WindEnergy Hamburg 2018, numerous experts from the association will be giving presentations on current topics related to wind energy politics, economics and society, including fakenews in wind energy, recycling of wind turbines or the latest German and European legislation and targets on wind energy.

Visit us from September 27 to 30 at booth 308 in hall A1 and discover the German Wind Power Magazine and the German Wind Energy Association live on site!



Inspecting offshore cables with autonomous boats and drones

A test 40 km off the Belgian coast shows how Unmanned Surface Vehicles (USV) support predictive maintenance of offshore assets.

In November 2020, the EU published its Offshore Renewable Energy Strategy (ORES), outlining its goal to increase Europe's offshore wind capacity from 12 GW to 300 GW by 2050.

In May 2022, Belgium, Denmark, Germany, and the Netherlands signed the Esbjerg Declaration at the North Sea Summit, during which they committed to jointly reaching 150 GW of offshore wind generation capacity by 2050.

For offshore wind, the role of Transmission System Operators (TSOs) is to transport and integrate the electricity generated at sea to the onshore grid. They do this through planning, building, operating, and maintaining the on- and offshore transmission infrastructure such as subsea cables and offshore switchyard platforms. Therefore, they play an essential role for ensuring that Europe harnesses the potential of the offshore wind in the North

and Baltic Seas, meet their climate targets, and maintain their security of supply.

Whilst the energy transition brings many opportunities with it, such as reaching the targets of the EU's green deal and enhancing European energy security, offshore wind projects and their value chains also carry several challenges.

Offshore wind brings some challenges in maintenance.

Offshore, by definition is cost intensive and related to safety risks. For operations and maintenance (O&M) activities that prolong the life of offshore assets, the cost and risk are significantly higher than for onshore projects. With corrosion due to the water salinity, seabed movements, weather and wave conditions that reduce access and flexibility, offshore O&M activities require highly trained staff for various operations.





To inspect their subsea cables and offshore platforms, TSO's deploy a whole variety of survey and support vessels to undertake bathymetric surveys (mapping of depths and shapes of underwater terrain) with equipment including remotely operated vehicles (ROVs), and all different types of sonar systems. These are used to determine whether the assets have encountered any issues, such as damage to the structure integrity and whether the subsea cables are still buried at the right depth.

USV make maintenance more efficient and safer.

Unmanned Surface Vehicles (USV) that can carry the necessary sensors and be operated remotely from an onshore base, therefore have a lot of potential. Their adoption and regular use could increase the efficiency and flexibility of inspections while substantially reducing the safety risks, dependence on the weather, environmental impacts, and cost of offshore O&M activities.

As part of its goal of moving from curative (or reactive) to predictive and condition-based maintenance to minimize asset downtime or failure and maximize system availability, Elia Group undertook a proof of concept (PoC) to test the potential of USVs and their role in supporting offshore O&M activities.

PoC: Testing security, quality, sustainability and cost of USV inspections

As part of the PoC, the TSO tested an USV that is five meters long, weighs about 1500 kg, has a top speed of 6 knots, maximum endurance of 12 days, can carry several sensors to inspect offshore assets

and collect mid-ocean data. The USV can be operated either autonomously or remotely with a hand console.

The objective of the PoC was to assess the maturity and feasibility of inspections carried out with remotely operated/autonomous USVs. This was done by undertaking a survey of the subsea cables of Belgium's Modular Offshore Grid's (MOG) and

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by inspecting its Offshore Switchyard (OSY), which lies 40 km out of the Belgian coast. The validation criteria included: Security and feasibility in terms of operations and permission processes; output quality of the inspection; sustainability in terms of CO₂ emissions and cost.



Hand console of the USV © Elia Group

Which features were tested with the USV?

For the test, the USV was equipped with the following:

- a MBES sonar system, to make a high-resolution cartography of the seabed and assess the burial depth or protection status of our submarine cables,

- a LiDAR laser scanning system, to create a detailed 3D model of the OSY topside and jacket structure above the waterline,
- and a drone platform with a high-resolution camera attached, to inspect and detect any damage along the OSY platform.

Scope of the PoC was to depart from the port of the Blankenberge, survey the cable route (~40km) with the MBES, cross the dense shipping lane of Het Scheur, and inspect the OSY Platform using a LiDAR laser scanner and drone with a high-resolution camera.

Creating high quality data with a fraction of cost and CO₂ emissions

The USV completed the survey activities in site conditions of up to 1.5m maximum wave heights, providing accurate and high-resolution seabed data from the sensors mounted on the USV, in water depths from 0 till 35 meter. The test's preliminary results in terms of the validation criteria are outlined below.

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- **Regarding security and feasibility:**
During the test, no incidents, HSE (Health Safety Environment) accidents or near misses occurred. Under current legislations' USV's cannot operate fully autonomous or remotely in open waters off the Belgian coast. Therefore, with support from Dries Boodts of the MRCC (Shipping Assistance Division of Belgium Coast Guard) and Jean-Baptiste Merveille (Directorate General Shipping in Belgium), the USV was always followed by a support vessel to ensure safety and security throughout the PoC.
- **Regarding output quality:**
In the bathymetry model of the seabed surface that the USV collected, it is possible to identify sand waves, dynamic features of the seabed such as mega ripples, cable fixation structures, and footprints left by dredging and trenching from the cable installation phase (see image 3). The LiDAR scan produced a high-resolution model with sufficient points per square meter/m² of the OSY to create an accurate 3D model of the structure. The drone produced high-resolution video footage of the OSY, enabling the detection of possible damage and corrosion.
- **Regarding sustainability:**
A survey mission with an USV can reduce fuel consumption and the amount of CO2 emissions per hour by over 98% when compared to a mission with a survey vessel.
- **Regarding cost:**
With large reductions in fuel consumption and a reduced need to plan for trained staff to go offshore, USVs promise to substantially reduce the costs associated with inspection surveys.

The PoC shows that USV's have reached the maturity to support offshore O&M activities. Besides that, USVs have the potential to address further use-cases such as the collection of mid-ocean data, the transportation of goods, and the on-boarding of other equipment. As of now, further tests are necessary to validate the development, explore operational challenges and develop a regulatory framework.

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Industry News

REPowerEU: A shift in European energy and climate policy

Russia's invasion and climate change are forcing the EU to rethink the energy supply. Are the new efforts in line with science-based goals to tackle the climate crisis?

Since the beginning of 2022 the European Union (EU) must face not one but two major challenges: The climate crisis and the energy crisis caused by Russia's war against Ukraine have forced EU leaders to develop plans to reduce and decarbonise European energy consumption. The REPowerEU initiative, launched in May 2022, represents an important step towards reducing energy dependency and meeting climate targets.

Until very recently, Russia was the EU's main supplier of crude oil, natural gas, and solid fossil fuels.¹ This situation has changed dramatically because of Russia's invasion of Ukraine, which is currently causing immeasurable suffering in the war zone as well as supply shortages that are sending energy prices soaring across Europe. Russia's threats to completely shut down natural gas exports to European countries have forced EU leaders to consider the potentially devastating impact of such actions on

the functioning of EU economies and its industries. An affordable and secure energy supply has thus emerged as an urgent national security matter.

A new crisis meets an old one: climate change

At the same time, global warming is progressing at a much faster pace than expected, exceeding the forecasts issued by climate scientists only a few years ago. According to recent projections, temperatures are likely to increase by 1.5° Celsius before 2026. Nothing short of urgent action on climate change can mitigate the severe consequences of this crisis.²

The convergence of multiple global crises has altered the calculations of national and EU decision-makers, who now seek to step up decarbon-

¹ In 2020, 43% of the EU's natural gas imports came from Russia. The EU represents the world's largest consumer of Russia's gas and oil exports, importing almost three-quarters of Russia's natural gas and 49% of its crude oil in 2021. Source: Eurostat

² Temperatures have already risen by 1.1°C, according to the latest climate update published by the World Meteorological Organisation (WMO), there is a 50:50 chance that warming will reach 1.5°C by 2026.



The Russian invasion is forcing the EU to rethink.

isation efforts while ending European dependence on Russian fossil fuels as quickly as possible – ideally by 2027, with Russian gas imports reduced by two-thirds by the end of 2022.

New climate targets to put Europe back on track

To achieve these new objectives, the European Commission announced the 'REPowerEU' initiative in May 2022. Building on previous decarbonisation policies like the 'Fit for 55' package,³ the initiative proposes a set of short-term measures and new

climate and energy targets. The binding EU energy efficiency target will increase from 9 % to 13 % relative to the 2020 PRIMES Reference Scenario⁴ and the headline target for renewables from 40 %⁵ to 45 %. According to the European Commission, these new targets will put Europe on track to achieve net-zero emissions by 2050 and meet the milestone target of reducing its emissions to 55 % by 2030.

While the new targets set in the REPowerEU initiative represent a clear improvement over those in the 'Fit for 55' package, it is important to note that the package was already criticised by many as inadequate when it was adopted in 2021. Critics argued that the energy sector targets were not ambitious enough to keep global warming below 1.5°C and objected to the fact that targets were not binding at national level. While adjustments to the package should be welcomed, they are not more ambitious than the targets that are called for based on science-based climate assessments. At a time when the IPCC's experts are issuing a 'code red for humanity',⁶ we need to measure numbers against scientific claims, not against what is considered politically possible.

³ The package included amendments to and revisions of key legal instruments, including the Renewable Energy Directive, the Energy Efficiency Directive and the EU's Emission Trading System.

⁴ Under the former method of calculating energy efficiency targets relative to the PRIMES Baseline 2007, this corresponds to an increase in energy savings from 37% to 40% in terms of final energy.

⁵ The 40% RE target was tabled under the 'Fit for 55' files package in July 2021.

⁶ 'IPCC report: "Code red" for human driven global heating, warns UN chief,' UN News, 9 August 2021, retrieved from <https://news.un.org/en/story/2021/08/1097362>

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What is RePowerEU?

REPowerEU's first task is to reduce energy consumption to cut imports from Russia and meet the new efficiency target. Measures include a 'Playing My Part' plan and an 'EU Save Energy Communication' to promote and support individuals as well as businesses in reducing their energy demands. In addition, the European Commission proposes, among other measures, an increase in financial support for retrofitting buildings as well as the introduction of pricing measures to encourage consumers to instal high efficiency heating systems, switch to heat pumps and purchase more efficient appliances.

Easier permits for more renewable energies

The expansion of renewable energy generation capacity is a second key objective of REPowerEU. Based on its assessment that there is an overriding public interest in renewable energy projects, the Commission proposes legislation and recommendations that can fast-track and simplify permit-granting procedures. As part of the initiative, Member States will be asked to identify available land and



The program wants to make planning and building of renewable energies easier and faster.

sea areas for project development and designate 'go-to areas' where projects can be exempt from environmental impact assessments. REPowerEU also includes a strategy to double the capacity of solar PV by 2025 and proposes an obligation to equip all new public and commercial buildings with solar panels after 2025. The obligation would also apply to residential buildings after 2029.

Diversifying the energy supply to reduce dependencies

Although the main priorities are to decrease energy consumption and expand renewables, Europe will still need to import energy to replace Russian fossil fuels. Acknowledging that energy imports always create dependencies, the Commission plans to minimise risks by diversifying Europe's energy supply. While the immediate goal is to boost local produc-

tion of biomethane and imports of liquefied natural gas (LNG), the revised external energy strategy includes a long-term approach aimed at establishing energy partnerships with trusted international partners and a focus on importing carbon-neutral hydrogen. REPowerEU also seeks to structure European demand through a joint purchasing platform and a framework for an optimised and transparent use of infrastructure for importing, storing and transporting gas.

Another target: Repowering Ukraine and Europe's Eastern partners

In addition to REPowerEU, the European Commission also engages in energy diplomacy and has announced a plan to support Ukraine, Moldova, the Western Balkans, and the Eastern Partnership countries, many of which are also heavily dependent on energy imports from Russia. Among other things, these countries will be offered an opportunity to participate in the EU's joint purchasing platform for gas. The Commission's plans for Ukraine go even further and include measures to integrate the country into European gas and electricity grids and a strategic partnership on renewable hydrogen.

The main target: Combining climate protection and fossil independency

The REPowerEU initiative finally acknowledges what climate and green energy stakeholders have contended for decades: a combination of higher renewable shares and substantial energy savings can not only help mitigate climate change, but also build defence mechanisms against fossil dependency and reduce costs and risks for citizens and companies.

Moving forward, decisionmakers will nevertheless have to address certain issues concerning REPowerEU, such as how to guarantee that biomethane production and hydrogen imports are environmentally sustainable and how to safeguard the transition to carbon neutrality while making new investments in new fossil infrastructure. The major shift in European funding associated with REPowerEU also raises concerns that other important issues – especially economic recovery after the pandemic – will be left unattended.

But: Only united action can have effective results

Furthermore, it remains to be seen whether REPowerEU will give cause for the European Union to move forward as one in the fight against climate change. National solo efforts to negotiate energy policy, such as the hydrogen agreement between Canada and Germany, should be welcomed as a step in the right direction, but such efforts are

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Independent and sustainable energy supply can only be achieved by all EU members together.

nowhere near as effective as united action. The EU now faces the task of advocating joint international steps that can contribute to real climate change mitigation and real progress.

Once the REPowerEU initiative is adopted on the European level, the task of implementing most of the measures will fall to the Member States, such as the integration of dedicated REPowerEU chapters into recovery and resilience plans (RRPs) under the RRF or the creation of national funding schemes for retrofiting buildings. Unfortunately, experience from previous climate and energy measures suggests that varying levels of commitment and diverging interests among Member States may cause substantial delays.

Now words must be transformed into deeds

All in all, REPowerEU's upwards revision of the 2030 climate and energy targets sends a strong signal and shows the way forward towards a fossil-free future. Now it is up to European institutions and the Member States to ensure that this set of proposals doesn't remain empty words.

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HUSUM WIND

Transforming Energy

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> On- and Offshore

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2023



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.

ADLS to bring back the dark skies at night

Aircraft Detection Lighting Systems (ADLS) reduce light pollution and better the acceptance of wind energy. Dark Sky had a leading role in this development.

Communities around the world have discovered that a dark sky is something preferable over the man-made illumination of cities, roads and buildings. Not only, that this can be a waste of energy, also it is doubted, that the margin of safety or comfort will balance the disadvantages of this development. Photographers have been criticizing for long that it is nearly impossible to find a dark sky at night. Also stargazing is becoming more and more difficult in some areas of the world. Well-known pictures from space are showing an earth, that is covered with lights in all night-time areas. Organizations like the International Dark-Sky Association are raising awareness of these circumstances and are promoting the reduction of artificial light at night.



Dark Sky Transponder Antenna and LED Light © Dark Sky

Wind farms contribute their share to light pollution. Light pollution also became a problem when wind-farms raised in less populated areas and, due to their height, must be recognized as obstacles to low-flying aircraft. Therefore, in most cases they are lighted at night with red light, often blink-

ing and with a physical light intensity up to 2.000 candela – which is equal to 2.000 candles. Where other aviation obstacles are less frequent and more isolated, windfarms are perceived as a concentrated source of light pollution and are not well accepted by residents near the wind farms.



Aviation Lights on a wind turbine © Dark Sky

... and Dark Sky wants to change that.

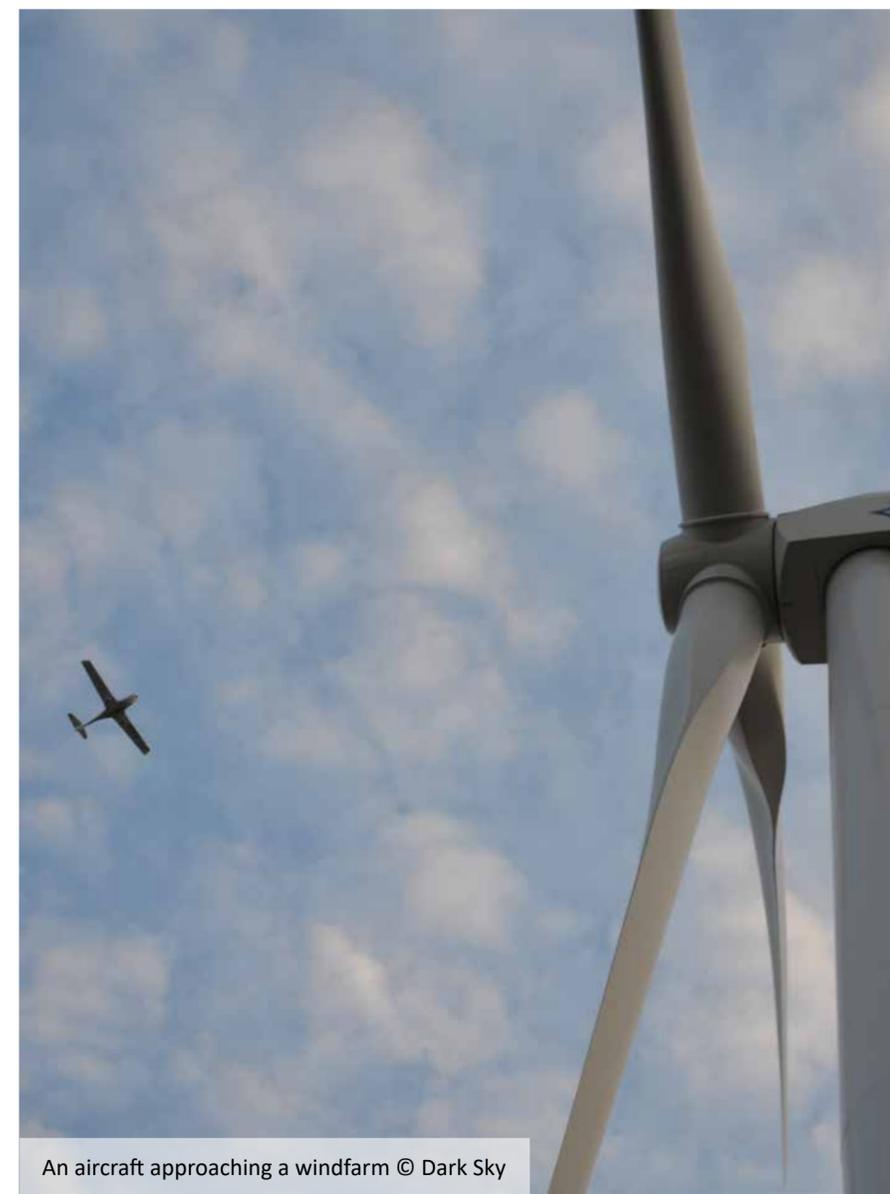
The German company Dark Sky GmbH has worked on this topic for a long period of time. As part of the ENERTRAG group, it was spun off from an aviation light supplier as a specialist for Aircraft Detection Lighting Systems (ADLS). Together with other technology leaders, the staff at Dark Sky has developed the idea of the demand-driven activation of warning lights in order to reduce light pollution and raise acceptance for new wind energy projects. This has led into the establishment of a legal framework on ADLS in Germany and was continued into a binding obligation for all new and also most of the existing wind farms in Germany.

In the end of 2023, most of the windfarms in Germany will be equipped with ADLS systems and will contribute to a darker sky while securing flight safety. Dark Sky is operating different technologies for the detection of aircraft. Larger projects with more than 100 wind turbines are using primary radar sensors that will detect aircraft in a distance more than 20 km. The German regulations will require the light to be activated in a distance of 4 km and a height up to 600 m. The ADLS project "Dark Sky Uckermark", north of Berlin, is combining 2 of these sensors to a project that can cover up to 400 wind turbines.

Different ADLS-technologies are used.

Nowadays more often a transponder-based detection technology is used. This is possible since the German regulations on transponder usage has changed in 2020, since then all aircraft are required to use a transponder at night. These communication devices are transmitting the actual position, speed, and height together with an identification of the aircraft. This data is originally used by systems that coordinate air traffic, but by listening to these transmissions, ADLS systems can

control the function of aviation lights on wind turbines. In general, this technology can be used to control all types of warning or assisting lights that are related to air traffic, not only on wind turbines but also on buildings, bridges or towers.



An aircraft approaching a windfarm © Dark Sky



"There is a huge interest in ADLS from outside Germany. We are already in discussions in several countries and are looking for partners and pilot projects in these new markets. The goal is to make the sky dark again."

Thomas Herrholz
CEO of Dark Sky

In Germany, there are special challenges present, due to the obligations to approx. 14.000 wind turbines, which must be retrofitted until the end of 2023. Dark Sky has developed a practical approach to address these time constraints with its decentralized ADLS system. Other than centralized systems – best represented by large radar projects with a central sensor – decentralized systems are not using a network infrastructure to transmit time-sensible data between sensors and lights. With the simpler technology of transponder receivers, the cost advantage is used to install one receiver on every obstacle and to connect it directly to the warning light. This process reduces project engineering and makes it possible to install and finish many ADLS systems in a limited time.

Germany is not the only market for ADLS.

The team at Dark Sky wants to export the idea to other markets, because not only in Germany there is a huge interest in ADLS-technologies and their benefit for operators, residents and environment. Dark Sky will host a webinar on November 15th, 2022, to inform about the chances from ADLS, the experience from the German projects and their

plans in some selected countries. The Webinar will be held in English and will feature some experts from international markets.

ADLS: Technologies to darken the sky again

ADLS are technologies that help to reduce light pollution, particularly connected to wind energy projects. They have been continuously refined over several stages of development and proven in projects all over Germany. These technologies are ready to be transferred to other markets and Dark Sky is offering help with a complete portfolio of detection technologies, a motivated team of experts and a high level of knowledge.

Contact

Thomas Herrholz
CEO of Dark Sky GmbH
Phone: +49 395 7665 8080



An ADLS Radar Sensor © Dark Sky



Extended oil lifetimes in practice

The ADDINOL Eco Gear Series specifically tailored to wind turbines shows convincing results in practical application.

Lubricants as construction elements play a decisive role in the safe operation of wind power plants. In order to achieve reliable protection against friction, wear and corrosion as well as long service lives at maximum operational safety, a reliable and capable partner is required on the lubrication side.

ADDINOL Lube Oil GmbH offers a wide range of lubricating oils and greases specifically developed for the demands and conditions prevalent in wind turbines. The gear oils of the ADDINOL Eco Gear series in particular provide a number of benefits for the operators:

- Ideal for high loads in quenched and tempered as well as hardened-ground gears with a tendency to micro-pitting
- Reliable protection against wear and corrosion
- Highest operational safety

- Above-average service lives
- Minimum effort for maintenance, extended service intervals

The right lubricant for every lubrication point of the wind turbine

ADDINOL lubricants are developed in our own laboratory in close cooperation with leading OEM and institutes. We are already preparing for the requirements of tomorrow to provide customers with high-performance lubricants from ADDINOL also in the future.

- ADDINOL Eco Gear series: for high wear protection of gearbox and gear motor
- ADDINOL Hydraulic fluids: for highest precision and maximum protection of hydraulic clutches and blade adjustment
- ADDINOL Lubricating greases: for long-term lubrication of pitch, main and azimuth bearings



Experience from practice

The efficiency of a wind turbine is also determined by the gear oil. With ADDINOL Eco Gear 320 S above-average oil change intervals are achieved in practice. Even in plants which have been in operation for many years, the advantages of lubrication with ADDINOL Eco Gear 320 S pay off.



Fleet average of more than 10 years of oil life with high-performance gear oil

Location: 300 turbines in wind farms around the Mecklenburg lake district, north-east Germany

Turbines: GE, Nordex

Gearboxes: Eickhoff, Winergy

Oil volume: between 300 and 600 litres gear oil depending on size and power class

Gear oil: ADDINOL Eco Gear 320 S

Results:

The application of ADDINOL Eco Gear 320 S leads to average oil change intervals of approx. 10 years with maximum operational safety of the turbines. Thanks to selected antioxidants, the Surftec® technology as well as an extremely low friction coefficient the oil temperature is sustainably reduced and thus the ageing process is delayed considerably. The ageing process is influenced not only by the time of use, but above all by the temperature that the oil experiences during its application. As a rule of thumb, oil ageing doubles with every 10 °C increase in temperature. Therefore, every degree Celsius by which the oil temperature is lowered matters! This applies in particular to gear oils that

are to remain in service for a long time, such as in wind turbine installations. If the oil and gearbox load is minimized in the long term, service life can be extended and maintenance costs reduced.

Safe continued operation for wind turbines in the longer run

Location: 250 turbines in wind farms in Lower Saxony

Turbines: GE, Vestas

Gearboxes: Valmet, ZF

Oil volume: 125 to 150 litres depending on gearbox type

Gear oil: ADDINOL Eco Gear 320 S

Results:

Thanks to the unique ADDINOL Surftec® technology which adapts to the changing load conditions in the gearing and thus increases the load-carrying capacity, heavily loaded tooth flanks of the wheel pairs are optimally protected against wear, material removal, pitting and fatigue, even under increased stress. The performance of the ADDINOL Eco Gear series is assessed by internationally recognized test methods.

Gear wheel runs almost without any wear.

In the Scuffing Load Test of the FZG Institute the load carrying capacity of a lubricant is tested on a special test rig. At defined rotational speeds and temperatures the limiting stress capacity of gear oils is analysed. The gear wheels used during this test are examined for scuffing and marks after the test run both visually and by the help of measuring procedures. A tooth flank with cross-grinding (initial condition see detail A) was tested with conventional industrial gear oil of the CLP type – strong scuffing is obvious (see detail B). The other side of the gear wheel was tested with ADDINOL Eco Gear under the same method. This tooth flank does not show any damages (see detail C). With ADDINOL Eco Gear the gear wheel was running almost with-

out any wear. The initial grinding surface pattern is fully preserved. The reliable and economic operation of a wind turbine that has proven itself over many years is ensured.

"We possess a worldwide distributor network of lubricant experts in over 120 countries. These partners accompany the application of ADDINOL lubes on site, from the selection of the fitting lubricating oil, grease, or spray to monitoring and support in application"

Sascha Möbius

Technical Sales Manager Europe at ADDINOL GmbH



Sound advice for optimum results

The extensive product range of ADDINOL is accompanied by sound technical advice and comprehensive support both nationally and internationally. Customers and partners are assisted in the selection of the optimum lubricant for wind turbines or other applications in the industrial and automotive sector, considering the respective conditions and requirements as well as possible incompatibilities. Also, the process of changeover and the introduction of ADDINOL lubricants will be accompanied by our experts. Regular training sessions for partners and customers complete the support.

Contact

Sascha Möbius
Technical Sales Manager
Europe at ADDINOL GmbH

Phone: +49 3461 845-0





Recyclable Blades: One step more to make wind turbines fully recyclable

New method of rotor blade production marks a milestone on the way to introduce a circular economy in the wind industry.

Over the past 40 years, the wind industry in Europe has driven the energy transition through innovations that have pushed turbine availability, efficiency, and performance to ever-expanding heights. As a result, onshore and offshore wind power plants help Germany generate nearly half of its electricity from renewable sources at affordable prices.

"We want the wind industry to be a part of the solution by having a small carbon footprint value chain and fitting into a circular economy."

Martin Gerhardt,

Managing Director Siemens Gamesa GmbH

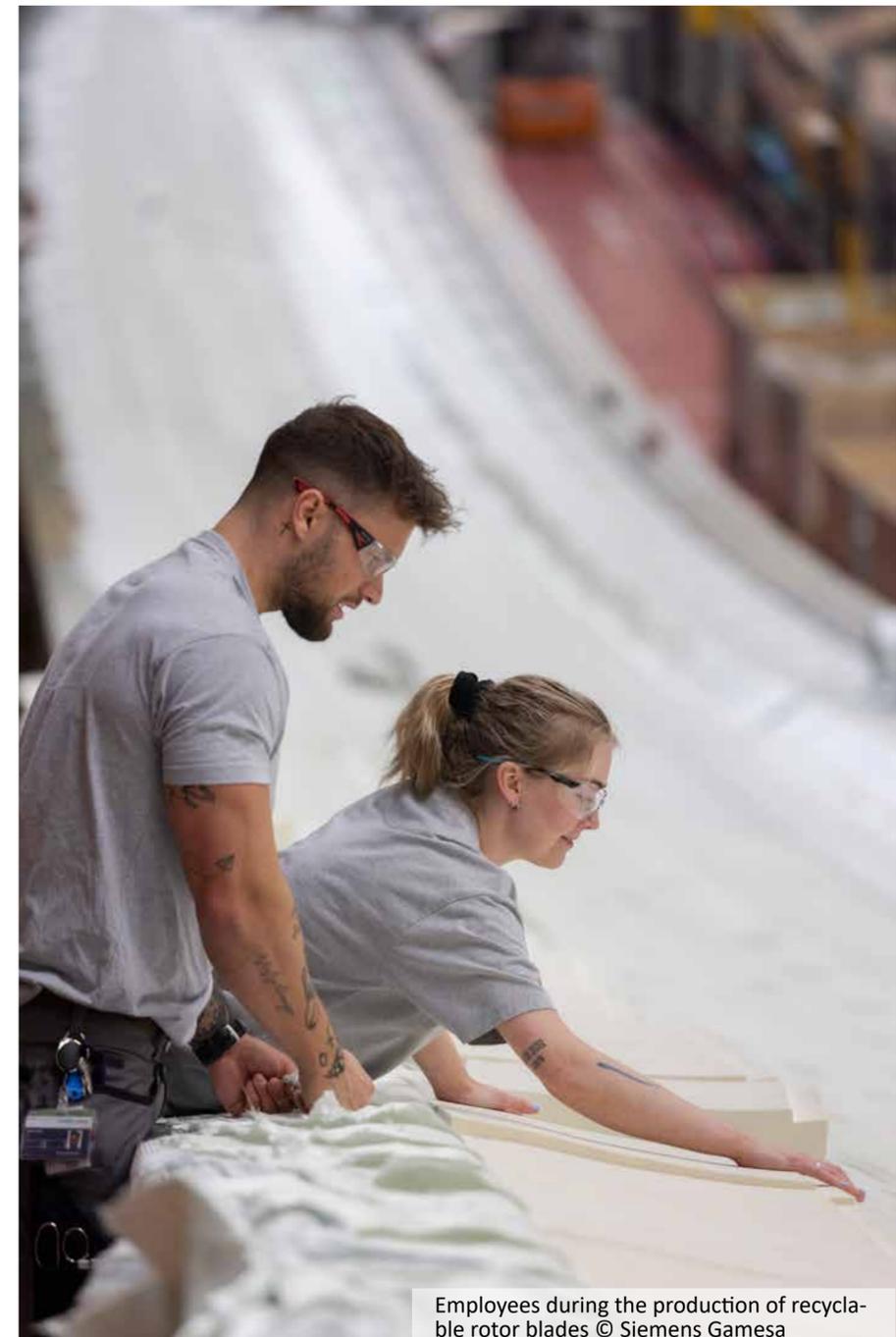
If we want to expand the share of renewables in Germany to 80 percent by 2030, that currently means no less than doubling the installed capacity. This new decade of growth ahead of

us, poses new challenges as we must make it as sustainable as possible to use finite resources as efficiently as possible.

Rotor blades need to withstand immense strain.

Currently a large part of the turbine can be recycled; the steel in the towers and the copper in the cables – in total approximately 85 percent. The rotor blades, however, were a challenge until recently because of the technical prerequisites of the materials.

The rotational forces found in operational wind turbines put immense strain on the blades. With tip speeds reaching approximately 90 meters per second – equivalent to 324 kilometers per hour – and a projected lifetime of more than 25 years, high quality and innovative design is imperative especially when considering their exposure to hail, lightning or, in the case of offshore turbines, their exposure to salty. For a 108-meter-long offshore blade the rotational forces are around a staggering 80 million newton meters. To put this into perspective, the force pulling on a human shoulder while spinning a 1 kg object around in an outstretched arm is only about 10 newton meters!



Employees during the production of recyclable rotor blades © Siemens Gamesa



First installation of recyclable blades in Kaskasi wind park in Germany 2022. © RWE/Matthias Ibeler

Challenges for the recycling of rotor blades

With the growing size of the blades, the reinforced fiberglass structure has been supplemented with carbon fiber technology. Carbon is a stiff and light material, and the result is a very reliable and robust blade design which is perfect for the extreme conditions. But as all components are bonded together, adding the carbon increases the difficulty of separating them at the end of the blade's life cycle.

The challenge of recycling the blades at end-of-life is related to the durable nature of the thermoset resin used, which makes it energy-intensive to separate the materials at end-of-life either mechanically, thermally, or chemically. However, with adaptations to the traditional resin system, this challenge has now been mastered for the first time.

The solution: easier separation of the components

Innovative recyclable blades use a new resin that can be easily dissolved in a mild acid solution at the end of the rotor blade's life cycle. This is achieved by a chemical change in the structure, which creates a 'cleavage point' that can be activated by a combination of heating and exposing to acidic solution. By doing so, the resin will dissolve and become a thermoplastic recyclate that can be used for new purposes. For example, suitcases or monitor housings can be built from the recovered material. Also, the remaining materials in the blade, such as fiberglass and wood components, can easily and energy efficiently be separated from each other and returned to the material cycle.

The process has been developed in a way so that the production process remains the same and therefore does not require new processes, equipment or facilities, but can utilize the existing processes as the current manufacturing setup. The recyclable blade can be produced for any offshore turbine and any size of blade. The material properties of the new resin are higher than those of the

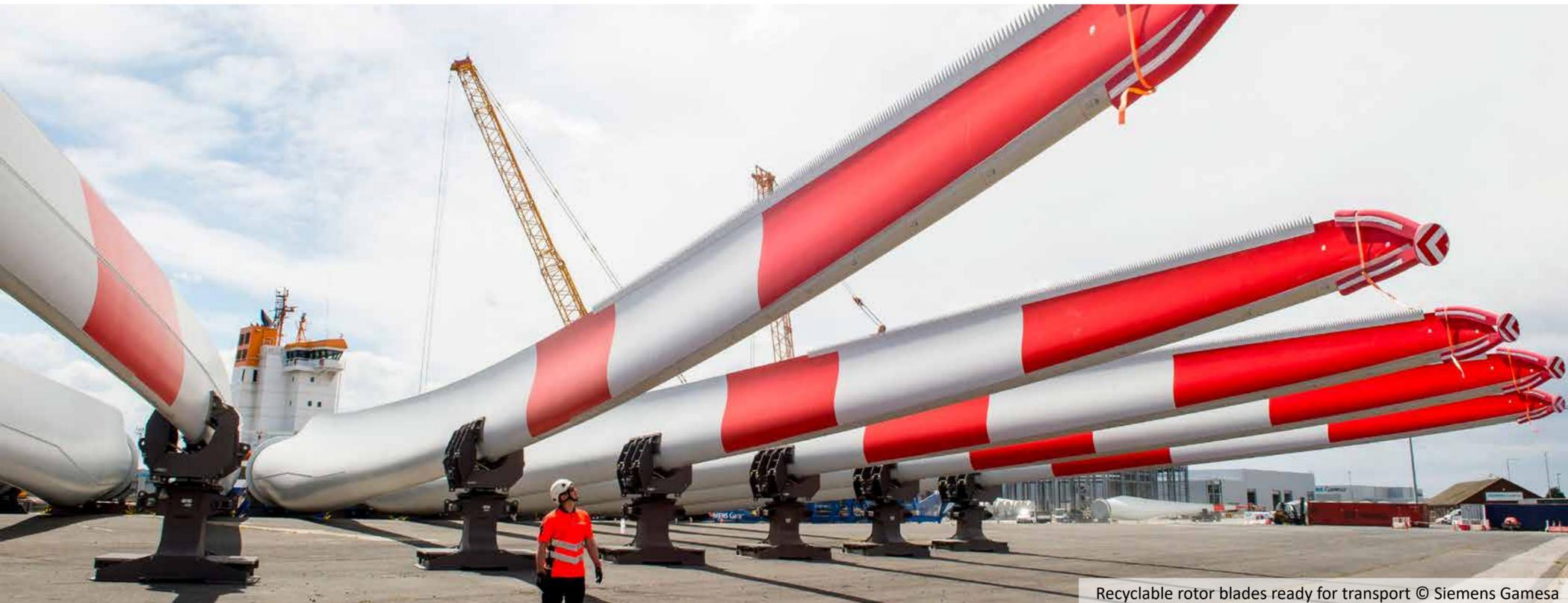
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Recyclable rotor blades ready for transport © Siemens Gamesa

old one. Furthermore, the resin has been designed for extra slow reactivity to enable improved processability and to cure faster than conventional materials, thereby contributing towards lowering cycle time in blade manufacturing.

Recyclable blades: Only one year from introduction to practice

Just as remarkable as the technology itself was the speed of getting the recyclable blades into market. From the introduction of the technology in late 2021 to the first deployment in the offshore wind power plant Kaskasi in the German North Sea less than a year has passed. That this speed is urgently needed, is highlighted by a little figures game.

Adding up all Offshore projects in the pipeline worldwide until 2050, more than 200.000 blades will be installed. Considering that landfill used to be the solution for decommissioned rotor blades in the past, these blades one after another would span around half of the globe with more than 22.000 kms length and a total weight of more than 10 million tons.

Currently, the recyclable blades come at a price increase compared to the conventional solutions. However, the end-of-life costs will on the other hand decrease while the recycling rate of the blade will increase significantly compared to landfill or energy recovery processes often applied to conventional blades today.

Laws and environmental protection demand more sustainability.

What happens today to decommissioned blades is laid out in different national legislations. In Germany, the operators carry the responsibility and landfill is already not an option anymore. One option would be to repair and reuse these blades but considering the high prerequisites



for the material this option clearly has its limits. Repurposing old blades for pools, playgrounds, bicycle stands, or the like is a fashionable option, but these will also require material recycling at some time. Recycling options for the composite materials are available today, but they are neither available cost competitive nor at the scale necessary. This leaves for most old blades the option of regaining the thermal energy in them, meaning incineration and co-processing for example in cement production.

Wind power plant operators could benefit from this new technology because it reduces their environmental footprint, which becomes increasingly important as qualitative criteria are introduced in more and more auction systems. Additionally,

at the end of the plant's life, when the operators must dismantle it, they do not produce waste or simply energy for incineration, but they get back valuable raw materials.

Recyclable blades show what the European wind industry is capable of.

This new technology is a good example of how the wind industry in Europe pushes the energy transition with new innovations and as a result creates many jobs and value across different countries. The blades that were used in the Kaskasi wind park are a multinational project: The development took place in Denmark, the blades were produced in the United Kingdom and the nacelles for the project came from Germany. This European collaboration underlines the technological experience and innovative character of the European wind industry and also highlights that Europe can hold security of supply in its own hands.

We will need to rapidly deploy wind turbines to help decarbonize, avoid climate change effects, and support energy security. With the recyclable blade it is demonstrated that this can be achieved in a waste-minimized matter, where we are also reducing the carbon footprint of the wind turbine life cycle by making materials available for future purposes after having produced renewable electricity for many years.

Author
Martin Gerhardt
 Managing Director of
 Siemens Gamesa in Germany




Goldhofer

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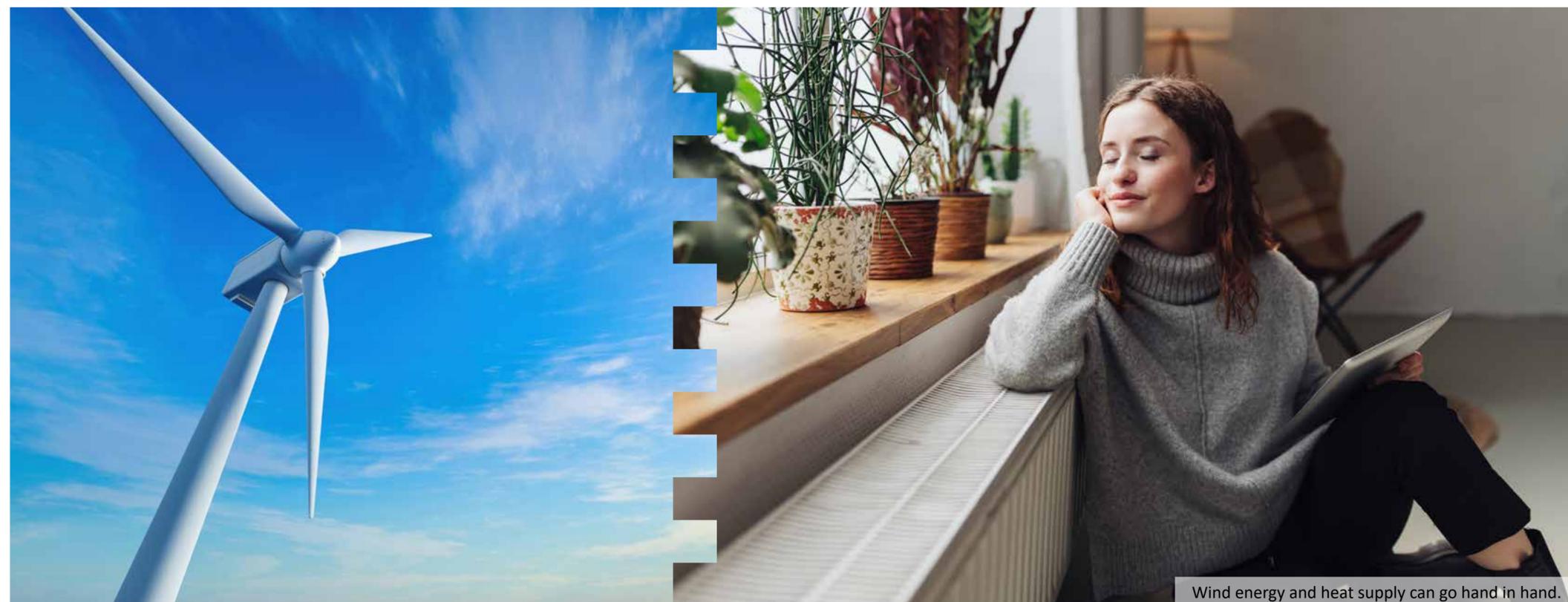
Power-to-heat: A Win-Win for wind power and heat supply.

New power-to-heat technologies could push the energy transition further by solving some challenges of the actual electric power supply.

Germany's expansion target for 2030 is quite clear: 115 gigawatts of installed onshore wind energy are envisaged in the recently adopted amendment to the German Renewable Energy Sources Act (EEG). The fact that the necessary annual addition of 10 gigawatts this year has so far fallen far short of expectations is not mentioned there. "The situation with new permits leaves a lot to be desired," the German Wind Energy Association (BWE) said at the beginning of August. The lack of gas supplies from Russia also makes it clear: a quick solution to strengthen renewables in the energy sector is needed.

Converting wind power into green heat

When one thinks of renewable energy, the first thing that comes to mind is electricity. Around 50 percent of it – which is a significant share – comes from renewables in Germany. The situation is quite different with heat: Only 15 percent comes



Wind energy and heat supply can go hand in hand.

from renewable sources. Yet more than 50 percent of the total final energy consumption is for heat. The industrial sector, where process steam and heat are needed for the most part, even accounts

for about two-thirds of this. While green electricity is now becoming suitable for mass consumption, green heat is still a rare commodity.

Where wind power volumes potentially affected by curtailment or electricity from de-subsidised wind power plants face a high demand for heat, the solution is simple: power-to-heat technologies with a storage component connect the electricity market with the heat market and thus solve several problems at once.

Lesser down times for wind turbines ...

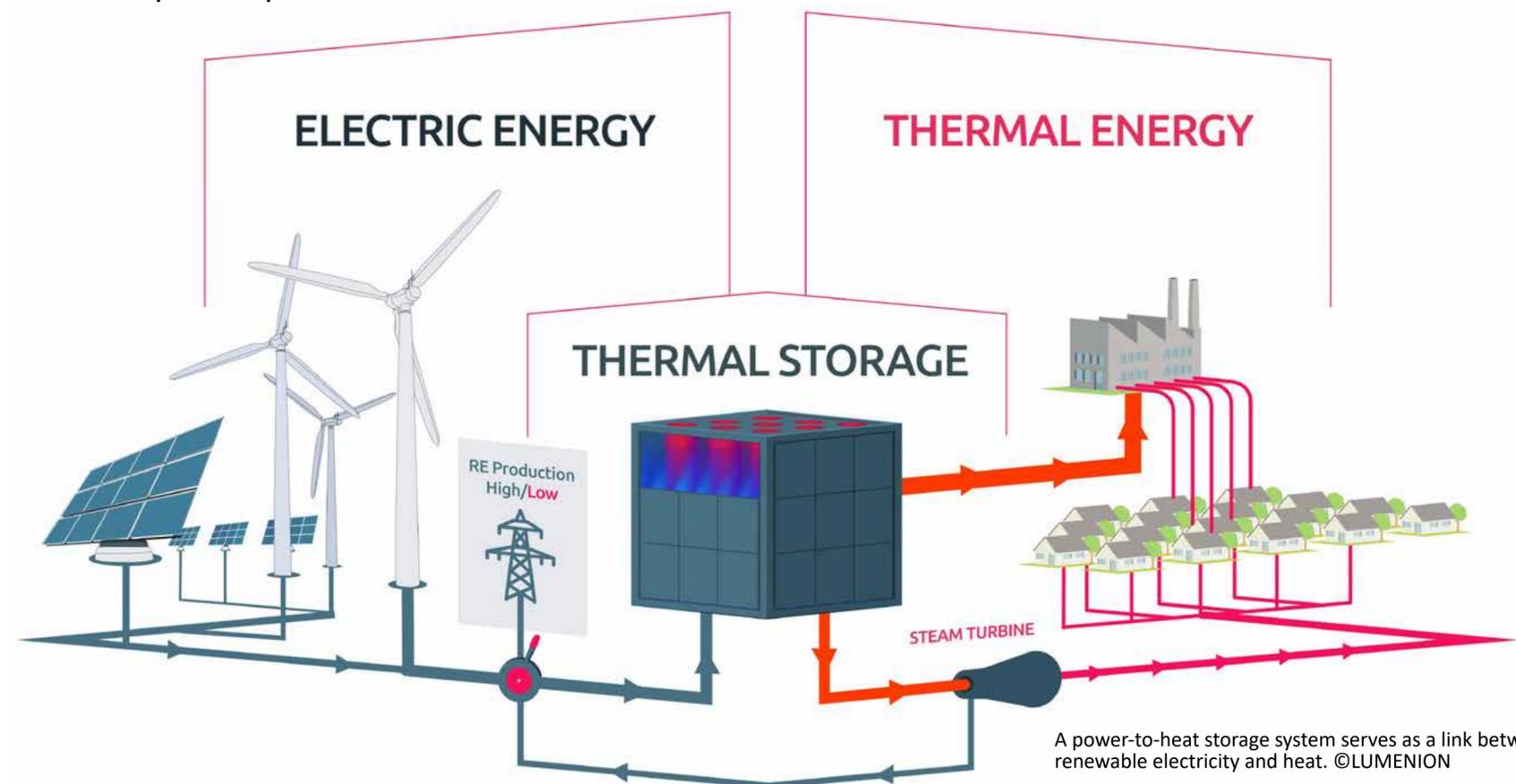
On the side of electricity generation, there is the fundamental problem of volatility. If there are generation peaks that exceed the capacity of the electricity grid, a shutdown of the wind power plant is unavoidable. Through sector coupling, however, these excess quantities can be shifted quickly from the electricity grid to the heating grid. For wind farm operators, this means a huge improvement by maximising wind yields, reducing connection costs and even generating additional revenue through heat supply. The situation is similar for wind farms that continue to be operated after the legally guaranteed "Renewable Energy Law" (EEG) subsidy under German law expires. Here, the operator can also generate stable, electricity exchange-independent revenues by selling excess heat.

... and better use of the capacities ...

For grid operators, such a shift serves as a relief. By making better use of existing grid capacities, there is less time pressure on investments in the further expansion of the grid. Without having to wait long for grid expansion, energy yields can already be increased by fully utilising the existing wind power potential. This makes the wind farm business case much more attractive, which should also have a positive effect on the further expansion of wind power plants.

... can make green energy cheaper.

By shifting the generation peaks, the volatility of the feed-in into the electricity grid and thus the need for balancing energy is reduced. Together with the reduced investments in grid expansion, grid fees are thus kept in check and renewable energies become even more affordable for the end consumer.





Example of a storage system integrated into the heating system of a residential complex © LUMENION

"A cross-sectoral energy system is the system of the future with which we can reliably cover our demand for heat without losses of wind power."

Peter Kordt,
CEO of LUMENION GmbH

Using peaks to store renewable electricity as heat.

Thanks to an effective use of electricity peaks, larger parts of the demand for heat in the industrial and building sector can be supplied with CO₂-free energy. Especially in the industrial sector, heat- and steam-powered processes can thus be further decarbonised and climate targets in companies can be achieved more quickly. An important factor in the shift from fossil fuels is the greater security of supply provided by renewables.

Through electricity-heat coupling, the heating market can also take advantage of particularly favourable electricity prices. This also provides economic incentives to push ahead with the transition towards to a greenhouse gas-neutral energy supply.

Power-to-heat storage provides maximum flexibility.

Power-to-heat technologies such as thermal energy storage systems are a particularly useful link between the electricity and heat market. With an efficiency of up to 95 percent, they store large amounts of energy from generation peaks quickly, reliably, and cost-effectively. By separat-

ing energy supply and demand, they provide more flexibility in the electricity grid. On the other hand, they guarantee a stable heat and steam supply for energy-intensive industries, as the lack of electricity during off-peak hours can simply be compensated for by the previously stored energy.

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The vibration technology specialists: www.esm-gmbh.de



A simple loading principle: Fast in – steady out

Usually, these storage systems can be charged in a short time. A resistance heater then converts the electricity fed into the system into heat, which is transferred to the storage core. Depending on the storage material, which can range from steel to salt or sand, it is heated until the maximum storage temperature is reached. Thanks to insulated covers, there are very marginal losses of the energy stored within some days. Nevertheless, thermal energy storage systems were not designed for long-term storage.

Whenever energy is needed, they can be discharged just as easily: The stored heat then passes through to a heat exchanger, which discharges

process heat or process steam in a desired temperature for any application. Some of these systems offer the possibility to simultaneous charging and discharging which ensures maximum availability and optimises the use of resources.

An integrable key technology for the energy transition

Thanks to the modular design of these sector-coupling storage solutions, they are individually scalable so that their capacity is linked to the specific needs of customers. As they are usually based on industry-proven techniques, they make it possible to enter new technological terrain while retaining proven industrial processes and infrastructures. The difference to fossil-fuelled boilers: they make it possible to protect the respective business case against rising energy and CO₂ costs while ensuring the supply of green, greenhouse gas-neutral energy. Thus, they represent an important key technology for reducing CO₂ emissions and make the most effective use of fluctuating wind power possible – in the shortest possible time and not just in 2030.

Author

Peter Kordt
CEO of LUMENION GmbH



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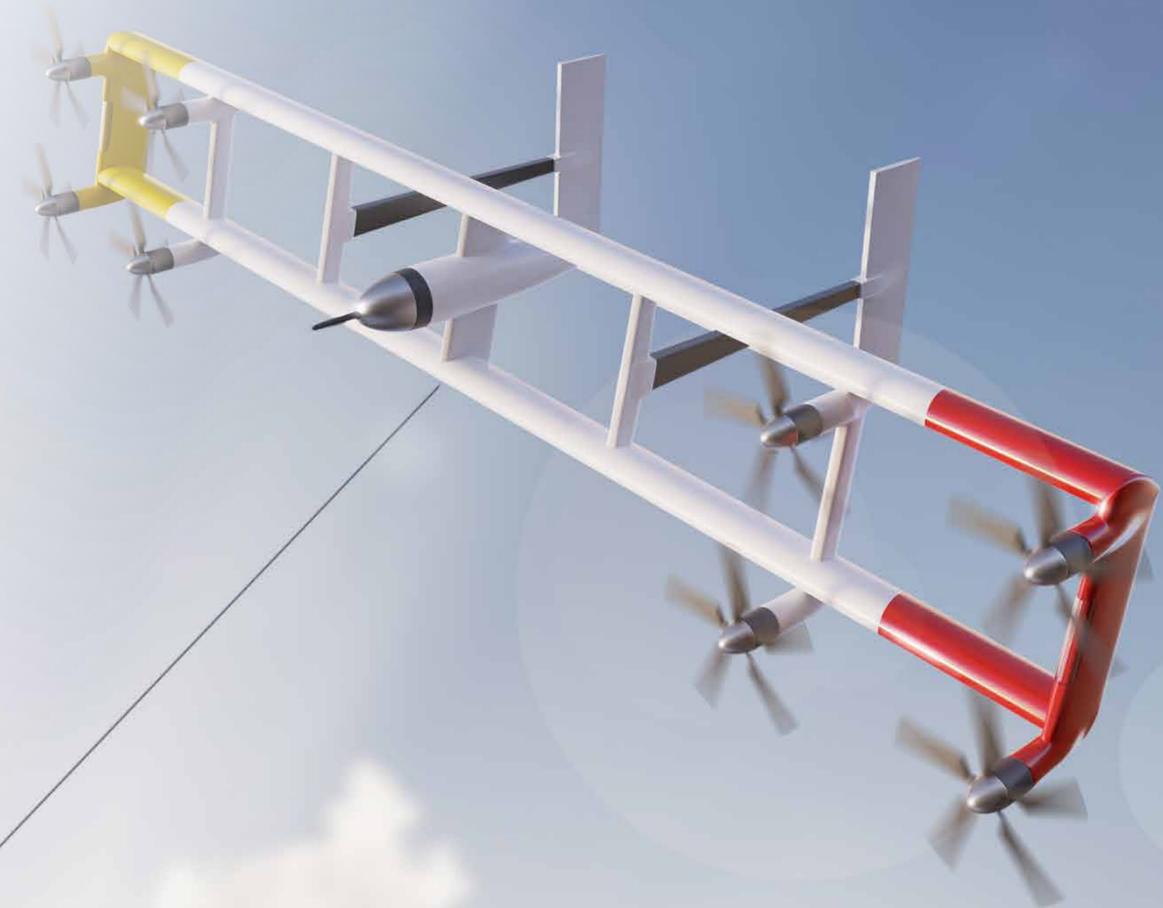
Breaking the standard with Flying Wind Turbines

Kitekraft is developing the wind turbine of the 21st century – with one-tenth the material and half the cost of the standard three rotor blade ones.

The world needs more renewable energy – more installed capacity in more places and in a wider variety of sizes – as quickly as possible. Established 3-bladed wind turbines are already an important pillar of the energy transition and will continue to play a key role in the future. That said, they also come up against regulatory, logistical, or economic limits: high investment costs, difficult to access sites, distance regulations or local opposition prevent wind power expansion in many places. In addition, there are often no reasonable solutions for many smaller or shorter projects and use cases, as economic installations today only start at 2 MW.

Developing areas where conventional systems do not fit.

We have made it our mission to drastically increase the applicability of wind power and thus make wind energy usable in more sizes and at more locations. This is possible due to our innovative concept. Our wind power system consists of a kite (drone with wings) that is anchored to a ground station with a tether. The system takes off and lands like a drone with the help of onboard rotors. Once the system is in the air, the kite flies constantly on the path of a horizontal figure eight, generating electricity with the same rotors.



Less materials, less costs, less CO₂-footprint

This eliminates the need for large towers or huge rotor blades and allows us to achieve twice the height of established wind turbines with the same power output using 10x less material. Due to these circumstances and simpler and cheaper production, logistics, installation, and maintenance, we achieve significantly lower costs. Already with

our first product, a 100 kW turbine, we achieve costs comparable to today's wind turbines in the MW range. In addition to cost reductions, our technology offers further advantages through a significantly lower material and CO₂ footprint. Also in terms of social acceptance, our products have an advantage over conventional wind turbines due to a significantly lower visual impact.

3 MW is the next target for our turbines.

The first 100 kW systems are aimed at niche applications in the area of self-supply of agricultural or industrial sites as well as smaller communities. The next product size is 500 kW with the main application in hybrid microgrids or already for power production and feed-in to the grid. Of particular interest here are repowering projects

"We are building the wind turbine of the 21st century, making wind power more widely applicable."

Maximilian Isensee,
CEO and Co-Founder of Kitekraft

Take-off and transition to operational use
(landing is in reverse order).





Prototype in flight ©Kitekraft

in Germany where new wind turbines face regulatory hurdles (distances, regional planning, etc.) and our turbines can fill gaps. The next scaling step will bring our turbines up to 3 MW and thus into the range and use cases of established wind turbines. In perspective, we are planning our turbines for both onshore and offshore applications.

New technologies for new challenges

We continue to face a huge challenge in the energy transition and need every renewable technology that can contribute. With our technology, we are expanding the economic viability of wind power to more applications, sizes, and locations. Here, our kite wind turbines can exploit niches that conventional rotor blade turbines are denied by regulations or site conditions.

You would like to learn more about our wind turbines? Meet us at the WindEnergy Hamburg 2022 in hall B7, booth 425.

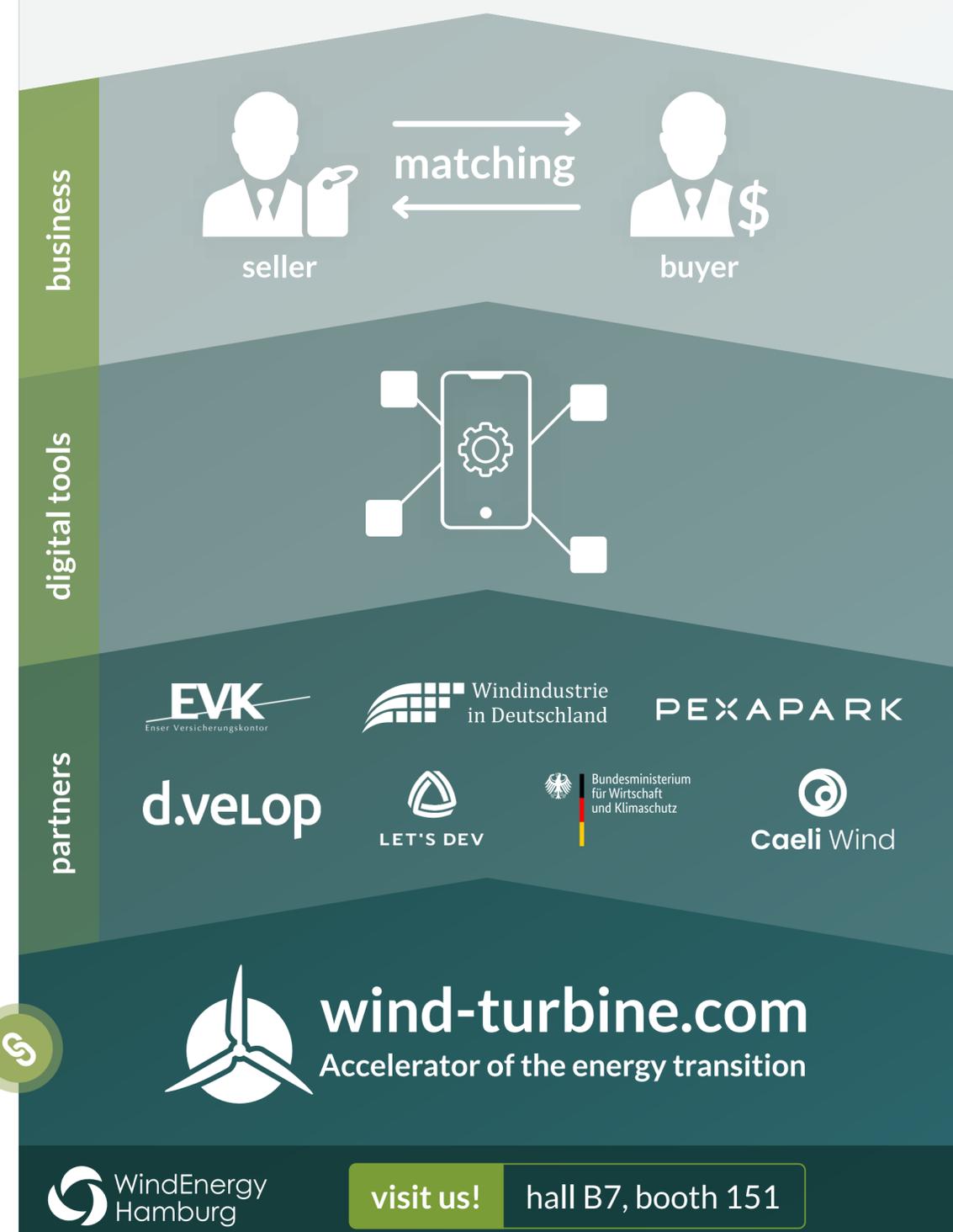


Author
 Maximilian Isensee
 CEO and Co-founder of
 Kitekraft



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8.2

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 Heidestraße 2, 10557 Berlin, Germany
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 ➤ Lubricants



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 Am Sande 50, 20457 Hamburg, Germany
 ➤ Law



ELMEKO GmbH + Co. KG
 Graf-Zeppelin-Str. 5, 56479 Lieben-scheid, Germany
 ➤ Manufacturer and Supplier of electrical and electronic components



Agile Wind Power AG
 Sonnentalsstrasse 8, P.O. Box 232, CH-8600 Dübendorf
 ➤ Wind turbine manufacturer
 ➤ Planning and Construction



Dark Sky
 Jahnstr. 3A, 17033 Neubrandenburg, Germany
 ➤ Aircraft Detection Lighting Systems (ADLS)



EnBW Energie Baden-Württemberg AG
 Schelmenwasenstr. 15, 70567 Stuttgart, Germany
 ➤ Planning and Construction
 ➤ Operation and Service



Berdan Civata B.C.
 Tarsus-Mersin Organized Industrial Zone, 33540 Mersin/Turkey
 ➤ Manufacturer of wind turbine fasteners (From foundation to blades)



DunoAir Windpark Planung GmbH
 Hawstr. 2a, 54290 Trier, Germany
 ➤ Planning and Construction
 ➤ Operation and Service



Energiequelle GmbH
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 ➤ Planning and Construction
 ➤ Operation and Service





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- Supplier of other components
- Transport and Logistics
- Wind turbine manufacturer



Your contacts to German experts



ERG Germany GmbH
Jungfernstieg 1, 20095 Hamburg, Germany

- Operation and Service
- Planning and Construction





Goldhofer AG
Donaustr. 95, 87700 Memmingen, Germany

- Manufacturer of transport equipment for wind power turbines





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- Technical consultants
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"Wind-on-Land"-Act

How German politics plans the future of wind energy.

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.

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