BWE INDUSTRY REPORT

BWE
German Wind Energy Association

Wind Industry in Germany

Economic report
An overview of the German wind industry

Companies
Leading companies present their products and services

Industry directory
More than 320 addresses – easy access to the right contact

2022

INTERNATIONAL

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German Wind Energy Association

Editorial

Dear readers,

Everything is pointing towards change. A so-called “traffic light coalition” will now be gracing the political stage following 16 years of coalitions led by Angela Merkel. Their programme is set out in a 177-page coalition agreement published under the self-confident slogan “Alliance for Freedom, Justice, and Sustainability”. The Green Party has finally managed to create an opportunity for climate protection and the energy transition, and the coalition partners have subscribed to their agenda. The new Federal Chancellor has already stated that Germany will once again lead the way in climate protection.

To achieve this aim it will be necessary to overcome the stagnation that has taken hold in recent years. Legislative measures aimed at removing hurdles and bottlenecks are long overdue. But the good news is that our calls for significantly faster and simpler approvals and the dedication of 2 percent of the available land for wind energy production have been reflected in the agreement. However, the success of the energy transition will be crucially dependent on the preservation of existing areas through targeted Repowering schemes. We still have to overcome the dramatic lull in expansion in recent years and we are still a long way from a situation in which onshore wind energy will be able to make the necessary contribution to meet energy and climate policy targets. The electrical power market now needs to be redesigned to ensure that the necessary expansion takes place. We need more flexibility in terms of generation, consumption, and storage as well as an end to fossil fuel subsidies and an honest and straightforward CO_2 pricing scheme.

The experiences of certain federal states have shown that permit applications can result in implementable projects provided that land use planning, clear legal framework conditions, and a pragmatic administration are in place. More of the same is required, especially in the south-east and south-west of the country where consumption rates are particularly high, which is why the indication by federal-level politicians that two percent of the available land surface area in every federal state should be set aside for wind energy production is extremely important. Sitting idly on the side-lines is no longer an option for anyone.

A new federal government will have every opportunity to steer developments in the right direction in a rapid and targeted manner. The wind energy sector, which is primarily made up of small and medium-sized enterprises with strong local roots, is ready and waiting. Within the energy sector, it is we who function as the new value creation and employment engine and offer major employment opportunities. As an association, we will launch a powerful campaign to draw attention to this fact. The wind industry is well prepared, and we want to hit the ground running. We would like to assure the incoming federal government that political objectives can be achieved!

Yours sincerely,

H. Albers

Hermann Albers,
President, German Wind Energy Association (BWE)

Content
Economic report

Briefly asked

The sector is driven by its actors. We have asked entrepreneurs of the German wind industry about their most important innovations, strategies and markets. Read their answers on **pages 13, 26, 40 and 44.**

Companies

These pages are dedicated to companies whose new products, processes or methods ensure the continued development of the wind industry.

German manufacturers have a high share of the world market, reaching an export rate of 60 to 70 percent. The technology and efficiency of their turbines set standards and are sought-after globally.

Manufacturers of wind turbines from all over the world buy systems and components in Germany. Years of experience of the operational side together with specific research and development projects are much in demand everywhere.

Start-ups are entering the market with new ideas. A selection is presented on these pages. Be inspired by their innovative power.

Planning, finance, transport, construction and marketing. The fields of planning and operation of wind turbines are a continuous growth market in Germany.

The BWE is the voice of the German wind industry. It passes on its expert knowledge through its events and publications – servicing policy-makers and the sector in equal measure.

More than 320 addresses of leading companies in the wind industry.

An overview of all categories is inside the back cover page.

ECONOMIC REPORT:

Wind Industry in Germany

About 30,000 wind turbines currently stand on Federal German territory, amounting to more than 60,000 MW of installed power. About 135,000 people are employed in the sector.

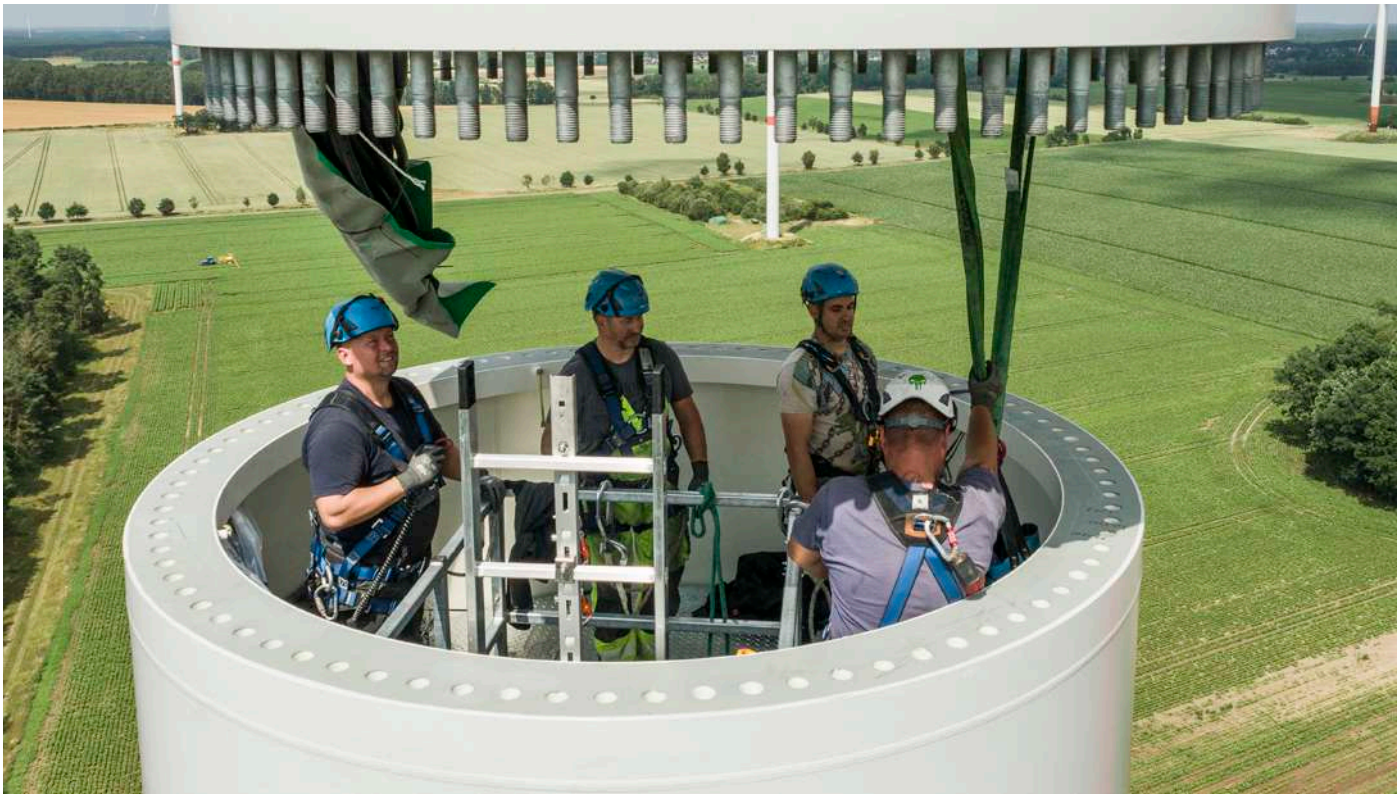
Wind and solar park in Lüpitz industrial park, Saxony
Photo. Jan Oelker

THE GERMAN MARKET

A growing expansion trend – but further increases will be needed to meet climate targets

The expansion of onshore wind energy in the first half of 2021 increased significantly compared to previous years, but 2019 and 2020 also saw the lowest expansion rates since the introduction of the EEG. To be able to meet the ambitious climate targets set by the German federal government and the EU, the wind industry is calling for improvements in the land and licensing situations.

Foundation for a Vensys 136, 3.5 MW, at Nateln wind farm in the Wendland region.
Photo: Ulrich Mertens



Erecting a Vensys 136, 3.5 MW, hub height 161.2 m. Photo: Ulrich Mertens

240 onshore wind turbines with a total rated output of 971 megawatts (MW) were installed in Germany in the first half of 2021. This would appear to be a record-breaking expansion rate in comparison with previous years: the industry has managed to grow capacity by 62 percent more than in the first half of 2020 (591 MW). The capacity added to date even exceeds that of the whole of 2019 (958 MW). However, both of these comparison periods mark the weakest expansion periods since the introduction of the EEG in 2000. The figures were compiled by consultancy Deutsche WindGuard on behalf of the German Wind Energy Association (BWE) and the German Engineering Federation VDMA Power Systems.

Over fifty percent of the 240 turbines were erected in Lower Saxony, Brandenburg, and North Rhine-Westphalia. Thirty-five turbines (134 MW, approx. 14 percent of the newly installed capacity) were realised as repowering projects, and 135 existing turbines (140 MW) were dismantled in the first half of 2021. According to Deutsche WindGuard, the total number of onshore wind turbines in Germany increased to 29,715 in the second half of 2021 with a total capacity of 55,772 MW.

62 %

more performance growth than in the first half of 2020 **(591 MW)**. The capacity added to date even exceeds that of the whole of 2019 (958 MW).

The expansion rate will have to more than double to meet climate targets

Provided there are no process, supply chain or construction issues, the associations are assuming an increase of 2200– 2400 MW for 2021 as a whole as compared with 1431 MW (420 wind turbines) in 2020. As such, the wind industry will not meet the target of just under 4000 MW per annum that is stipulated in the EEG 2021 this year. According to the BWE and the VDMA, given the outgoing German government's plans to reduce CO_2 emissions by 65 percent by 2030 and the German Federal Ministry for Economic Affairs and Energy's electricity consumption forecast, a further increase in the gross expansion targets for onshore wind energy of 5000 MW per annum will be necessary.

According to BWE President Hermann Albers, it will only be possible to achieve

„With the establishment of the National Government and the Federal States Collaboration Committee for More Land and Permits, the EEG 2021 has created a framework that now has to be used for the adoption of specific measures.“

these figures if politicians set the necessary course without delay: “Improving the land and permit situation,” he says, “is an essential building block for achieving this. With the establishment of the National Government and the Federal States Collaboration Committee for More Land and Permits (Bund-Länder-Kooperationsausschuss für mehr Flächen und Genehmigungen), the EEG 2021 has created a framework that now has to be used for the adoption of specific measures. The Collaboration Committee’s survey of potential land should deliver some concrete results before the new government is formed.”

EEG Amendment 2021: last minute reform

The EEG Amendment 2021, which – for the first time in the EEG – defines specific expansion and power volume paths, came into force on 1 January 2021. Other important things included in the amendment are the legal regulation for the financial participation of municipalities in wind turbines, a one-year follow-up subsidy for existing turbines following the expiry of the EEG subsidy, and the establishment of a National Government and the Federal States Collaboration Committee for More Land and Permits, which will monitor the state expansion targets and their implementation status on an annual basis. To expedite the expansion of wind farms it will be necessary to greatly accelerate the pace of land use designation and the dismantling of licensing obstacles according to the BWE and the VDMA.

On the whole, the EEG amendment 2021 failed to meet all of the wind sector's expectations. In addition to some positive initiatives, such as the financial participation of municipalities and fixed expansion paths, there is a lack of strong incentives for removing approval procedure obstacles and obstacles to the provision of

Nateln wind farm, erecting a Vensys 136 3.5 MW: Lifting the generator.
Photo: Ulrich Mertens

land for onshore wind energy, which will be necessary for achieving the German government and EU's ambitious targets, as BWE President Hermann Albers explained following the adoption of the EEG draft in the Bundestag in late December 2020.

The EEG 2021 was adopted virtually at the last minute in December 2020 so that it could come into force as of 1 January 2021. The result was that numerous regulations were included in the reform which, in retrospect, have turned out to be a hindrance to the expansion of onshore wind energy. These included the reduction of tender volumes by the BNetzA, the stipulation of three tender rounds per year, and the 2019 and 2020 tender volume catch up, which came too late. The then German federal government announced that it would correct obvious errors in April 2021.

Question #1: "Which **actors** have a particular responsibility for promoting the German wind industry?"

"Asset managers have started to take advantage of digitalisation. However, we are still at the very beginning of a great wave of optimisation. There is still huge potential for improvement in the financing structures of many assets!"

DOREEN PIMPL, CEO,
greenmatch AG

"It is clear that politicians have a particular duty to ensure that the appropriate framework conditions are in place. Climate protection now requires fast, decisive action and the expansion of renewable energies is urgently needed."

MARKUS LESSER, CEO,
PNE AG

"In addition to the political framework conditions, the interaction between the operator/asset manager and the plant manager/service and maintenance provider will be decisive for the future. We can increase profitability provided that both stakeholders manage to form a close working relationship and, for example, optimise the interfaces via framework agreements etc., and avoid any duplication of tasks. This also applies to older turbines in particular, which should be operated for as long as possible in the event that a repowering approval cannot be obtained."

JÖRG BLUMENBERG, Managing Director,
juwi Operations & Maintenance GmbH

▲ REpower MD70 in Reußenköge wind farm, North Frisia. Photo: Jan Oelker

▼ Hötzelsroda-Beuernfeld wind farm in Thuringia: Enercon E48 and Vensys V82, with AN Bonus in the background. Photo: Jan Oelker

CONTINUED OPERATION

The EEG amendment is only a short-term bridging solution – what are the alternatives for operators?

The amendment to the Renewable Energy Sources Act (EEG 2021) made provision for a follow-up subsidy for the continued operation of subsidised EEG wind turbines as of the 1st of January 2021. However, the funding is limited to one year, so the importance of alternative options for operators is increasing.

The EEG 2021 amendment 2021 was passed by the Bundestag and Bundesrat on 17 and 18 December 2020 at the proverbial last minute, before EEG support was withdrawn for the first existing wind turbines in early 2021. Operators of existing wind turbines were forced to make a landmark decision in 2020: they could either conclude direct marketing agreements (PPAs) for their electricity or wait to see whether a political solution for their existing wind turbines would be forthcoming, whereby they risked having to feed their electricity into the grid with no further subsidies in 2021.

How does the follow-up support for subsidised EEG wind turbines work?

The new provisions that have been included in the EEG 2021 (§§21, 23b, 53, 95 No.3 and 105) mean that wind turbines no longer eligible for EEG support as of 1 January 2021 are entitled to follow-up support. The amount is calculated from the monthly market value as at December 2020 (3.291 ct/kWh) plus a premium of 1 ct/kWh until 30 June 2021, 0.5 ct/kWh until 30 September 2021, and 0.25 ct/kWh until 31 December 2021. The marketing revenues of 0.4 ct/kWh will be deducted from these amounts.

Although the subsidy amount is low, the German Wind Energy Association (BWE) considered the bridging of continued operations to be a success in early 2020. During the BWE's monthly policy briefing in January 2020, Wolfram Axthelm, Managing Director of the BWE, referred to the regulation as a buffer against an abrupt dismantling of existing wind turbines and went on to say that: "Whether the surcharge of initially 1 cent, which will then be reduced to 0.5 and later to 0.25 cents, will be able to provide a sufficiently long-term bridge to keep the wind turbines in the market is rather questionable. However, there will be no abrupt decommissioning."

The EU excludes follow-up funding via tenders

The legislator had been planning to create a feed-in tariff entitlement (§ 23b para. 2 EEG) under certain conditions via the participation in tenders. However, the European Commission raised certain concerns about this and ruled that the investments had already been amortised over the 20-year EEG subsidy period and that further state subsidies constituted improper government aid. As such, the planned follow-up support for old wind turbines via tender participation will not be included in the EEG 2021.

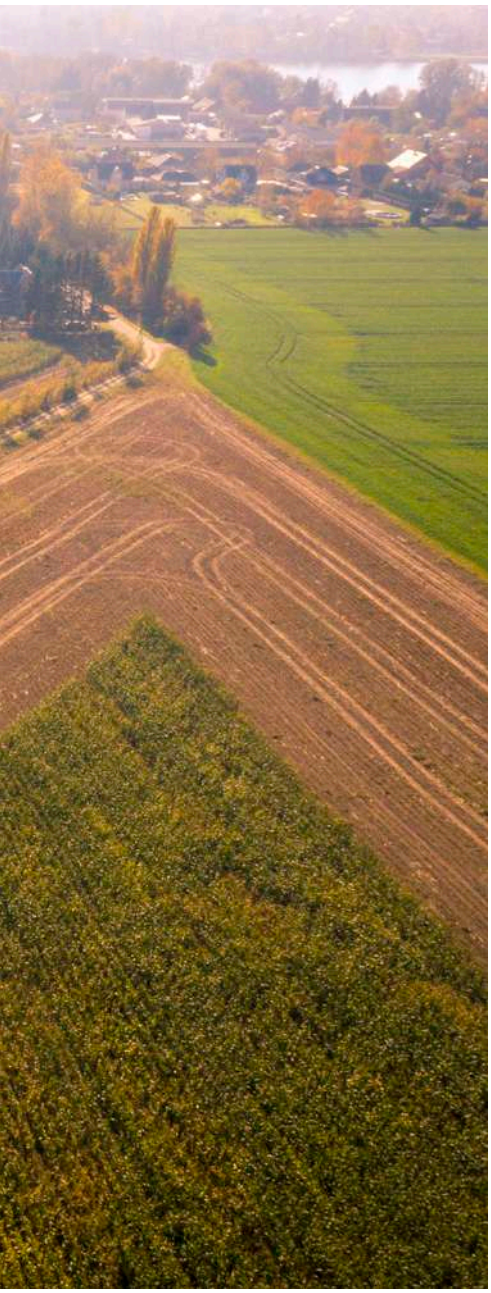
Operators of existing onshore wind turbines whose EEG support expired on 1 January 2021 can still benefit from the staggered supplements in 2021, as this was approved as part of the pandemic-related economic aid package. However, as of 1 January 2022, operators of existing wind turbines will have to rely solely on market revenues, with no additional supplements or subsidies. Although electricity prices have recovered significantly in 2021 compared to the previous year, it is still possible that operators will have to take their wind turbines off the grid if it proves impossible to continue to operate them in a profitable manner.

"From our point of view," said Wolfram Axthelm about the decision, "we will be able to cope with the fact that the European Commission has overturned the follow-up funding. Right from the

outset, the scope of the programme was extremely limited. As such, its actual effect had always been questionable. “It would be far more important,” he continued, “to finally take the steps necessary for the targeted promotion of the repowering of older wind turbines. The end objective is to make much better use of sites that have already been in use for years and that have therefore also been accepted for a long time. So, the consistent repowering of older wind turbines would be of far greater value for all stakeholders than the envisaged follow-up subsidy would ever have been“.

> “We can expect a significant increase in the demand for green electricity from the hydrogen sector in the next few years, but also from other sectors, which will significantly expand the marketing opportunities for non-subsidised wind turbines.”
>
> Dr Antje Wagenknecht, Managing Director of the Specialist Agency for Onshore Wind Energy (FA Wind)

Südwind turbine near Bernau.
Photo: Silke Reents



The legislator is planning an EEG exemption for green hydrogen

The Bundestag approved a draft Federal Government ordinance on 24 June 2021, which deals, among other things, with the exemption of the EEG surcharge for the production of green hydrogen. This ordinance, which constitutes the first legal basis for the use of the term "green hydrogen" in Germany, sets out the requirements for the production of green hydrogen, especially in terms of electricity consumption. Wind turbines that supply electricity for the production of green hydrogen should be able to apply for the surcharge exemption as of 1 January 2022. But as is the case with the planned tenders for follow-up funding for existing wind turbines, nothing can happen without the European Commission's verdict about the legalities in terms of (potentially improper) government aid. There are also still open questions about the classification of hydrogen under European law, although these should be resolved by the end of the year.

What the effect of the EEG 2021 will be on wind turbines that will no longer be subsidised remains to be seen. Given the uncertainties that operators are faced with, PPAs represent a reliable long-term alternative in terms of planning and a serious alternative to direct marketing and the uncertain development of electricity prices. Prices bounced back in 2021 following the massive collapse in the wake of the Covid-19 pandemic in 2021. Both of these developments were driven by special factors involving long-term uncertainties. It is also impossible to predict how statutory support set out in the EEG 2021 and under its successors will develop.

"We are clear about what has to be included in the updated version of the EEG," says Wolfram Axthelm: "what we need now is to finally engage the turbo drive for the expansion of renewable energies. That will require more land, faster approval procedures, targeted repowering schemes, a redesigned electricity market, and the genuine protection of species rather than individuals. Only if these hurdles, which have been known about for years, are removed," he continues, "will Germany have any chance of achieving its climate targets. In this context, it will be important to exploit the opportunities for Ü20". Ongoing issues in relation to government aid suggest that wind turbine operators ought increasingly to be seeking alternatives to state subsidies as soon as possible.

INFO

PPAs are playing an increasingly vital role

Power Purchase Agreements (PPAs) are playing an increasingly vital role for wind turbines whose subsidy entitlement has expired or is due to expire in the near future. PPAs are bilateral contracts entered into between an electricity producer and a buyer for a direct power supply, often for many years, at a negotiated fixed price. The benefit of this for wind turbine operators lies in the guaranteed purchase price for their electricity, which is decoupled from the unpredictable fluctuations on the electricity exchange. Whilst PPAs have been in use internationally for a number of years, they are now also becoming increasingly important in Germany and their importance is likely to increase due to the lack of follow-up funding for existing wind turbines in the EEG 2021.

REPOWERING

The key to the energy transition

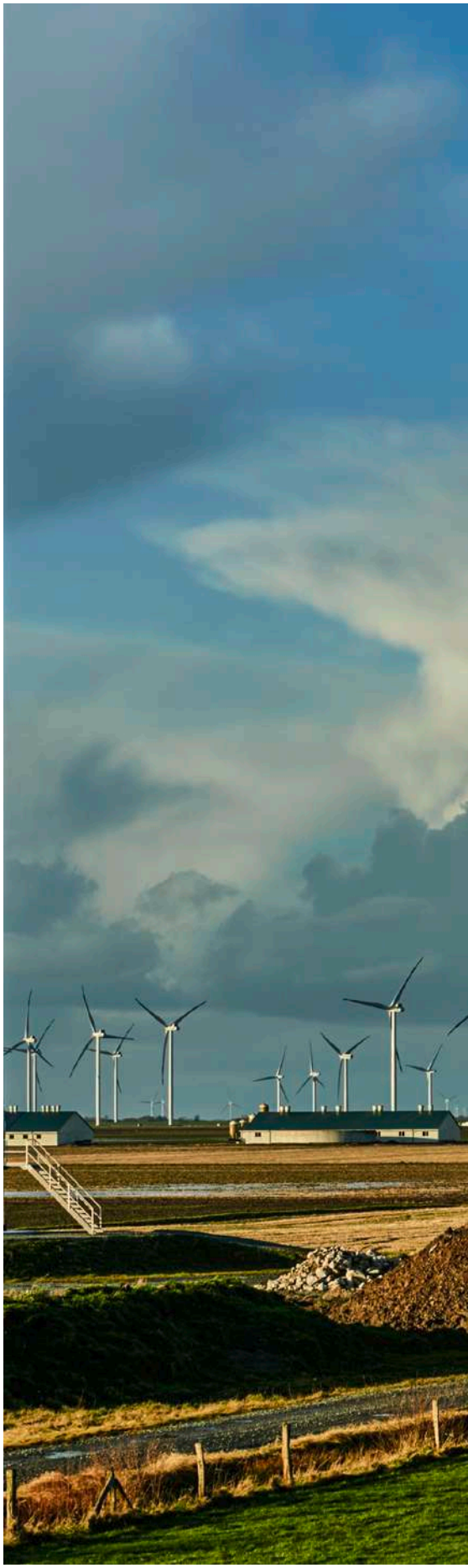
Ever since the 1st of January 2021, repowering has played a special role: the first wind turbines have now become ineligible for the EEG subsidy and are facing economic hurdles, which makes repowering the potential key to a resurgent wind energy expansion.

Both the Bundestag and Bundesrat unanimously ratified the Paris Climate Change Conference accords in 2017. In their coalition agreement, the grand coalition (CDU/CSU and SPD) agreed to build upon this and increase the share of renewable energies in overall electricity consumption to 65 percent by 2030. This target was also enshrined in law in the Renewable Energy Sources Act (EEG) 2021. Repowering is of particular importance in this context because the EEG 2021 includes a motion for a resolution by the governing parliamentary groups in which various repowering solutions are proposed.

The outgoing federal government stipulated in this motion that the conditions for the expansion of onshore wind energy must be improved to expedite the expansion of renewables. The motion defines repowering as the key factor for the rapid planning and approval of new wind farm projects. It also called upon the Federal Government to review the Spatial Planning Act, the Building Planning Act, the Federal Emissions Control Act, the Species Protection Act, and the licensing procedure in favour of repowering and to investigate potential improvements for repowering projects. But what exactly does repowering mean?

Repowering delivers enormous benefits …

The term repowering usually refers to the replacement of existing wind turbines with new, more powerful models. New construction may take place in the immediate vicinity of the existing site in which case it is referred to as **site-maintenance repowering** or further away from the old site, in which case it is known as **site-relocation repowering.** Site-maintenance repowering entails dismantling the old wind turbines and erecting new ones at the original site. Site-relocating repowering, by contrast, only implies a link between the construction of the replacement wind turbine to the dismantling of one or more older wind turbines, regardless of whether dismantling and construction take place at the same location.



Repowering at Reußenköge wind farm, North Frisia. Photo: Jan Oelker


Vestas

Dismantling wind turbines in Adorf am Diemelsee for ABO Wind. They will be replaced by two new, more powerful turbines at a later stage. The new turbines have three times the output of the old ones. Photo: Hagedorn

Repowering often increases the site output by multiples of the original output, which means that higher output rates can be achieved with fewer wind turbines at the same site. So, there are significant benefits to repowering: the loss of existing wind power capacity is absorbed and wind power sites that have already been accepted for many years remain operational. The land can also be used more efficiently because of the pre-existing knowledge of the wind conditions at the site and the higher output of the new wind turbines, in addition to which the share of wind power in total electricity generation is increased. Compared with continued operations, there is a clear economic use benefit. But there are also ecological benefits to using repowered wind turbines compared with existing ones, because sensitive animal species benefit from fewer and taller turbines due to the larger open spaces between the turbines.

In 2021 alone, around 4,000 MW would fall out of EEG support.

… but is encountering a number of legal hurdles

Notwithstanding the obvious improvements, there is barely any relief for site-preserving repowering projects from a licensing law perspective. On the contrary: the current legal situation in Germany is characterised by obstacles and implementation difficulties. For example, the process is exactly the same as the one for new wind turbine planning and can take several years. The relevant authorities also often categorise repowering projects as new permits in accordance with § 4 of the Federal Emissions Control Act (BImSchG), which require a full review. Licensing practices are also inconsistent and an investigation into the potential impact on flora and fauna has to be carried out, along with reports on pre-existing impacts on the area due to the construction and operation of the current wind turbines that had not yet been taken into account. The urgently needed expansion of repowering projects is currently being hindered by these obstacles.

The end of EEG subsidies is increasing the importance of repowering

Around 4,000 megawatts (MW) of wind energy capacity will cease to be eligible for subsidies under the Renewable Energy Sources Act (EEG) in 2021 alone. According to estimates from Fachagentur Windenergie an Land (FA Wind), another 2400 MW on average per annum will follow by 2025. On the other side of the equation are annual tender volumes of 3000 to 4500 MW over the next five years. As such, one can expect to see a major impact on the net new installation quota should the wind turbines in questions be dismantled and the necessary increase in the installed onshore wind energy capacity in Germany

would be slowed down significantly. For comparison: the gross wind energy expansion in the first half of 2021 was 971 MW, whilst 140 MW of capacity were dismantled. There is an obvious need to promote repowering and to counteract the impending loss of many existing wind turbines over the next few years.

Increasing political pressure for more repowering

Even if existing wind turbines receive short-term follow-up support through the EEG 2021, that would only postpone the issue of the economic viability of numerous existing wind turbines rather than resolving it, which is why industry associations are fervently calling for fundamental reforms to facilitate repowering projects. The German Wind Energy Association proposed a variety of mechanisms that policy makers could use to drive repowering forward in a paper presented in the first half of 2021. And the wind industry is not the only stakeholder pushing for political action: the EU already called for easier and more flexible regulations for repowering projects in 2018 in connection with its directive on the expansion of renewable energies within the EU. In June 2020 both the Minister Presidents' Conference and the Federal Council also endorsed this demand. It remains to be seen how the new German federal government will deal with this matter in detail.

Heubusch wind farm near Meerhof.
Photo: Ulrich Mertens

"We will see increasing repowering rates"

DR. ANTJE WAGENKNECHT
Managing Director of the Specialist Agency for Onshore Wind Energy (FA Wind)

As you know, Dr. Wagenknecht, repowering often involves multiplying the power output. The average output of newly installed wind turbines up to September was 4 megawatts, whilst the average output of existing plants was only 1.9 MW. How could this potential be better used going forward?

In most cases, repowering refers to the replacement of obsolete or disused wind turbines with more up-to-date models at sites that have already gained public acceptance, which often involves reducing the number of wind turbines at the site whilst increasing the power output. However, this potential can only be exploited if the sites in question are available for the installation of new wind turbines. It has become apparent in recent years that only a limited number of previously used sites, for example those that are more distant from residential areas, have been designated for this purpose in recent regional and land use plans. A return to existing noise protection regulations would be desirable in this context, which base the assessment of whether wind farm sites should be redeveloped on the blanket distance specifications for local sound emissions.

Between 14 and 24 percent of wind energy expansion in Germany in the past 4 years has been due to repowering projects. Do you think this percentage will increase?

I'm convinced that we'll see increasing repowering rates in the coming years, firstly because ever more early generation wind turbines are reaching their technical end of life and secondly, because space was and continues to be a scarce commodity in this country. Dynamic developments in modern wind turbine technology enable us to generate many times more electricity in the same area, which also boosts the economic incentive for replacing old turbines. Regulatory measures ought not to slow this development down, because the increasing demand for green energy doesn't leave much room for prohibiting the use of already well-accepted sites by efficient new wind turbines.

The prototype of the Enercon E-160 EP5 stands at the Wieringermeer wind energy test field in North Holland. Photo: Enercon/Klaas Eissens

WIND TURBINE TECHNOLOGY

Wind turbines continue to get higher whilst the market leader holds its position

Vestas was able to defend its position as market leader in the construction of new onshore wind turbines against Enercon in 2020. The wind turbine configurations and parameters remained virtually unchanged compared with 2019.

Due to the slow expansion rate, the German market for wind turbines remains competitive. Whilst Vestas was able to defend its position as German market leader, in terms of total power output, the company lost more than 8 percentage points of market share, gaining just 35.1 percent of overall market share (compared with 43.6 percent in 2019). In second place, Enercon, who erected more turbines than their Danish competitor in 2020, only has a market share of 32.3 percent due to its lower total power output (compared with 31.6 percent in 2019). Nordex, who were ranked third, achieved the greatest expansion in terms of market share gaining additional 5 percentage points (15.4 in 2020 compared with 10.1 in 2019).

So once again in 2020 the leading wind turbine manufacturers were able to maintain their market positions. "What is becoming clear," says the Specialist Agency for Onshore Wind Energy (FA Wind) in their analysis of the expansion of onshore wind energy in 2020, "is that the German wind turbine market is firmly in the hands of just a few manufacturers: Enercon,

The prototype of the Vestas V162-6.0 MW was erected at the Osterild test site in 2020. Photo: Vestas

Nordex and Vestas supplied 83 per cent of all new turbines connected to the German power grid in 2020 (and 85 per cent in both 2018 and 2019)". Vestas erected 136 turbines in 2020, whilst Enercon built 156 and Nordex 56 (compared with 119, 94, and 28 respectively in 2019). With 39 new wind turbines, GE (in fourth place) more than doubled its newly installed capacity compared with the previous year (16). Siemens Gamesa also increased its installed capacity from 5 turbines in 2019 to 13 in 2020, followed by Vensys (13 turbines following a two-year market absence), and eno energy (3 turbines).

Consistent system configurations

The values for the system configurations remain virtually unchanged: the technology used in most systems installed in 2020 is largely the same as in those installed in 2019. At 3.4 megawatts (MW), the average output per turbine remains unchanged,

Fitting the third rotor blade on Prototype 1 of the N163/5.X on the test site at Janneby citizens'wind farm. Photo: Ulrich Mertens

WIND TURBINE TECHNOLOGY

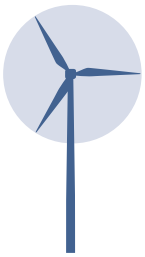
Turbine types frequently put into service in the year 2020

Manufacturer	Turbine type (model)	Quantity
Vestas	V126	43
Enercon	E-115	35
Enercon	E-92	33
Vestas	V136	31
Nordex	N149	24
Enercon	E-126	24
Enercon	E-138	23
Vestas	V112	23
Vestas	V150	21
Nordex	N131	19

Data: BNetzA
Analysis: FA Wind
Source: FA Wind (2021): Analysis of onshore wind energy expansion in the year 2020

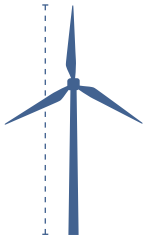
as does the average rotor diameter of 122 metres and the average hub height of 135 metres. The total height of 196 metres is also the same as the 2019 figure. Only the specific surface wind power changed by 1 percent to 298 W/m². According to the Specialist Agency for Onshore Wind Energy (FA Wind), 22 percent of the wind turbines installed in 2019 have a rated output in excess 4 MW (compared with 14 percent in 2019). Slightly over one half of them had a capacity of 3-4 MW (compared with approx. two thirds in 2019) [1].

1— Source: FA Wind (2021): Expansion of onshore wind energy in the year 2020.



122 m
Average rotor blade **diameter** of newly installed turbines.

135 m
The **average hub height** of the newly installed turbines.



196 m
The **average height** of newly installed turbines (including rotor blades).

Manufacturers continue to develop their respective technologies

Vestas continues to rely on the EnVentus platform for its onshore wind turbines and has further developed the previous year's V150-5.6 MW and V162-5.6 MW models to produce the V150-6.0 MW and V162-6.2 MW models, respectively. "The EnVentus platform architecture," as the Danish company explains on their website, "combines state-of-the-art and proven system concepts in a single innovative unit and draws upon technologies and our experience in both the on- and offshore sectors." In addition to their flagship EnVentus platform, Vestas is continuing to rely on the 4 MW platform, which can be installed both on- and offshore.

Enercon continued with its EP5 series in 2021 whereby they significantly enlarged the turbine type with the E-160 EP5 compared to the E-136 EP5 (the first number in each case refers to the rotor diameter). Depending on the design, this turbine type has an output of between 4.6 and 5.56 MW. Production start for their newest model, the E-160 EP5 E3, is scheduled for 2022. New features of this model will include the installation of the transformers and the e-module within the nacelle, which had previously been housed in the turbine tower. In contrast, Enercon made no technical changes to their extremely successful EP3 series, which is designed to operate in weak wind conditions.

Hamburg-based Nordex also continues to rely on its proven Delta4000 platform and their new N163/6.X wind turbine puts Nordex in the 6 MW class. As José Luis Blanco, CEO of the Nordex Group, explains: "Our Delta4000 series systems are based on a uniform technical platform. We can adapt type-specific components, such as rotor blades or gearboxes, to work with different variants thanks to consistent modularisation. Our N163/6.X is another example of how highly efficient, field-proven solutions can be implemented to suit specific geographical regions".

WIND TURBINE TECHNOLOGY

Average turbine configuration

Average configuration	Additional capacity installed in 2020	Change from previous year
Turbine output	3,407 kW	0 %
Rotor diameter	122 m	0 %
Hub height	135 m	0 %
Total height	196 m	0 %
Specific surface performance	298 W/m²	+1 %

Source: Deutsche WindGuard: Current state of onshore wind energy expansion in Germany in the year 2020.

Question #2: "What has been your most important **strategic decision** within the last two years?"

"The consistent implementation of modifications and upgrades, in order to increase the operational capability and gearbox life expectancy, under consideration of technical and economical aspects."

ACHIM OEBEL, General Manager and Shareholder, Multigear GmbH

"An important decision was to bring know-how and decades of experience in sealing technology for large and heavy machine construction into the challenging growth market of wind energy."

DIPL.-ING. DIETMAR WOYCINIUK, CEO, TECHNO-PARTS GmbH

"This was clearly the merger of the wind onshore divisions of EWE Group and Aloys Wobben Foundation (ENERCON). Our joint venture "Alterric" is a leading green power producer in Central Europe. In this way, we are meeting the aspiration of the parent companies to design a climate-neutral energy supply. At the same time, we can create real added value for our partners and the renewable energy future with our joint energy transition expertise."

DR. URBAN KEUSSEN, Managing Director, Alterric

"One of the most important strategic decisions we took in the past two years was to increase our in-house expertise in order to be able to perform all service tasks on Senvion 3X products. We also trained additional site managers, which means that we are now even more strongly positioned to undertake complex projects and major component changes in an even more timely and flexible manner."

SARAH SCHWAB, Managing Director, Connected Wind Services Deutschland GmbH

"The most important thing we have learned over the past few years is that we need to engage at the local level and that it is important to involve local residents and give them more opportunities."

HEINRICH LOHMANN,
Founder and Managing Director of the MLK Group

"2020 and 2021 were shaped by the Covid-19 pandemic. The fact that, despite the adverse conditions, we decided to expand our range of services and strengthen our team – and did so successfully – shows us that we are on the right track, both from an economic and ecological perspective. We believe in the potential of every team member, both within our Green Wind Group and society as a whole."

MARTIN KÜHL UND MANUEL LASSE,
Company founders and owners of the Green Wind Group (Photo: Castagnola)

"To no longer align our growth strategy to geographic markets but to our customer's targets – and thus exploit Ramboll's global presence and broad expertise."

GERHARD BINOTSCH,
Head of Project Development Onshore Wind, Ramboll

"The decision to align wind-turbine.com also in the direction of international new projects in order to accelerate the global energy transition with the help of digital business processes "made and operate in/by Germany."

BERND WEIDMANN, CEO,
wind-turbine.com GmbH

"We are continuously working on the further development of our products for the field of renewable energies. In order to guarantee a high production quality and to offer our customers the flexibility they are used to, we decided early on to establish our own protection and telecontrol department. The accumulated know-how represents a considerable competitive advantage compared to our peers in the market."

JULIAN VETTER, CEO,
Isoblock Schaltanlagen GmbH & Co. KG

THE LABOUR MARKET

Mixed feelings in the wind industry despite stronger expansion figures

The expansion of wind energy in Germany is regaining momentum, resulting in a fundamentally more positive outlook within the wind energy sector. A domestic hydrogen industry also has enormous potential in terms of value creation and job creation.

The weak growth over the past few years continues to weigh heavily on the German wind energy sector. According to the Bundesverband WindEnergie (BWE), whilst the wind industry employed 160,200 people in 2016 (133,000 onshore and 27,000 offshore), this number had already fallen to 135,100 in 2017 (112,100 onshore and 23,000 offshore). The Federal Statistical Office has not published any additional official figures since then, but the BWE estimates that over 40,000 jobs have been lost in the sector since the official 2017 figures, which is the result of years of declining installations. The introduction of tenders in 2017 has also introduced enormous cost and competitive pressures within the market.

Vestas, for example, announced the closure of its wind turbine plant in Lauchhammer, Brandenburg, in early October and production is expected to cease there by the end of 2021. There are around 460 people employed at the site. According to Vestas, they will be able to meet their customers' future needs with the aid of supplies from other rotor blade factories around the world. In addition to the Lauchhammer site, Vestas is also planning to discontinue production operations in

The tower of Nateln: Vensys 136, 3.5 MW. Photo: Ulrich Mertens

BWE

German Wind Energy Association

Bild: iStock/CharlieChesvick

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Job Fair Renewable Energies 30-06-2022

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Information and registration: **bwe-seminare.de**

Organised and run by:

BWE
BWE-Service GmbH

Industrial climbers at Hohenselchow wind farm. Photo: Paul Langrock

Esbjerg, Denmark, and Viveiro, Spain. Vestas had already cut about 500 rotor blade production jobs over the past few years.

The mood within the wind energy sector brightens

According to a survey published by the IG Metall trade union in September 2021, 60 percent of the wind sector works councils surveyed are expecting a positive market development for Germany. The works councils are expecting to see growth in the offshore sector and in the international markets in particular, especially in Europe and North America. For comparison: 74.1 percent of those questioned in the last survey in 2019 still feared a negative business development for wind sector companies. As Daniel Friedrich, trade unionist and District Manager of IG Metall Küste, said in the autumn of 2021: "Following some significant setbacks in recent years, the mood is brightening within the wind energy sector. This is due to the climate protection plans drawn up by the new German government and the European Union, which justify hopes for a significant expansion of wind energy. However," he continues, "we are far from seeing the "green jobs miracle, which was promised many times during the federal election campaign. Politicians and companies must do more to achieve this and to boost value creation in Germany."

Manufacturers fear a negative development, service providers are hoping for positive developments

Nevertheless, one in four of the works councils surveyed is expecting a decline in orders, despite the recovering expansion situation and the overall positive mood within the industry and nearly 20 per cent of them even fear staff cuts. Rotor blade, tower, and cable manufacturers in particular are sceptical about future developments. Yet, according to the survey, developments within the service sector, which according to the trade union, has become an important pillar within the industry, are positive. To bring about a real upswing within the wind energy sector, the union is calling for a legally mandated wind power expansion rate of 5 gigawatts (GW) per annum onshore and 3 GW offshore. According to IG Metall board member Wolfgang Lemb, the intention is to install a total of 100 GW of onshore and 50 GW of offshore capacity by 2030. Approval procedures would also have to be drastically expedited. "We need a continuous expansion and

Prototype 1 of the N163/5.X at the test site of Janneby citizens' wind farm. Fitting the hydraulic unit that will correctly position the hub when fitting the rotor blades. Photo: Ulrich Mertens

reliable framework conditions to secure the German wind energy sector," says Lemb in view of the current expansion situation; "The stop-and-go policy of the past few years must finally come to an end".

Hydrogen holds enormous potential for the wind industry

Hydrogen also offers huge opportunities for the German wind energy sector. According to a study carried out by the Wuppertal Institute and DIW Econ in 2021, provided that the hydrogen production facilities needed to meet the targets were based in Germany, achieving the German and European climate targets by 2050 could create up to 30 billion euro in additional added value and up to 800,000 jobs. What the study, which was commissioned by the German Renewable Energy Federation (BEE) and the NRW Renewable Energy Association (LEE NRW), also shows is that the expansion of renewable energies and the use of surplus electricity generation in hydrogen production would create certain synergies. The study found that, compared with importing hydrogen, electricity from onshore wind turbines in particular offers a competitive option for hydrogen production. As Dr. Simone Peter, President of the BEE, explains: "Thus far, all we have done in Germany with our National Hydrogen Strategy is to commit to the consumption of green hydrogen on a major scale. We now need an agenda geared towards the exclusive promotion of green hydrogen, which we should then also produce here!" The National Hydrogen Strategy, which the German government presented in summer 2020, was the starting point for the study. Despite the slow increase in the expansion figures, the situation in the labour market for the German wind industry remains difficult, albeit the sector is more optimistic about the future than it has been in recent years. The huge uncertainty that arose in the wake of the Covid-19 pandemic last year is gradually subsiding, but hurdles – particularly of a political nature – still remain, which are hindering a major upswing.

THE WETIX MOOD BAROMETER

A positive outlook for the global wind power sector

Since 2018, the WindEnergy trend:index (WEtix) has become established as an important mood barometer within the wind energy sector. Over 8500 stakeholders have already taken part in the biannual survey conducted by the wind:research trend and market research institute in collaboration with WindEnergy Hamburg.

Since 2018, the WindEnergy trend:**index** (Wetix) mood barometer survey has been conducted every six months by WindEnergy Hamburg, the world's leading trade fair for on- and offshore wind energy, in collaboration with wind:**research,** the leading market research institute for the wind energy sector. The results are analysed and interpretated by wind:**research** based on expertise gained in various national and international projects. WEtix asks the participants for their assessment of the current and future on- and offshore wind industry market situation as well as the potential of new technologies and digitalisation. Whilst the mood barometer asks the same questions in each survey round, these are supplemented by additional questions as required based on ongoing market observations, for example in relation to hydrogen.

The wind energy barometer is highly representative

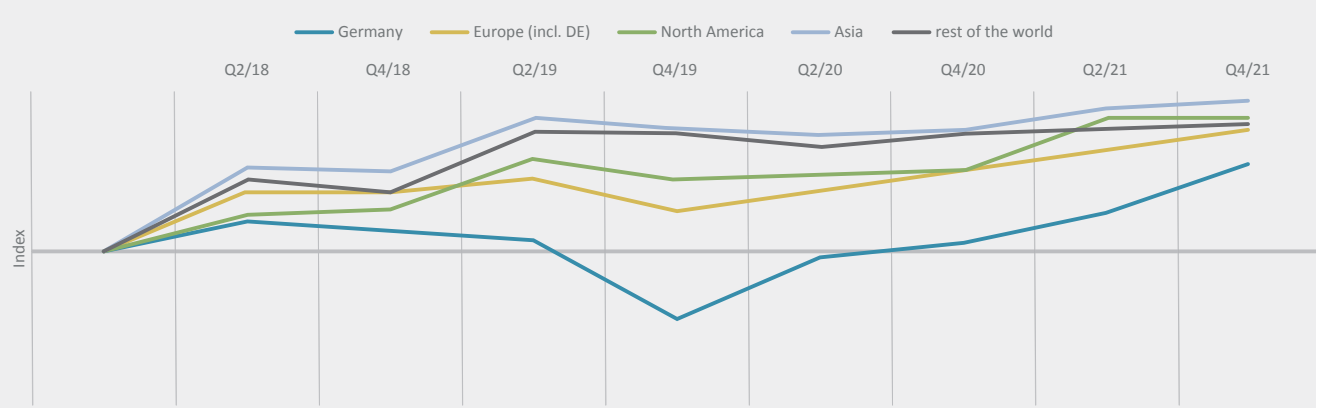
Both wind:**research** and WindEnergy Hamburg address market stakeholders via their vast networks within the industry. WindEnergy Hamburg's network currently comprises 1400 exhibitors and 35,000 visitors from over 100 countries. During the eight survey periods, over 8500 industry representatives have already taken part in WEtix' online surveys, which

The mood barometer in detail

Survey period	Visitors	Survey
1 **Q2 2018** (16.03. – 19.04.2018)	1,952	1,187
2 **Q4 2018** (25.09. – 09.11.2018)	2,414	1,655
3 **Q2 2019** (02.04. – 13.05.2019)	2,299	1,254
4 **Q4 2019** (23.10. – 30.11.2019)	1,582	1,026
5 **Q2 2020** (17.03. – 29.04.2020)	1,867	1,156
6 **Q4 2020** (27.08. – 16.10.2020)	2,517	1,277
7 **Q2 2021** (23.03. – 04.05.2021)	1,384	501
8 **Q4 2021** (09.09. – 28.10.2021)	1,459	502
Total	**15,474**	**8,558**

Source: WindEnergy trend:index (WEtix)

How do you rate the global market for the ***onshore*** wind industry **in two years' time?**



How do you rate the global market for the ***offshore*** wind industry **in two years' time?**

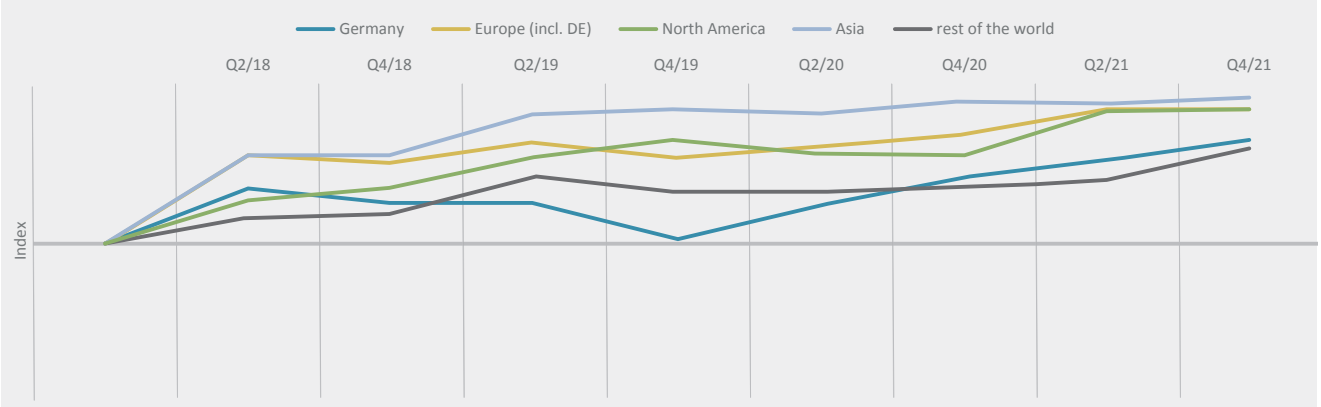


Figure 1: Two-year projected forecast of the global market for the onshore and offshore wind industry

has enabled WEtix to establish themselves as an important wind industry mood barometer during the past three years, a fact which is also reflected in media coverage of WEtix; both national and international newspapers, trade journals or online media report the results and discuss their significance for the industry's further development.

The surveys are characterised by a high degree of representativeness: the responses are spread broadly across different countries and represent the respective market sizes also in terms of the on- and offshore split. On average, more than 70 % and over 95 % of the market participants surveyed are active in the German and European markets respectively. A third of the respondents also focus on the Asian and North American markets respectively.

All regions achieve record values in the assessment of the future market situation

The latest WEtix compiled in the fourth quarter of 2021 reveals a positive mood within the global wind energy sector. The current onshore wind sector market situation for Europe, North America, Asia, and the rest of the world is rated as good. However, the mood is slightly more subdued than it was in the spring: all regions have been forced to accept slight losses compared to the last survey. The current offshore wind sector market situation is not dissimilar, and it too continues to be assessed positively around the world, although the results from all regions, apart from the rest of the world, were slightly worse than in the seventh WEtix.

On the other hand, the two-year outlook for the wind industry is extremely positive: every region around the world received record ratings in relation to the question of the onshore wind energy market situation. The future of the offshore wind energy market is also viewed in extremely optimistic terms: Asia, Europe, and North America all continue to be almost equally close to the optimum. The rest of the world is also catching up and could close the gap to the top three positions.

This general trend – i.e., stagnating or slightly declining ratings for the current market situation and high expectations for the future of the wind power sector – also applies in Germany. The mood within the German wind power sector is currently slightly muted – the on- and offshore sectors are achieving ratings, which are (only) just in the negative and positive ranges respectively, but according to the long-term market situation assessment, Germany could catch up with the global regions and achieve some extremely positive results.

Most pundits are expecting the Covid-19 pandemic to have a neutral or even a positive influence

The Covid-19 crisis does not seem to have had much of an effect on the good mood within the wind industry: just 20 % of the survey respondents fear negative impacts, whereas all other survey participants are either expecting no impact at all or are feeling positive to very positive.
Green hydrogen continues to be considered highly important: over 55 % of the respondents estimated the probability as high to very high that production of green hydrogen will play a major role for wind energy over the next three years.

Assessments about the reach of consolidation processes, however, have remained virtually unchanged since the last survey and ratings for both the on- and offshore sectors remain at the same high level as they have done in recent years. High expectations about the optimisation potential of digitalisation also continue to remain unchanged, whereby the respective expectations for the offshore sector are higher, as they have been since 2018. The general mood regarding potential savings through new technologies also remains in the medium to high range, with more or less unchanged values. Potential savings within the offshore wind sector have consistently been estimated to be significantly higher than those for the onshore sector ever since the launch of the WEtix.

Information about WEtix and wind:research can be found at www.windresearch.de.

In your view, what is the likelihood that ***green hydrogen*** production will play a significant role for the wind energy sector **in the next three years?**

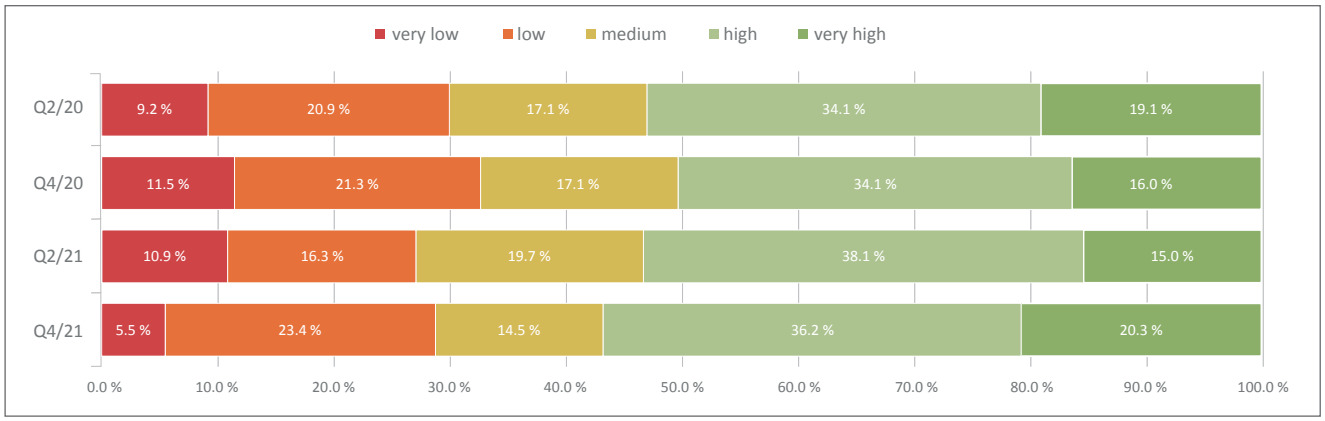


Figure 2: The role of green hydrogen production for the wind energy sector in the next three years

Wind farm near Petkus with General Electric turbines in and on the edge of the forest.
Photo: Paul Langrock

WIND IN THE WOODS

Forest and wind energy

Wind energy constitutes a key building block in the energy transition and is of crucial importance to climate protection. That is why Germany's new federal government has described the further expansion of wind energy as an urgent necessity in terms of achieving the national climate and environmental goals. Are forestry areas also suitable as wind turbine sites?

Recent studies, such as those conducted by the Helmholtz Association of German Research Centres, have concluded that only one in five trees in Germany is actually healthy. Increasingly frequent droughts and increasing temperatures are stressing German forests, which makes the energy transition and climate protection all the more necessary and makes wind energy into an instrument with which we can protect our forests.

Given their rapidly deteriorating condition, experts are calling for a better preparation of forests to deal with climate change, which would include reforestation with location-appropriate tree species and breaking up and replacing monocultures with more resilient mixed forests. Yet this presents forest owners with some major challenges. The financial resources and personnel needed to repair damaged forests and promote forest conversion are often lacking. The wind energy sector could be an important partner in this context. Whilst it is true that developing wind turbine sites in forests requires small-scale clearances, the environmental compensation that is required for this could contribute to the conversion of existing forests to more sustainable ones.

The numerous positive effects of wind energy infrastructure in commercial forests

Placing wind energy infrastructure in forests has other positive effects. Thanks to modern technology the wind potential above the forest canopy can be used efficiently. There is also very little conflict of use on forestry land. Forests act as shields to residential areas as they are largely uninhabited and often some distance from settlements. The tall trees not only have a shading effect but also dampen noise. At the same time, the essential functions of a forest, such as forest ecology, the forestry industry, recreation, and hunting, can continue unaltered.

Not "wind in the woods", but "wind in the forest"

What is colloquially referred to as "wind in the woods" could be better described as "wind energy in commercial forests", because forests comprising particularly valuable deciduous and mixed forests or protected areas of particularly high ecological value for humans and animals are excluded from use for wind energy. However, areas currently dedicated to commercial forestry should be taken into account

Enertrag's Rietz wind farm near Treuenbrietzen. Photo: Silke Reents

when assessing their suitability as wind power sites, particularly in federal states with a high proportion of forested areas and elevated, windy terrain. Constructing wind turbines in forestry areas does not always require tree clearances. Wind energy infrastructure can be installed in areas that have already been clear-cut to control pests or repair drought damage as well as on former military sites in forested areas, which minimises the impact on tree cover.

There are different types of forest each of which is subject to different protection categories and uses. A third of Germany's surface area is covered with forest and around 23.6 percent of the forested area is categorised as cultural or culturally influenced. Over 40 percent is classed as being in a semi-natural condition [1]. Those areas used exclusively for forestry may be suitable for wind energy infrastructure, which, in this context, can represent a complementary and sustainable use of natural resources.

1—Bundeswaldagentur 2012 https://bwi.info/

▲ Enertrag's Rietz wind farm near Treuenbrietzen. Photo: Silke Reents ▼

Forestry land is already being used for wind energy production

In Germany, 2086 wind turbines, or 7.5 percent of the total number of wind turbines, are currently situated on commercial forestry land and are generating slightly over 10 percent of the country's total installed wind power output [2]. However, forestry land can only be made available for wind energy production when given the corresponding designations, which is subject to stringent legal and planning requirements. The state authorities are responsible for approving wind energy projects. The use of forestry sites for wind energy generation is currently permitted in seven federal states, namely Baden-Württemberg, Bavaria, Brandenburg, Hesse, Rhineland-Palatinate, Saarland, and North Rhine-Westphalia, although the use of forestry land in the latter is only permitted if the need is proven and no alternative areas are available outside of the forestry land.

The expansion of wind energy in forestry areas has increased strongly over the past decade: 89 percent of all wind turbines currently located on forestry land have been erected since 2010. The trend towards "wind in the forest" is particularly noticeable in southern Germany. In late 2020 the majority of wind turbines were located on forestry land in Rhineland-Palatinate (467), followed by Hesse (456), Baden-Württemberg (334), Brandenburg (327), and Bavaria (297). Sixty-six new wind turbines with a total capacity of 225 MW were erected in forestry areas throughout Germany in 2020. The largest increase in the number of wind turbines installed on forestry land in Germany was recorded in 2016 when 1016 MW were installed [3].

2—FA Wind (2021) Entwicklung der Windenergie im Wald, 6th edition, 2021 https://www.fachagentur-windenergie.de/fileadmin/files/Windenergie_im_Wald/FA-Wind_Analyse_Wind_im_Wald_6Auflage_2021.pdf

3—FA Wind (2021)

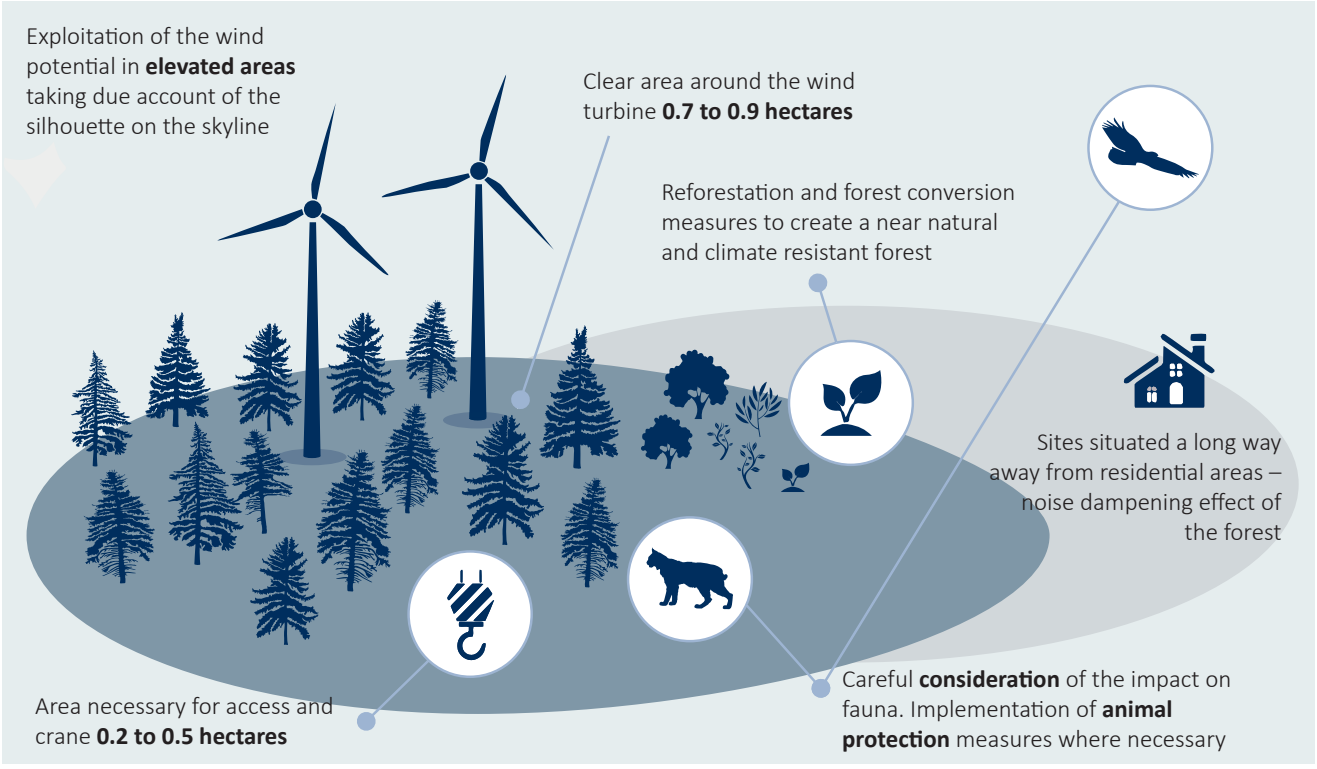


Figure 1: Wind use on forestry land, e.g., in pine forests and clear-cut areas (BWE 2018)

Question #3: "What has been the most important **innovation** in your industry in the last two years and why?"

"Through our cooperation with a well-known vehicle manufacturer HAWART has developed, constructed and manufactured a hydraulic lifting adapter. This new product is a suitable component for transporting large and very long rotor blades by road. Our lifting adapter connects the vehicle to the flange area of the rotor blade. In combination with the self-steering trailer made by DOLL rotor blades are safely transported by land. As an additional feature, a so-called tandem frame was developed on the trailer that carries the rotor blade in two tip frames. We are pleased that several customers have now used this transportation concept."

DIPL. ING. WILLY B. KÖRNER, CEO,
HAWART Sondermaschinenbau GmbH

"The failsafe operation of wind turbines requires knowledge of all construction activities within the wind farm itself and areas containing cable connections. Wind farm operators benefit from the high number of enquiries via the cross-sectoral central BIL portal."

JENS FOCKE, Board of Directors BIL eG,
BIL eG

"The establishment of the Energy & Power Solutions business unit by Rittal sends a clear message to the growing energy sector. Together with our sister company Eplan, we are constantly developing viable, efficient solutions in cooperation with our customers. In this context, cloud-based options also play an important role. This is because the key to greater productivity in enclosure construction lies in digital integration and data consistency along the whole value chain. "

FRANZISKA HAIN, Vertical Market Manager Energy,
Rittal GmbH & Co. KG

"Market and system integration via virtual power stations is the foundation for the future expansion of renewable energies and sector coupling."

JOSEF WERUM,
Managing Partner and founder,
in.power GmbH

"Digital business processes without media discontinuity are essential for planning, constructing and operating wind turbines. Our portal solutions are an important building block for the rapid and secure expansion and operation of wind energy in Germany. "

JÜRGEN BESLER, Managing Director,
infrest – Infrastruktur eStrasse GmbH

"For our company, the most important innovation in the last two years was the continuous development of the SPMT (self-propelled modular transporter) in combination with the bladelifter. This allows us a transportation of the blades through forests or small villages without the need to fell trees or widen roads. It results in a significant cost saving and at the same time represents a more sustainable solution."

BIRGIT STEIL, Managing Director,
STEIL KRANARBEITEN GMBH & CO. KG

"We can use storage units to refine the wind power, thus facilitating and improving grid integration. We offer operators attractive financing options through PPA contracts."

CHRISTIAN HINSCH,
Head of Corporate Communications,
juwi AG

"One of the most important innovations in the field of wind turbine inspection is certainly the patented TOPseven method for contactless drone-based lightning protection measurement. Validated and verified by TÜV SÜD, our technology can be used as an alternative test method (in accordance with the BWE guideline) for testing the conductor in the rotor blade."

FLORIAN ZIMMER, Head of Project Management,
TOPseven

GLOBAL MARKET

The wind energy sector defies Covid-19 – a record year for wind energy expansion

2020 marked a high point for the wind industry in two respects: never before has more wind power capacity been installed around the world and the industry proved to be extremely resistant to the Covid-19 pandemic. And finally, more wind turbines were also installed in Europe. But this is not enough to meet the EU's climate targets.

Whilst the expansion of onshore wind energy in Germany slowly picked up again in 2020, the international umbrella organisation Global Wind Energy Council (GWEC) described the year as "a record year for the wind industry". With 90.3 gigawatts (GW) installed on- and offshore around the world, 2020 was by far the best year ever in terms of expansion in the history of wind energy. The proportion of installed onshore wind energy production capacity in 2020 was 86.9 GW, whilst over 6.1 GW was installed offshore. 53 percent more capacity was installed in 2020 than in the previous year.

Last year, the Asia-Pacific region as well as North and Central America together accounted for over 85 percent of new onshore installations worldwide according to the GWEC's Global Wind Report. Whilst the industry was impacted by Covid-19, effects were short lived according to the GWEC report: "Whereas auctions had to be postponed or cancelled in the first half of 2020 due to COVID-19, the sector rebounded with a vengeance in the second half of the year as key and emerging wind markets began to overcome the effects of the pandemic."

Europe falls behind North America – Germany only in 5th place in global expansion

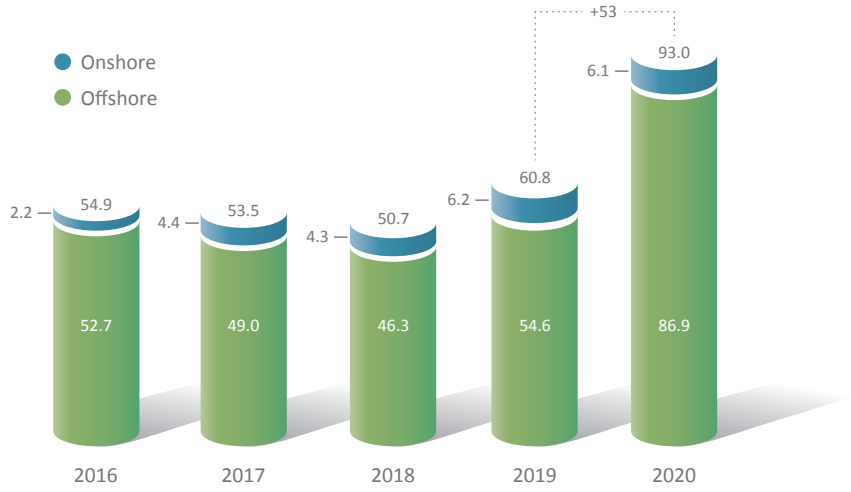
At the global level, Germany fell back to fifth place in 2020 behind China, the USA, Brazil, and the Netherlands. Some 81 percent of the total new (on- and offshore) installations were erected by the so-called "top five". The situation has also changed with regard to the regions. The Asia-Pacific region remains unchallenged in first place thanks to the "explosive growth in China" (GWEC Report 2021) with around 60 percent of all new installations. On the other hand, North America (18 percent) has relegated the previous runner-up Europe (16 percent) to third place due, among other things, to the low increase in wind energy expansion in Germany.

The GWEC is expecting a total global capacity increase of 469 GW over the next five years but predicts that it will not be possible to maintain the record levels of 2020 in 2021. It is working on the assumption that capacity will increase by 87.5 GW comprising of 38.5 GW in Asia, 17.1 GW in North America and 15.9 GW in Europe. According to Ben Backwell, CEO of the GWEC, 2020 was a milestone for the entire industry: "This year will not only be remembered within the wind sector as the year of the biggest expansion ever, but also as the year in which a real breakthrough in the energy transition took place

▲ The currently largest citizens' wind farm with 34 turbines in Zeeland Province, the Netherlands. Photo: Enercon

▼ The turbines in the McLean Mountain Wind Farm are part of the Northland Power Project, Canada. Photo: GE Energy/John Hryniuk

New installations



and a new, expedited expansion path was inaugurated as various countries and regions began to implement their plans to achieve net zero emissions in earnest."

In terms of total new (on- and offshore) installations in 2020, Germany is also falling behind in a European comparison taking second place with 1640 MW behind the Netherlands (1979 MW), according to the WindEurope Report 2021. In Europe as a whole, a total of 14.7 GW of wind power was installed in 2020 (11.8 GW onshore and 2.9 GW offshore). This corresponds to 6 percent less new capacity than in 2019 when a total of 15.4 GW

Scioto Ridge wind farm was erected in Ohio with a capacity of 250 MW and commissioned in June 2021. Photo: RWE Renewables

Wind energy in China.
Photo: Minyang Smart Energy

Question #4: "In which **foreign markets** is your company particularly active and why?"

"For us, diversification is a crucial aspect. On the one hand, we rely on our long established, stable markets such as France, Finland, Poland and Croatia. On the other hand, that same stability allows us to gain a foothold in new existing and growth markets. This is how we continue to expand our portfolio and grow sustainably."

HENNING RÜPKE, Managing Director International, wpd windmanager GmbH & Co. KG

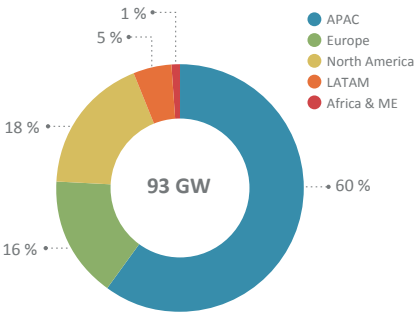
"We are constantly expanding our foreign activities, rexcently to the US and Taiwan, often hand in hand with the customer. Always taking into account the economic meaning and qualitative feasibility."

MATTHIAS BRANDT, Director, Deutsche Windtechnik AG

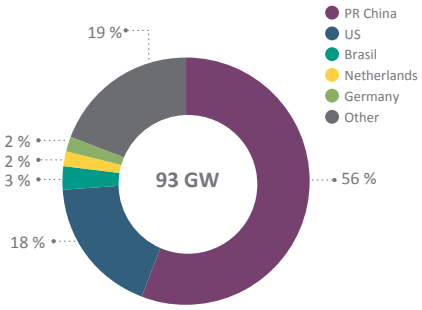
was installed. According to WindEurope, wind energy in Europe covered 15 percent (compared with 14 percent in 2019) of European electricity consumption.

The high level of growth in global wind energy continues to represent an opportunity for German companies. Although the expansion situation in Germany is currently improving, wind turbine manufacturers and others have been focusing increasingly on international markets for some time now. German project developers and service companies are also working successfully abroad.

New wind power capacity in 2020 by region
(Per cent)



New wind power capacity in 2020 and share of top five markets
(Per cent)



Graphic source: GWEC Global Wind Report 2021

Enercon E-82 at Tramandai wind farm in Brazil. Photo: Enercon/Alexander Saloga

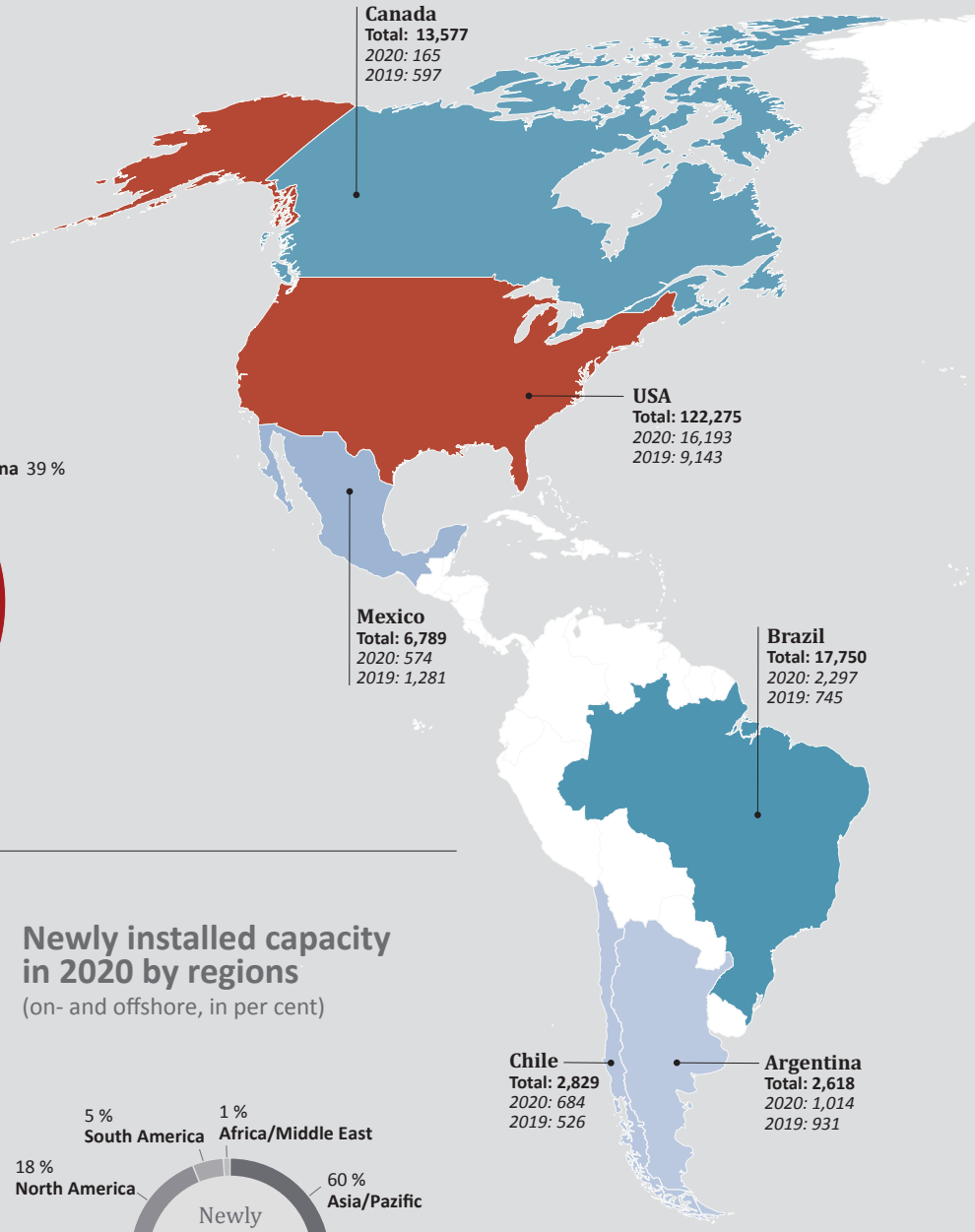
"France and Ukraine – two large and very different countries with high electricity needs or a lot of catching up to do in terms of renewable energies."

HEINER RÖGER, CEO,
NOTUS energy

"One of our most important international markets is North America, which has the greatest number of wind turbines globally except for China and whose market is very open to new technologies and innovation."

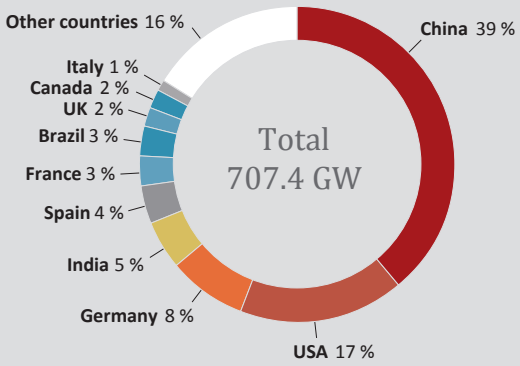
STEFAN BILL, DIPL.-ING., Managing Director,
REWITEC GmbH

Global installed capacity (onshore wind)



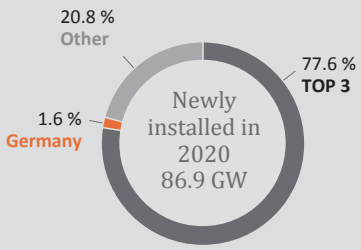
Global total installed capacity (2020)

(onshore, in per cent)



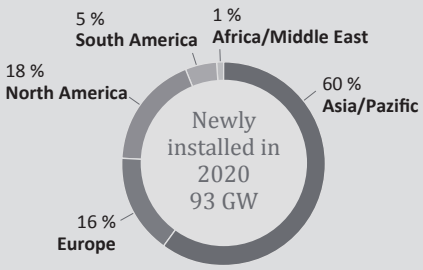
Share of the top 3 in the newly installed capacity (2020)

(onshore, in per cent)

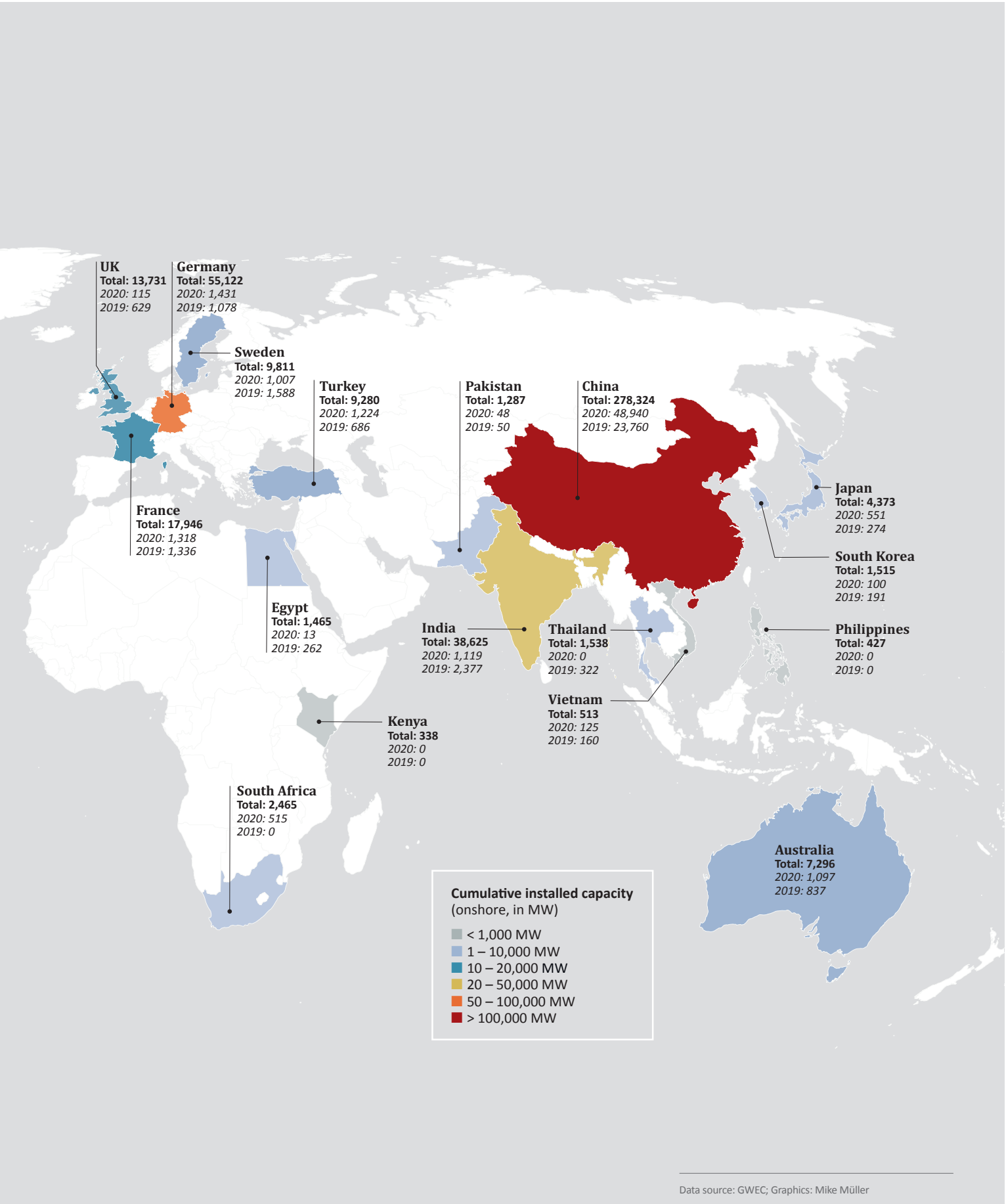


Newly installed capacity in 2020 by regions

(on- and offshore, in per cent)



* China, USA, Brazil



Data source: GWEC; Graphics: Mike Müller

"We need to forge ahead with electrification"

AN INTERVIEW WITH
GILES DICKSON
CEO WINDEUROPE

Mr. Dickson, what is the current situation in Europe in terms of expanding the wind energy infrastructure?

Not enough new wind turbines are being built in Europe to meet the targets of the Green Deal or the Fit-for-55 package. Our 5-year forecast tells us that 15 GW of new capacity will be added each year between 2021 and 2025, but we'll need 30 GW per annum to achieve the 55 % emissions reduction that has been targeted for 2030. Licensing is still the main problem and Germany is not an isolated case in this respect: other countries are also struggling to approve new projects. That's why we're following the recent increase in approvals as well as the over-subscription of the September tenders in Germany with great interest. Another important signal are the licensing simplification measures announced by the new German federal government. In 2022, the European Commission will also be tabling its own recommendations for speeding up licensing procedures in the member states. The confidence that the international financial markets have shown in the EU is another positive aspect. Notwithstanding the Covid-19 pandemic, the EU invested over €43 billion in 20 GW of new wind power capacity in 2020.

What is the current situation in terms of expanding offshore wind power?

Some 26 billion euro were invested in the offshore wind energy sector in 2020, although given the current expansion targets, even that was not enough because Germany's expansion efforts are losing momentum. When it comes to offshore wind energy, Germany is in danger of falling behind other countries. The one thing that is clear is that the majority of new wind farms will be built onshore: onshore wind power plants will account for 70 % of new installations over the next five years. Nevertheless, there will be a sharp increase in the proportion of offshore wind energy production. The EU's current offshore wind power output is 15 GW, which is expected to rise to up to 300 GW by 2050, so we really need to make the necessary investments in the relevant infrastructure, especially in ports, which are a crucial link in the supply and logistics chain, which is needed for the installation, assembly, operation, and maintenance of offshore wind farms. According to our estimates, the EU will have to invest some 6.5 billion euro in port infrastructure by 2030.

> "What we need in the long term is an electricity market designed to cater for an energy system that includes an extremely high share of renewable energy sources."

How would you rate the expansion situation in terms of the EU's "Fit for 55" package of measures, which is designed to achieve a 55 percent reduction in CO_2 emissions in the EU by 2030? Is Europe on the right track?

The European Commission's Fit-for-55 package represents a far-reaching raft of legislation designed to bring about a 55 % reduction in greenhouse gas emissions in the EU by 2030. The targeted share of renewable energies as a percentage of total energy consumption was increased from formerly 32 % to 40 % to achieve this reduction. What this means in specific terms is that the installed capacity of wind power in the EU will be expanded to 451 GW by 2030, which requires an annual expansion of 30 GW. At that rate, wind energy will become the most important source of electricity in the EU by 2027 and the EU Commission wants to achieve 1000 GW of onshore wind power and 300 GW of offshore wind power by 2050.

What are the current most important framework conditions at EU level?

The EU has set itself a clear target, which is to achieve climate neutrality by 2050. The EU Commission has declared that the share of wind energy in electricity generation within the EU needs to increase from the current 16 % to 50 % by 2050 and, significantly, has

> "The consistent continuation of the energy transition is now industrial policy."

announced improvements in the licensing situation for 2022 in order to achieve this. To be able to integrate these vast renewable energy loads into the system, annual investments in electricity grids and connectors will have to be doubled. We need to reinforce local supply chains to ensure that the envisaged 1300 GW of electricity generated by wind turbines within the EU by 2050 will continue to be produced in Europe. We need to promote electrification through such things as batteries, storage, EV charging infrastructure, and heat pumps. What we need in the long term is an electricity market designed to cater for an energy system that includes an extremely high share of renewable energy sources.

What are you expecting from the new German government?

Germany's early and determined commitment to wind energy has made us a world leader in the field and our investments have helped to make wind power one of the cheapest forms of energy production throughout the EU. The new German government will shore up our leadership role in this field and promote the market acceptance of new electrification and renewable hydrogen technologies.

This no longer about green ideology: the consistent continuation of the energy transition is now industrial policy. It is true that companies that consume high amounts of electricity used to be afraid that renewable energies were too expensive and that their volatility could endanger the entire electricity grid. But that has changed radically. The demand for cheap and clean wind energy is increasing in all sectors of the German economy. The availability of renewable energies has become a decisive locational advantage, not least because of the increasing prices in the EU emissions trading and electricity markets. This is shown by the surge in renewable PPAs throughout the EU.

The initial results of the exploratory discussions to form a new government coalition give me hope. The most important problems have been identified: approval procedures need to be expedited, 2 % of national territory is to be made available for wind power production, and towns and cities will benefit even more from wind energy production. What is still missing is a committed repowering strategy. But all parties to the exploratory talks seem to agree that we need to do more to protect the climate and that this will only be possible with more wind power.

The annual "Electric City 2021" event was held in November this year and all the participants are planning to meet again in Bilbao in April 2022. What sets these two events apart?

The aim for Electric City 2021 was to broaden our view: a fundamental change is currently taking place in the EU energy system, which is all driven by electrification. Some 25 % of the EU's energy system is currently electrified. The EU Commission's aim is to achieve 75 % electrification by 2050 at which point most industries, including the transport, heat, and industrial sectors that still depend on fossil fuels, will be powered by renewable energies. It is these new stakeholders with whom we wanted to engage at the Electric City 2021 event. In Bilbao, we will be placing greater emphasis on the economic effects of wind energy for people and communities. And, after the Covid 19 pandemic, we are, of course, really looking forward to the evening events, delegation visits, and networking opportunities: the entire EU wind industry will finally be able to get together again in one place!

> "By 2050, the EU Commission wants to achieve 1000 GW of onshore wind and 300 GW of offshore wind."

Thank you very much for the interview.

OFFSHORE

No expansion in the first half of 2021

No offshore installations were erected in German seas in the first half of 2021 for the first time in a decade. According to the wind industry, however, this lack of expansion is the result of political decisions rather than any lack of interest on the part of investors or a lack of drive on the part of the industry.

There are essentially no statistics relating to offshore wind energy in 2021, because not a single offshore wind turbine was erected in the first half of the year or in the following months. Nevertheless, the German Wind Energy Association (BWE) and other industry representatives used the otherwise traditional look at the expansion figures for the first half of 2021 to analyse the current German offshore wind energy situation and to make certain demands on the politicians.

According to statements made by the BWE, BWO, VDMA, WAB and the Offshore Wind Energy Foundation in relation to the offshore wind energy situation and the offshore expansion figures for the first half of 2021: “Offshore wind energy is reliable and competitive and is a significant economic driver that will be crucial when it comes to achieving Germany's recently increased climate targets. However, a number of market participants have already either left the offshore wind sector or relocated from Germany to other countries. This circumstance,” they point out, “can be attributed to increasing international demands for a share of the value created in national markets in addition to the lack of prospects for offshore wind construction activities in Germany this year.”

Industry representatives call for higher expansion targets and better framework conditions

According to the associations, Germany is the technology leader in the offshore wind power sector. However, they point out, it will be necessary to “reignite” expansion to maintain this lead and to secure domestic value creation and employment within the offshore wind power sector in the future. According to the sector organisations, the industry is expecting an increased to very strong expansion rate as of the middle and especially towards the end of the decade. It will be imperative to counteract this imbalance in a timely manner.

Given the lack of expansion in the first half of 2021, the associations are calling on policymakers to exploit the short-term potential to reverse the negative trend in value creation and employment through construction projects, qualification measures, and a targeted export and

Wikinger offshore wind farm in the Baltic Sea.
Photo: Paul Langrock

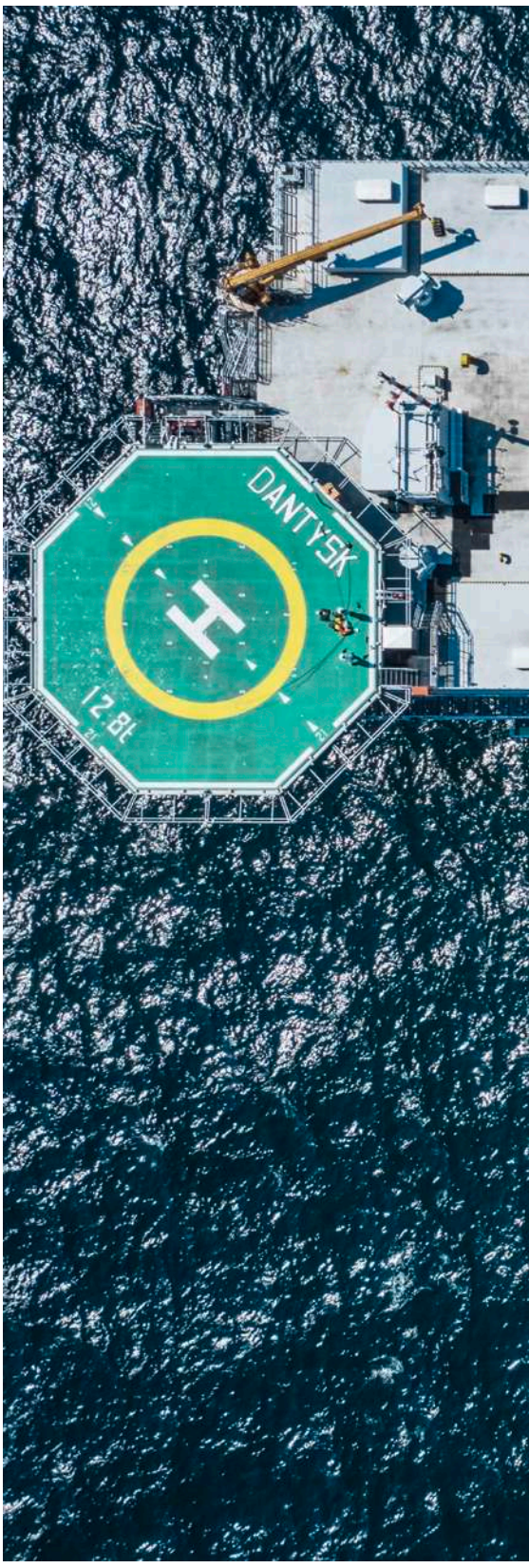
research campaign. The objective is to secure jobs and to place the nationwide offshore wind industry's expertise in the service of measures designed to meet future challenges such as the development of a "green" hydrogen economy.

A robust offshore wind energy sector will be required to meet new climate targets

Given the climate targets set by the outgoing German government, the associations are calling for adjustments to the German offshore wind energy sector expansion targets for 2030 and 2040. Expert reports by the Berlin-based energy industry consultancy enervis and the Fraunhofer Institute for Solar Energy Systems (Fraunhofer ISE) confirm that it is possible to achieve capacities of well over 50 gigawatts (GW), which, according to the associations, are not only feasible but also urgently needed. Industry representatives see an urgent need for political action, especially in view of the planned role of offshore wind energy in the production of green hydrogen: "To achieve the expansion targets for offshore wind power that were formulated last year in combination with the green hydrogen requirements by 2040, it is imperative to designate additional sites in the North and Baltic Seas as soon as possible. The economic production of green hydrogen at those offshore sites that have so far been earmarked for this purpose but are not yet connected to the shore by cable or pipeline is not possible and they will not be able to contribute towards achieving the German hydrogen target of 5 GW by 2030".

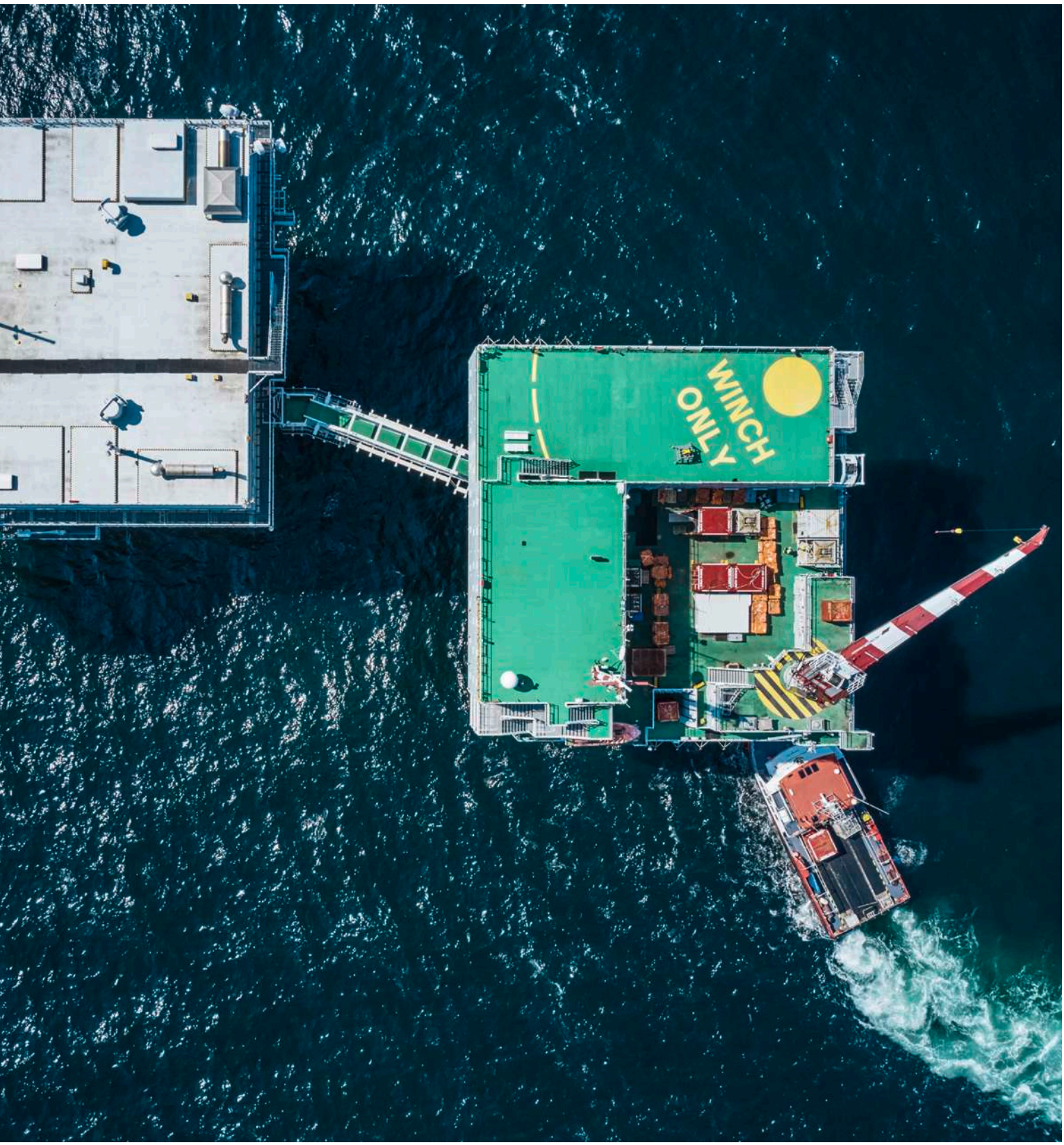
Policy makers must lay the market-economy foundations for the production of green hydrogen

Implementing the German Federal Ministry for Economic Affairs and Energy's National Hydrogen Strategy, which was adopted in 2020, will require a market-based foundation for green hydrogen say the associations. Politicians must also call for this at the European level. "The framework for exempting hydrogen-based green electricity from the EEG surcharge is a good approach to this". A binding volume target for the production of green hydrogen from offshore wind energy and reliable procurement mechanisms are also needed. In addition, the associations explained, the German government's new goal of achieving climate neutrality by 2045 should be underpinned by specific expansion targets for the offshore wind power and green hydrogen sectors. In this context, they are calling for the expansion of offshore wind energy to 300 GW by 2050.

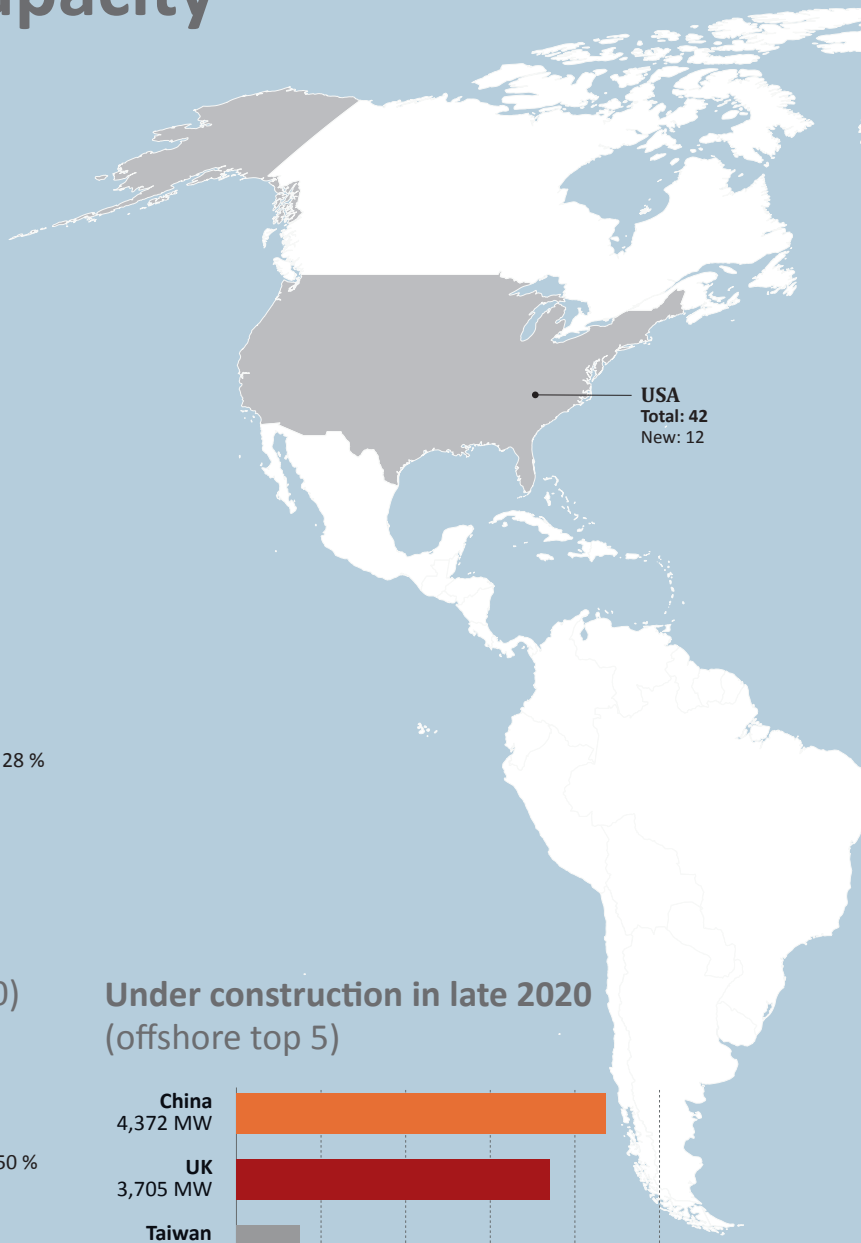


Offshore Accommodation Platform (OAP) and offshore transformer station at Dan Tysk offshore wind farm in the North Sea. Photo: Jan Oelker

Hydrogen platform. Photo: Tractebel

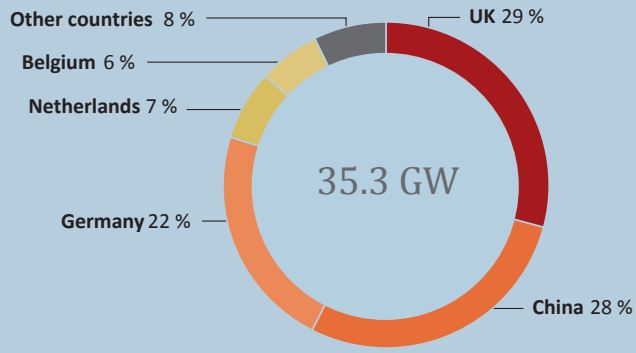

WINCH
ONLY

Global installed capacity (offshore wind)



Global total installed capacity (2020)

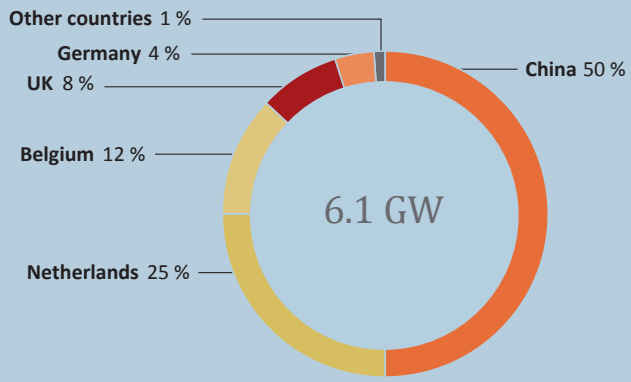
(offshore, in per cent)



Source: GWEC

Newly installed capacity globally (2020)

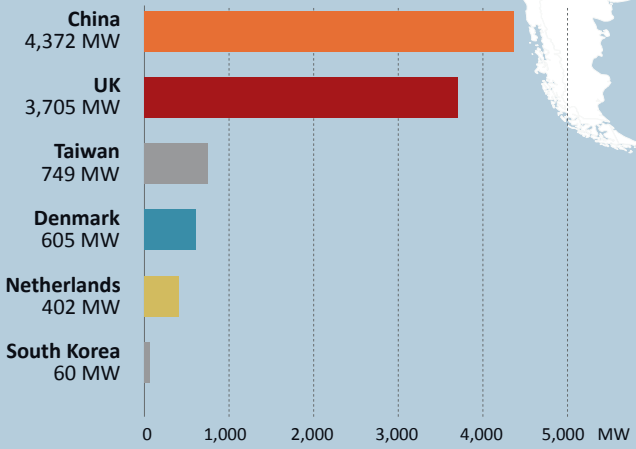
(offshore, in per cent)



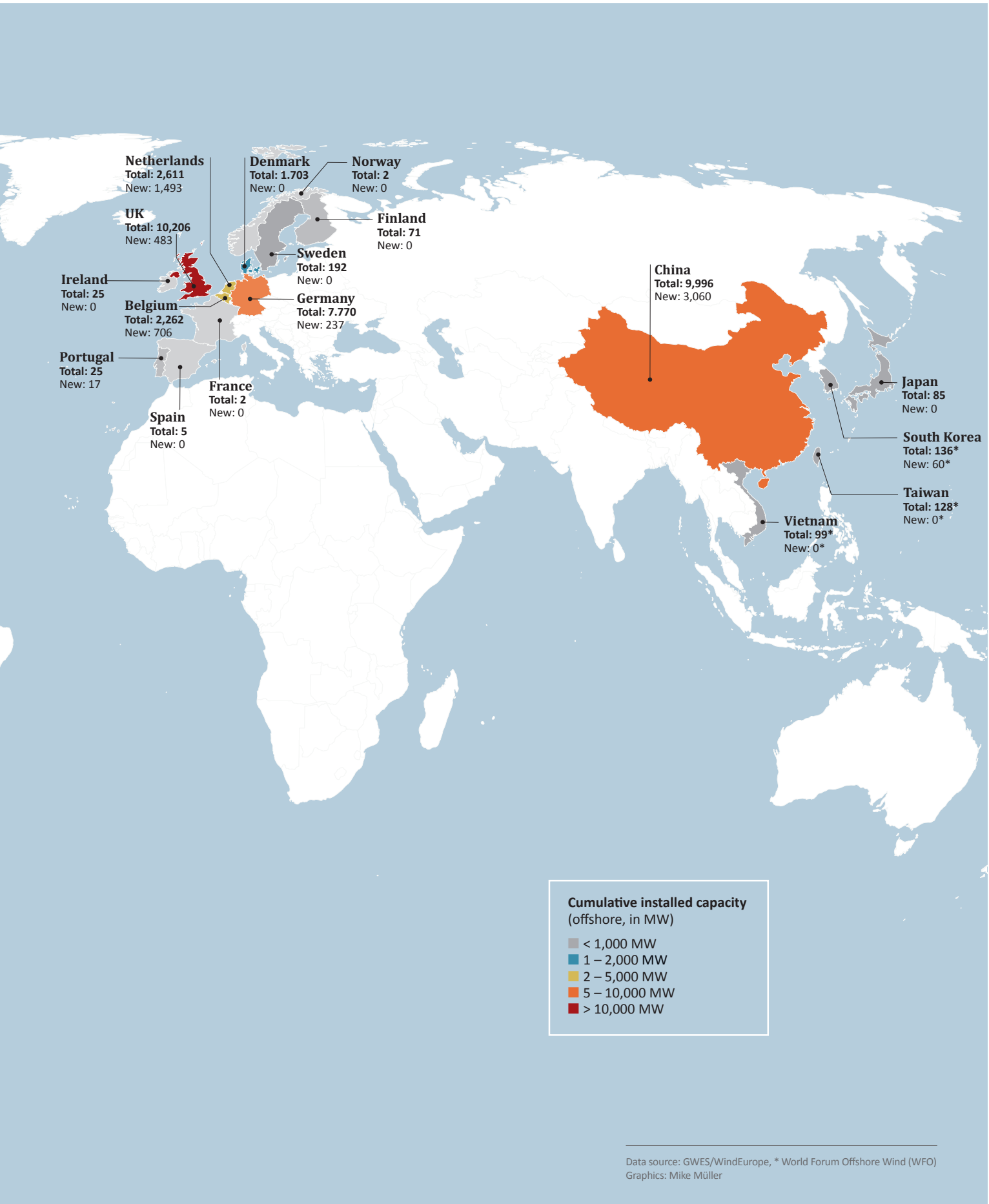
Source: GWEC

Under construction in late 2020

(offshore top 5)



Source: Global Offshore Wind Report 2020



Data source: GWES/WindEurope, * World Forum Offshore Wind (WFO)
Graphics: Mike Müller

Ready-to-use drone for non-contact rotor blade inspection and lightning protection system testing on wind turbines.
Photo: ENERTRAG Operation (Silke Reents)

DRIVERS OF INNOVATION:

Companies with innovative projects

The following pages are dedicated to companies whose new products, processes or methods ensure the continued development of the wind industry. Use the opportunity to get in touch with them and benefit from their innovation.

ECOZINS: CAPITAL FOR THE ENERGY TRANSITION

The energy transition is clean, decentralised, and participatory – it provides responsible investors with sustainable investment opportunities in projects with attractive returns and socio-ecological added value.

As a young and dynamic FinTech company from Marburg, we want to drive the energy transition forward and rethink funding. Our core task is to match sustainable projects in the fields of renewable energies, e-mobility, and energy efficiency with responsible investors. We are developing the relevant technical solutions to achieve this and are advocating more sustainable financial awareness, because sustainable actions are necessary to preserve our planet for future generations.

Increasing access to investments in renewable energies

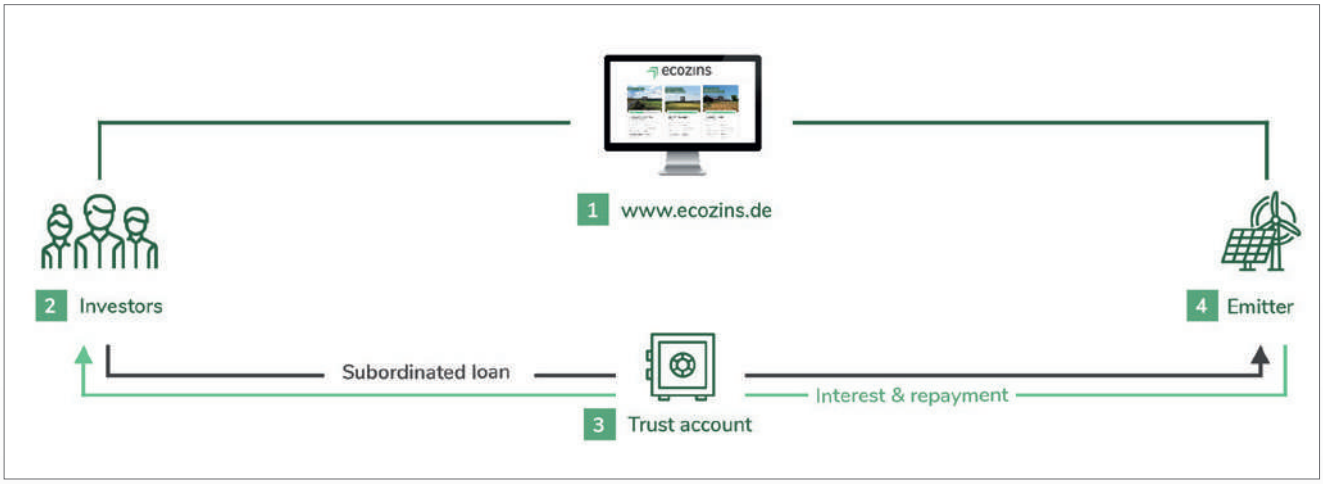
With its crowd-investment platform, ecozins, AUDITcapital GmbH has taken an innovative step towards sustainability and green investments to ensure that sustainable approaches also take root in the financial sector. Private investors can use the online platform to invest easily in projects that generate returns while also protecting the climate. Investments in climate-neutral energy production facilities are extremely capital-intensive. Investment volumes in wind farms, for example, are regularly in the double-digit million range, which is why this asset class has been the preserve of institutional investors until now.

Ecozins wants to make the renewable energies asset class accessible to private investors as well. Project developers who implement the energy transition in a decentralised, grass-roots-based, and participatory manner, benefit from the additional capital injected by investors, which will enable them to realise more climate protection projects. This is why they are happy to pay attractive dividends.

Renewable energies: a safe investment opportunity

The legally guaranteed feed-in tariff for renewable energies makes for investment security and predictable, stable cash flows, from which the dividends are paid out to the investors. Under the crowd funding exemption regulation enshrined in the German Investment Act, up to six million euro may be raised without a BaFin approved securities prospectus. The online sales and investment process also ensures compliance with the provisions of the Small Investor Protection Act. Investors can accumulate a sustainable and diversified portfolio due to the relatively small investment amounts, which start at just 100 euro (up to a maximum of 25,000 euro). All investment-related documents, such as contracts, interest and redemption schedules, and tax certificates are securely stored in the customer's ecozins account.

This is how ecozins works: Simple. Digital. Secure.



"I am passionate about citizen participation in renewable energy projects, because I'm convinced that the energy transition will only succeed if it happens hand-in-hand with the public, rather than passing them by."

Tim Weinel, Managing Director of AUDITcapital GmbH

More opportunities through crowd-funding and participation platforms

The first variant of the innovation described above involves crowd-investing in sustainable projects, by means of which large volumes can be raised jointly by a large number of people. It is free to invest via the ecozins online platform at any time and from anywhere in the world. The second variant gives companies the chance to commission AUDITcapital GmbH to set up a bespoke participation platform based on their own ideas and customised for their own projects with their own name and corporate branding.

Conclusion

We want to expedite the energy transition and ensure that the financial sector transitions towards greater sustainability takes account of the goals and values of investors. Because we are passionate about our planet, we are also passionate about promoting sustainable and green projects and facilitating their implementation by raising investment capital. Let's meet this challenge together.

Project overview

Platform	**ecozins**
Facts and figures	**Launch of the ecozins platform: 2019 Successfully financed projects: 12 Registered users: over 1,100 Raised capital: more than 3.6 m € Repaid capital: more than 600,000 € Interest: between 3.0 – 6.0 %**
Description	**Climate-friendly dividends for private investors. Comfortably invest money in sustainable projects online.**
Types of projects/ investment opportunities	**Renewable energies, e-mobility, energy efficiency, sustainability**
Conditions	**Individual investments between 100 € – 25,000 €**
Locations	**Across Germany**

ecozins
Klimafreundlich Rendite erzielen

You are interested in crowdinvesting, mezzanine financing or public participation? Then don't hesitate to contact us. Our contact can be found in the **company profile on page 138.** ▶

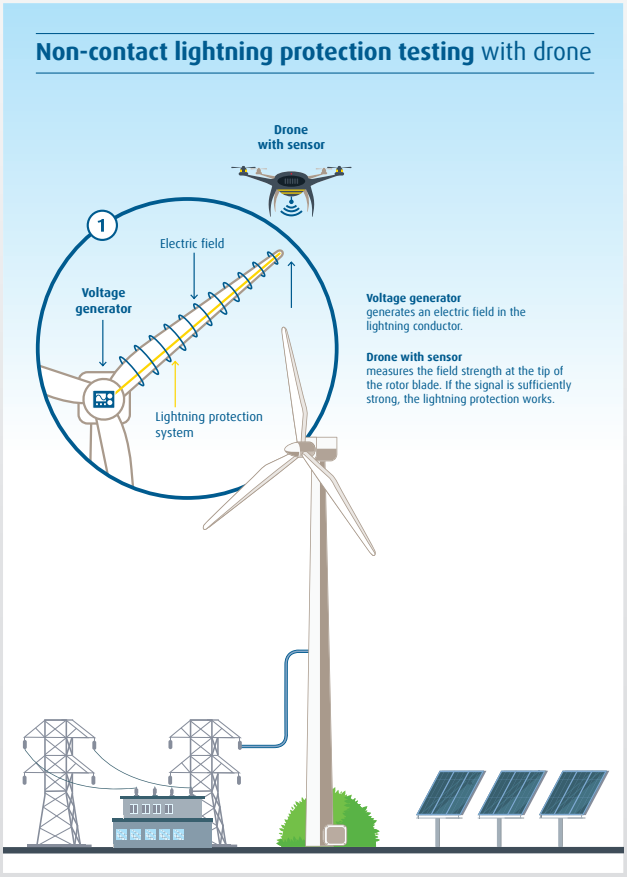
NEW ROTOR BLADE INSPECTION METHOD

ENERTRAG Operation has developed an innovative procedure that improves rotor blade inspections, including lightning protection system testing, and optimises them to meet the increasing demands of the market.

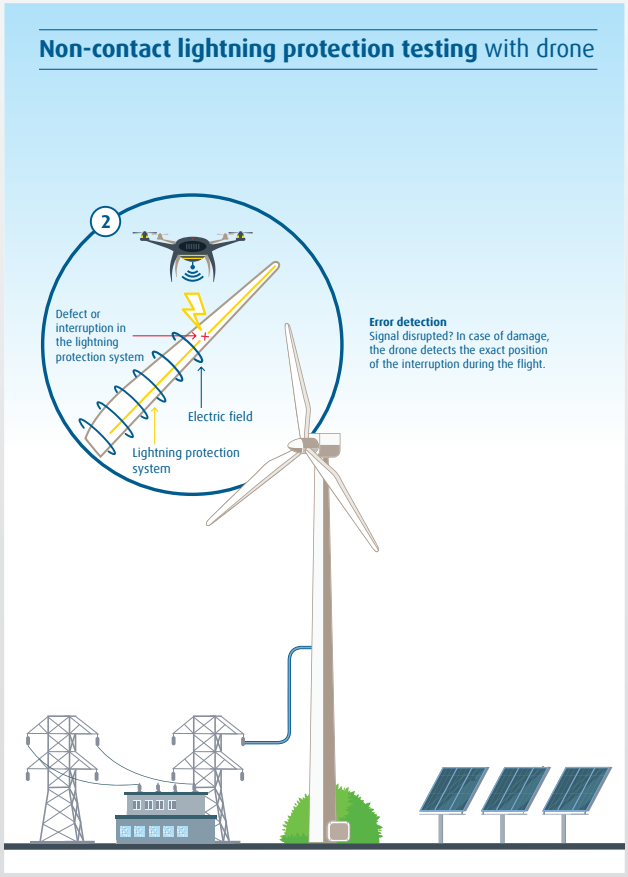
The next generation of turbines will have hub heights far in excess of 150 m and rotor diameters of up to 160 m. For safety reasons, it will no longer be possible to use climbing ropes to access turbines of this size as there is an increased risk of ropes of this length swinging too much or getting snagged on the hazard lights on the tower. Such situations are difficult to control and, therefore, represent an enormous hazard for the relevant personnel.

Drone-based contactless lightning protection inspection

"There are several benefits to this process", as Dr Konrad Iffarth, authorised signatory at ENERTRAG Operation and a key driver of this innovative approach,



Description of the wind turbine rotor blade lightning protection system inspection procedure



Drone-based contactless lightning protection system inspection

Picture of a ready-to-use drone for rotor blade inspection and contactless lightning protection system inspection

explains: “On the one hand, the use of drones saves a lot of time. According to our most recent tests, it only takes about 30 minutes to inspect all of the rotor blades, which means that it will be possible to test many more wind turbines in succession in future. “On the other hand”, he continues, “the new inspection system simulates a lightning strike much more accurately than it is possible with the current testing methods. This reduces erroneous results and the system should be universally applicable to all wind turbine types.“

More accurate and efficient and in use from 2022 onwards

The prototype development and subsequent test phase were completed in autumn 2021 and a successful feasibility test has since been carried out. Another important milestone is the final validation by the TÜV Nord.

Wind turbine operators will be particularly happy about the enormous downtime reductions, which already begin with the test and tour planning, which also involve the use of smart combinations. The field strength meter can even be taken along during the regular mechanical inspection of the nacelle, so there is no need to climb the tower twice, which means that the rotor blades and the lightning protection system inspection can be completed efficiently at the same time and under almost any weather conditions.

The spectacular image quality and the autonomous flight pattern also facilitate a higher fault detection rate. High-resolution, wide-angle surface images of rotor blades of any size can be recorded using technology from our well-respected collaboration partner Sulzer Schmid.

The decisive factor is that, following an initial artificial intelligence-based analysis of the data, our experts will carry out a deeper analysis. Having acquired years of experience in evaluating inspection data and classifying defects, the benefits of this smart symbiosis will be obvious to operators.

Further information is available at:
betrieb.enertrag.com

Project overview

Initiator	**ENERTRAG Operation and Sulzer Schmid**
Implementation	**From 2022**
Figures and facts	**~25 % reduction of costs compared to rotor blade inspection by rope access technique in combination with machine inspection (e.g. recurring inspection)** **• Flight time of 30 to 45 minutes per turbine (incl. setup time)** **• Applicable at wind speeds up to 12 m/s**
Project status	**Advanced field tests and validation**
Location	**In wind farms across Germany**

ENERTRAG
One energy ahead
Operation

Are you interested in the project and want to know how your community or your business can benefit from it? Contact us. Our contact can be found in the **company profile on page 145. ▶**

TRAINING INFRASTRUCTURE SETS NEW STANDARDS IN WIND POWER

A potent branch of the cooperative with a unique infrastructure offering basic and advanced, supplier-unaffiliated personnel training.

More and more highly trained craftsmen are needed for operating and expanding wind power installations. Demographic change and increasing personnel fluctuation create additional demand. These factors result in a markedly greater need for basic and advanced training. Training institutions also face significantly higher demands regarding infrastructure, didactics, action and distance learning.

Training on real plant technology

In order to meet such market requirements, KWS Energy Knowledge eG in Essen, Germany, has been establishing its own unique infrastructure. The cooperative's design with currently around 160 members from the power industry offers an ideal legal and business framework.

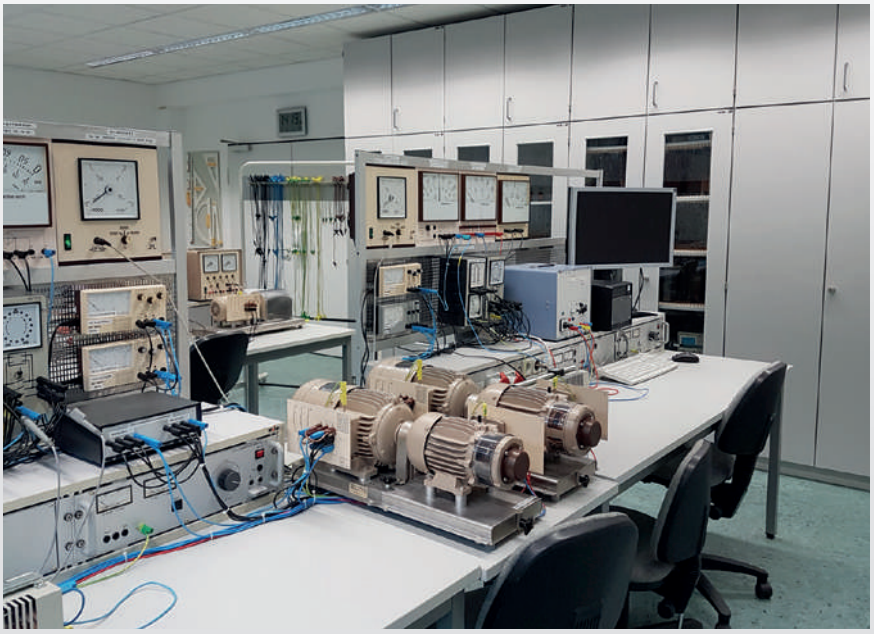
The key instruction component is a wind power training installation employing real-world technology: Nordex S70, hub height 14 m, engine room complete with full operating equipment, hub with rotor shaft, rotor blades and yaw control system, wind velocity indicators and lighting installation, fully functional electrical, measurement and control engineering technology for training operations, and transformer station.

In addition, KWS operates 7 training laboratories with OEM technology including control engineering, electrical engineering, and measurement engineering. This permits

a wide range of training and educational content to be customized to client-specific demands for realistic training and examination purposes. Based on more than 60 years of professional experience in the field, all theoretical contents are also on offer for both classroom instruction in Essen as well as distance learning.

Numerous qualifications available

The following vocational qualifications in the field of electrotechnology may be attained (official German acronyms in parentheses): Electrically Instructed Person (EUP); Electrically Qualified Person for Specified Duties (EFKffT); Electrically Qualified Person (EFK), Responsible Electrically Qualified Person (VEFK); Electric Safety in Low Voltage Systems; Switching Authority up to 155 kV; Qualified Person (TRBS 1203); Requalification for Electrical Installations and Equipment (DGUV3).



Conclusion

Demand for realistic and supplier-unaffiliated basic and advanced training continues to rise significantly. KWS Energy Knowledge eG in Essen, Germany, provides the complete infrastructure and many years of experience in the field.

In the area of technology, the following topics are covered: Wind power installation mechanical engineering, drive train alignment, transmission inspection with video endoscopy and transmission technology, hydraulic systems setup, functions, maintenance and repairs, switchgear and electro-hydraulics. Also covered is the full scope of operations and maintenance including mechanical and electrical malfunctions identification.

Workplace safety instruction follows GWO and DGUV (German Public Accident Insurance) standards, e.g. high altitude work and rescue (DGUV-R 112-198/199), in-house first aider (DGUV-1), in-house fire warden (DGUV-I 205-023), and load slinging (DGUV Regulation 100-500). We also conduct special training for hub, nacelle top, and azimuth area rescue.

Project overview

Initiator	**KWS Energy Knowledge eG**
Implementation	**Courses and training (theory and practice) on original systems, conducted at KWS' premises in Essen**
Figures, data, facts	**KWS provided a total of around 230 training sessions and courses in 2020**
Project status	**Ongoing**
Location	**KWS Energy Knowledge eG, Deilbachtal 199, 45257 Essen, Germany info@kws-eg.com**

Are you interested in the project and want to know how your community or your business can benefit from it? Contact us. Our contact can be found in the **company profile on page 163.** ▶

SOCIAL AND LOW-RISK LOCAL PARTICIPATION

Provided that locals are involved in a fair and socially acceptable manner, the relationship between wind farms and local residents can be fairly robust. **MLK** and **REZ** have joined forces to develop new concepts in Brandenburg.

Wind farm participation concepts are designed to enable local residents to participate in the economic success of a project. In the early years, this objective was achieved through citizen-owned wind farms. Such participation concepts are currently returning in the guise of cooperative and crowdfunding models. Still, most local investors either underestimate or shy away from the entrepreneurial risk associated with investing in a wind farm. Local residents do not want to and should not risk losing money.

Risk-free participation concepts for local residents

REZ and MLK have developed a number of participation concepts that can benefit local residents economically without subjecting them to financial risk and which also take account of various social factors. Even population groups with no disposable funds of their own or who cannot risk losing their invested capital should be able to participate. Projects should also be as specific and tangible as possible: Whilst community participation schemes are very good and politicians appreciate them, it can take some time before they reach the public at large.

Neighbourhood power supply deals and day care centre collaborations

The projects implemented so far include neighbourhood power supply deals, citizen savings projects and direct wind farm participation opportunities. A partnership agreement was also concluded with a day-care centre as a model project, which not only included agreements on joint projects, but also provided equipment and ensured a daily supply of milk to the day-care centre.

In terms of local power supplies, a subsidised tariff has been launched in collaboration with green electricity suppliers whereby the participating wind farms pay the electricity supplier an annual subsidy of between 156 and 180 euro for each contract. In one of the projects there is a social subsidy of another 60 euro per year. The local resident tariff is currently tax-neutral for the beneficiaries and also has no negative consequences for unemployment benefit recipients. MLK have made it possible for the recipients to combine their subsidised package with that of ENERTRAG, a neighbouring planner, at certain locations near Prenzlau, which results in some incredibly low-cost offers – despite the fact that they are delivering green electricity.

A total of 200,000 and 300,000 euro respectively was provided with a guaranteed annual interest rate of 3 percent in two citizen savings projects, which were implemented in collaboration with the DKB in 2017 and 2020. The 3-year programme was without any real risk for the investors, as the amounts deposited were secured by the Bank Guarantee Fund.

However, attempts to enable groups with little capital of their own to participate in the economic success of wind farms did not met with immediate success. A loan with an associated interest rate of over 4 percent over almost 4 years was set up on the DKB crowdfunding platform, yet the local response was muted in spite of local marketing measures. The crowdfunding community, by contrast, subscribed to the remaining amount within a few hours. A low "risk affinity" in that area and Covid-19-related limitations that affected the on-site campaign were identified as possible reasons.

"We want to continuously develop our participation opportunities and enable local residents to share in our success; that's the least we can do."

Heinrich Lohmann, founder and managing director of the MLK Group

Conclusion

Local participation concepts must also include groups that have few or no assets of their own. This can be achieved through neighbourhood electricity tariffs, citizen savings schemes, participation via crowdfunding or collaboration with kindergartens or other social institutions. High-risk investments, by contrast, are difficult. Getting local participation and buy-in requires project transparency and, very importantly, face-to-face events.

Project overview

Initiator	**MLK Gruppe and Regenerative Energien Zernsee (REZ)**
Implementation	**MLK Group – in partnership with regional energy suppliers or DKB depending on the project**
Facts, figures, and data	**Neighbourhood electricity tariffs available in nine localities, two citizen savings projects and a crowdfunding campaign carried out, day-care sponsorship in place since 2015**
Project status	**Ongoing**
Location	**Mainly in Brandenburg**

MLK Windparks
Lichtenberger Weg 4
15236 Jacobsdorf OT Sieversdorf
Phone +49 (0) 3 36 08 - 17 99 97
Fax +49 (0) 3 36 08 - 17 99 98
E-Mail info@mlk-consult.de
Web www.mlk-windparks.de

Regenerative Energien Zernsee GmbH & Co. KG (REZ)
Bergstraße 1
12169 Berlin
Phone +49 (0)30 224 459 830
Fax +49 (0)30 224 459 831
E-Mail zentrale@rez-windparks.de
Web www.rez-windparks.de

Are you interested in the project and want to know how your community or your business can benefit from it? Contact us. Our contact can be found in the **company profile on page 178 (REZ) and 168 (MLK). ►**

CONTACTLESS LIGHTNING PROTECTION

Alternative test method for lightning protection measurement on wind turbines: **TOPseven's** patented technology for contactless lightning protection measurement on wind turbines has been validated and verified by an independent organization.

"TOPseven's drone-based contactless rotor blade lightning protection inspection system represents a milestone for the wind power industry. In collaboration with TOPseven, I and a number of experts from our Wind Energy Department carried out the project for the validation and verification of version 1.0 of their new system and am pleased to say that we were able to complete it successfully."

Dr.-Ing. Ralf Frentzel,
TÜV SÜD Industrie Service GmbH,
Senior Expert EMC and Lightning Protection.

Wind turbines are particularly prone to lightning strikes due to their exposed locations and these strikes can have serious consequences including everything from downtime for repairs to the destruction of the entire system. That is why wind turbine lightning protection systems have to be reliable and operators have to be able to detect any potential damage as soon as possible, which means that lightning protection system tests and visual inspections have to be carried out on a regular basis.

Up until now, inspections have almost exclusively been carried out by industrial climbers although drones equipped with cameras and controlled by specialist pilots have also been deployed for this purpose over the past few years. However, there are drawbacks to both of these approaches such as high costs and the need for third-party specialists.

TOPseven has developed an alternative technology for this and can now provide a globally unique automated and drone-aided contactless lightning protection inspection system. Users receive training from specialists, which enables them to carry out the inspections independently.

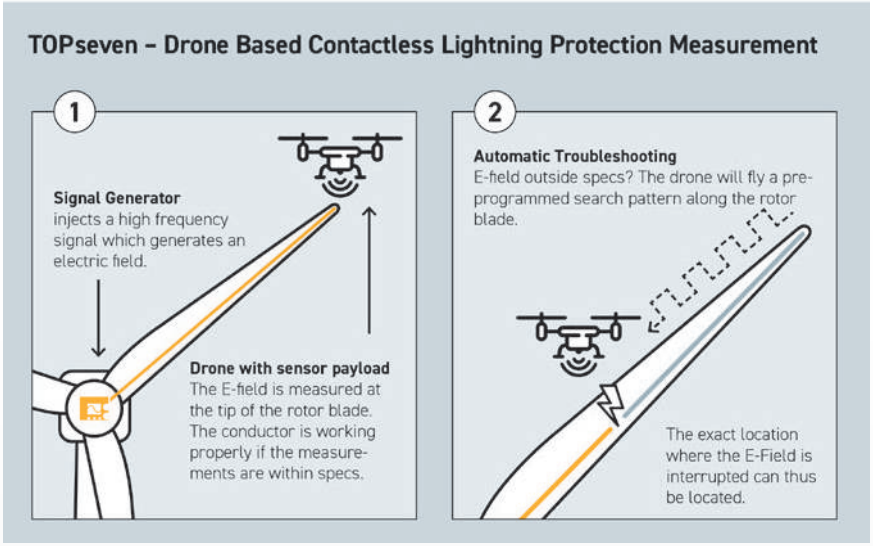
The contactless lightning protection inspection system is completely automatic, and it is no longer necessary to employ a specialist pilot or rope climber for the task. All that is required is a short training course, after which the inspection can be carried out by in-house staff. Not only does this eliminate capacity bottlenecks and dependency on skilled personnel from third-party companies, but also facilitates more flexible and rapid inspections.

This patented process is primarily based on the non-invasive application of an electromagnetic field to the lightning protection system as well as a contactless inspection of the rotor blades by a drone fitted with a special field current sensor. With the aid of special mensuration technology, this inspection system is able to determine the functionality of a lightning protection system faster, more efficiently, and more accurately than conventional methods.

The TOPseven system also precisely identifies the location of any potential damage, which means that it can be relocated at any time for subsequent repairs.

The Bundesverband WindEnergie (German Wind Energy Association or BWE) reissued the technical guidelines for testing wind turbine lightning protection systems in March 2021, whereby one crucial innovation is that alternative test methods can also be used to test the systems, provided that they have been validated and verified by an independent and accredited body. Through its independent validation and verification tests, the TÜV SÜD has confirmed that the TOPseven inspection system is a suitable alternative test method for the section of a wind turbine's lightning protection system that extends from the tip of the rotor blade to the blade flanges and that it complies with the relevant BWE Technical Guidelines.

A European patent for our innovative inspection system was also granted and published in July 2021 (EP 3 596 570).



Conclusion

The innovative, patented TOPseven system is unique on the global market and solves inspection bottlenecks for operators and surveyors as well as for industrial climbers. Contactless lightning protection inspections by drone are efficient, precise, and cost-effective. The ability of end users to operate the technology in-house guarantees a level of corporate independence that is still unique today.
Our mensuration system has been validated and verified by TÜV SÜD as an alternative test system for the section of a wind turbine's lightning protection system that extends from the tip of the rotor blade to the blade flanges.

Location **TOP seven GmbH & Co.KG**
Schiffbauerweg 1
82319 Starnberg
Phone: +49 8151 95966-0
E-Mail: info@TOPseven.com
www.TOPseven.com

TOP7
MAKING DRONES SMARTER.

Are you interested in the project and want to know how your community or your business can benefit from it? Contact us. Our contact can be found in the **company profile on page 183.** ▶

RETROFIT FOR THE CONTINUED OPERATION OF WIND TURBINES

Wieland Electric is supporting wind turbine operators by providing them with a complete system for the simple retrofitting of the work and safety lighting for safe continued operations.

Under the Renewable Energy Sources Act (EEG), many wind turbines will lose their remuneration entitlement this year. Initially, this will apply to facilities with a total output of just under 4000 megawatts. More wind turbines with an average output of up to 2400 megawatts will then follow each year until 2025. However, the benefits of these turbines are considerable, even after their remuneration period has expired. They can continue to contribute to climate protection and to resource conservation through their use of existing infrastructure. Even after they have reached their design life of 20 years and have been amortised, wind turbines in favourable wind locations can continue to operate for many years.

QUICK INSTALLATION, LONG OPERATION

Smart lighting solutions using efficient and durable components

PLUGGABLE CONNECTION SYSTEMS RST® MINI AND RST® CLASSIC

- Time-saving, tool-free plug & play installation
- Pre-wired with colour and mechanical coding for safe installation
- High level of protection up to IP68

MAINTENANCE-FREE LED LIGHTS PODIS®

- Time-saving, tool-free installation using connector plugs and magnets
- High quality material for a long service life
- Resistant to shocks, vibration and extreme temperatures from -40° C to +50° C

UNINTERRUPTABLE POWER SUPPLY

- Stable supply voltage for high availability of safety lighting
- Central installation and comprehensive diagnosis for simple and plannable maintenance
- Buffering times can be adapted to countries and demand

Complete system for retrofitting work and safety lighting

Crucially, continued operations of this kind depend on the condition of all components that are relevant to the stability and functionality of the safety devices, system controls, and braking systems. The framework conditions are set out in the Principles for Carrying out an Assessment and Verification Concerning the Continued Operation of Onshore Wind Turbines (BPW), which also covers testing and inspecting the wind turbine's lighting system and safety lighting. Retrofitting represents the best remedial option in this respect. Wieland Electric can support plant operators with a complete system that can be retrofitted quickly and easily and with no need to dismantle the existing lighting system.

A high-performance system

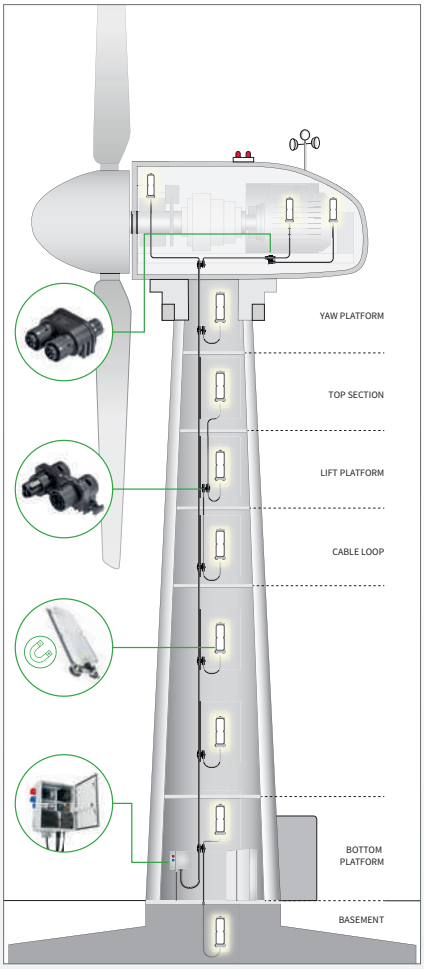
Wieland's complete solution ensures the hassle-free and profitable continued operation of the tower and nacelle lighting systems. It includes uninterruptible power supply, infrastructure cabling, and LED lights. It is a centrally powered safety lighting system, which can use either a secondary voltage of 48VDC (SELF) or normal mains voltage of 230V AC. It provides at least a 30-minute buffering period following a mains outage, although this period can be extended through the use of more powerful batteries. In contrast to the outdated technology where batteries are installed directly in the lights themselves, the Wieland Electric solution includes a central battery as well as modern, safe and easily maintained LED technology.

Can be installed in a single day

„One wind turbine, one day" was the motto under which a practical test was run on a 2004 Vestas V80 wind turbine. It proved how practical and time-saving the retrofit system solution actually is: just three engineers, equipped with Wieland products, carried out a complete overhaul of the turbine in a single day!

The following components were used:

- UPS cabinet, primary circuit: 1-phase 230 V AC supply voltage
- UPS cabinet, secondary circuit: 24 / 48V DC or 230V AC
- LED lights 24 - 60 V DC or 230 V AC
- Infrastructure cabling (example): Ölflex Classic 3G 2.5mm² (other cable type/ cables possible as required) as well as RST round cable connector for harsh environmental conditions



Conclusion

The mere fact that a remuneration entitlement expires does not necessarily mean that a wind turbine will no longer be profitable to operate: given the right strategy, continued operation may well be worthwhile. When it comes to continuing to operate the facility's lighting system in a profitable manner, retrofitting Wieland's products and solutions is the solution for you. Our innovative system saves time and money and will get your wind turbine in shape for future operations!

Project overview

Implementation	**Installation of a complete wind tower lighting system in a single day made possible with Wieland products and just three engineers.**
Description	**Wieland solutions enable the continued operation of the wind turbine despite the expiry of the remuneration entitlement.**
Location	**Worldwide**

wieland

Save time and money with our completely pluggable, maintenance-free system. The Wieland system has a central power supply and can be installed without tools. Our contact can be found in the
company profile on page 123. ▶

Rendering: NRGSync

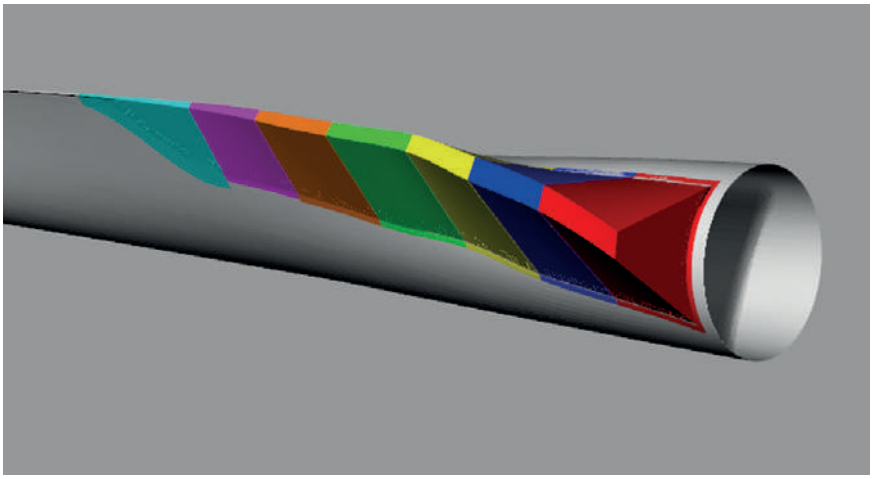
NEWCOMERS:

Start-ups

Start-ups are entering the market with new ideas.
A selection is presented on the following pages.
Be inspired by their innovative power.

Evoblade – We change the way you think about wind!

Evoblade is a North German start-up that spun off from the Institute of Aerospace Technology at the City University of Applied Sciences in Bremen in 2016. We develop aerodynamic retrofits for rotor blade optimisation as well as innovative small wind turbines.



EvoFlap trailing edge spoiler divided into seven segments

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.

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
- A 5-hole probe for measuring wind speed and direction by drone

Our 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.

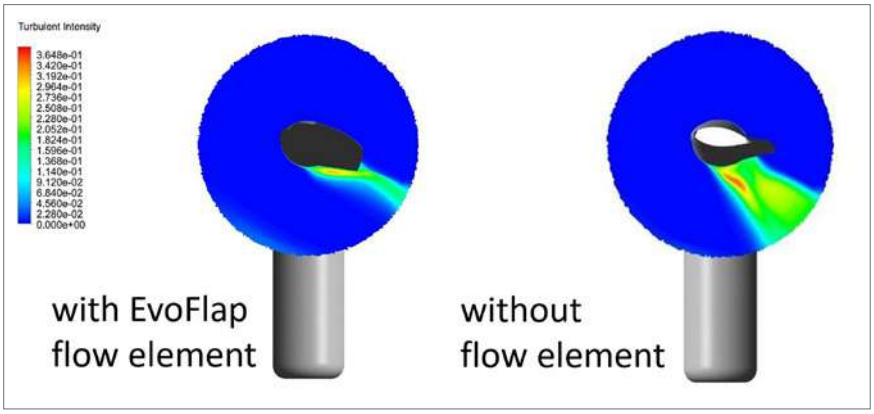
The technical and economic performance of a wind turbine is determined by the rotor blades. With the development and optimisation of the retrofittable flow element, we have achieved a significant improvement in the properties of both new and existing systems.

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).

Installing the EvoFlap

Evoblade UG (limited liability)
Flughafenallee 10
28199 Bremen
Phone: +49 (0)421 5905 5594
www.evoblade.de
LinkedIn: www.linkedin.com/company/evoblade
kontakt@evoblade.de

Founding year	**2016**
Focus	**Aerodynamics, flow simulation, renewable energy systems / wind energy**
We offer	**Flow elements for aerodynamic rotor blade optimisation, scalable small wind turbines for decentralised & supportive energy supply, technical expertise in flow simulations**
We are looking for	**Pilot wind turbine for a project currently being funded by ESA BIC Northern Germany and wind turbine operators for aerodynamic optimisation, investors, wind turbine and rotor blade OEM's, collaboration partners and licensees**



Reduced turbulence at the rotor blade root with EvoFlap

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.

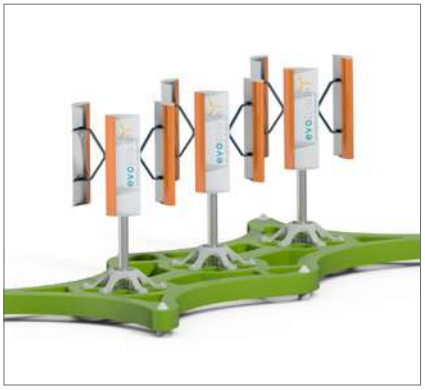
Our engineering team takes the energy transition and sustainability very seriously, which is why we are also focusing on small wind turbines.

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 so as 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.

„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


Small wind turbines arranged as a wind energy module

Small wind turbine with stacked rotor

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.

JenaBatteries: Sustainable storage for clean electricity

The energy transition needs sustainable power storage systems. **JenaBatteries** is the technology leader in the field of metal-free redox flow batteries. We offer resource-efficient and flexible solutions for stationary power storage applications.

The future belongs to CO_2-neutral society. Industry, power grid operators and the energy sector are increasingly searching for sustainable and efficient storage solutions for green electricity to make it independent of weather-related, seasonal, and diurnal fluctuations. JenaBatteries has developed a revolutionary storage system that differs fundamentally from conventional rechargeable batteries in that it uses metal-free storage molecules. Rather than being stored in solid electrodes, energy is stored in a scalable system consisting of tanks and electrochemical cells. To achieve this, the metal-free storage molecules are dissolved in water and poured into the tanks, making the battery incombustible and therefore safer.

One important feature of our batteries is that their production does not rely on the use of critical raw materials from unsafe countries of origin. Obtaining such materials is often linked to overexploiting nature and inhuman working conditions. Lithium mining for example lowers the ground water table near South American saltwater lakes, while cobalt extraction in the Congo involves child labour. The metal-free redox flow battery, in contrast, can be produced entirely in Europe.

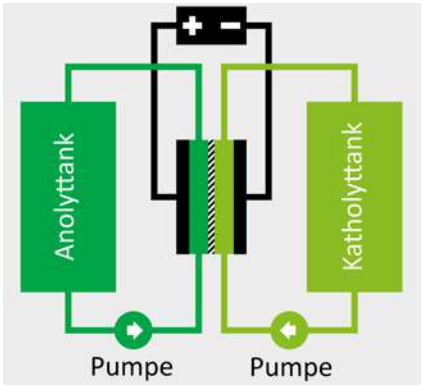
JENA BATTERIES

JenaBatteries GmbH
Otto-Schott-Straße 15
07745 Jena
www.jenabatteries.de
Phone: +49 3641 8793520
contact@jenabatteries.de

Founding year	**2013**
Employees	**35**
Focus	**Stationary power storage systems starting at 400 kWh for combination with renewable energies, peak load management, etc.**
We offer	**Metal-free redox flow batteries for sustainable, safer, and cost-effective power storage**

As a supplier of storage materials, BASF is an important regional partner with a global presence. Our battery therefore makes a significant contribution towards the achievement of the UN's global Sustainable Development Goals.

JenaBatteries has developed large battery modules the size of an overseas container, with a storage capacity of 400 kWh. They can provide interim storage space for electricity from solar and wind parks for example. In the future it will be possible to connect several such modules to form power storage stations. A major feature of our battery modules is their planned service life of 20 years. They are delivered as a turnkey solution with all necessary operational components included. Other exciting applications include peak load management in energy-intensive companies and internal consumption optimisation. As a low-cost alternative to the expansion of grid capacity for the rapidly developing e-mobility charging infrastructure, our batteries can enable the installation of additional charging stations.



The functionality of the metal-free redox flow battery was demonstrated on a large scale for the first time in a smart grid in the Netherlands in 2019. The field test, in which a 100-kWh battery was built and connected to renewable power sources, was an important milestone. JenaBatteries has further developed the technology based on the test results so that the first pilot facilities can now be installed in collaboration with selected partners and customers. Production will gradually be expanded over the next few years and in the future, units in the higher MWh range will also be capable of storing "green" electricity in a sustainable manner.

Conclusion

You too can rely on a forward-oriented technology that provides the solution to what the global renewable energy market needs most urgently – high-performance, sustainable storage solutions for the flexible, efficient energy systems of tomorrow.
www.jenabatteries.de

Decentralised energy generation 2.0

NRGSync's primary objective is to ensure independent energy production for the benefit of everyone. We combine decentralised energy production technology with versatile applications for everything from domestic residences through to municipalities.

EMIWA Anjo

NRGSync develops small and large wind turbines which combine all the benefits of decentralised energy generation. Equipped with our PV foil and coupled with our patented technical wind solutions, we have developed unique systems over the years that stand out in terms of yield, cost-benefit and flexibility.

Whether it be a municipality, an industrial site, or the creation of entire infrastructure solutions through a suitable charging infrastructure, we make it all possible from a single source and 100 percent "Made in Germany".

Anjo:
Energy supply for domestic residences
For our EMIWA "Anjo", all CE, EMC/EMC tests and all necessary DIN standards were complied with and certified. We have also complied with the legal requirement pertaining to noise emissions in residential areas, whereby a value of just 31db at full load was certified. All safety-relevant components have also been integrated, from overvoltage protection through to the non-combustible storage cell used for our own storage batteries.

As a contracting solution, including the coupling of PV systems for public and non-public buildings, tenant electricity models represent unique solutions for cities, municipalities, cooperatives, and management companies.

Liko:
Street light and charging station in one
The huge potential of our EMIWA "Liko" lies in its simplicity: the system produces approximately 700 KwH of energy per annum, but only requires around 70 KwH per year for its own (dimmable) lighting.

Among other things, it can be used as a motion detector, a monitoring system and as a replacement for existing lighting points. We use the installed cables to bring together and store the excess energy. This excess energy can be used directly at the Liko for charging e-vehicles or made available at strategically important collective locations.

NRGSync GmbH
Joseph-Haydn Weg 3
71126 Gäufelden
Phone: +49 (0)7032 2298008
info@nrgsync.com
www.nrgsync.com

Founding year	**2021**
Employees	**7**
Focus	**Manufacturer of innovative wind systems for infrastructure, private, commercial and industrial contexts for decentralised independent energy generation.**
We offer	**Holistic system solutions for private and commercial sites, industry and heavy industry, energy parks, housing developments, decentralised H2 production, charging infrastructure**

EMIWA Liko

Hiroki:
The wind turbine for the city centre

Like all our products, the EMIWA "Hiroki" – which means "big tree" in English – is a global first in the field of decentralised energy generation. The Hiroki can be installed in any built-up area and combines modern design with high performance at a height of between 40–50 metres. It can produce between 780,000 and 1.23 million KwH of energy at ports, industrial sites, city-centre locations etc. The installed capacity is 3 MW. Totally new potential applications include integration in major charging stations or directly at filling stations for the production of green hydrogen.

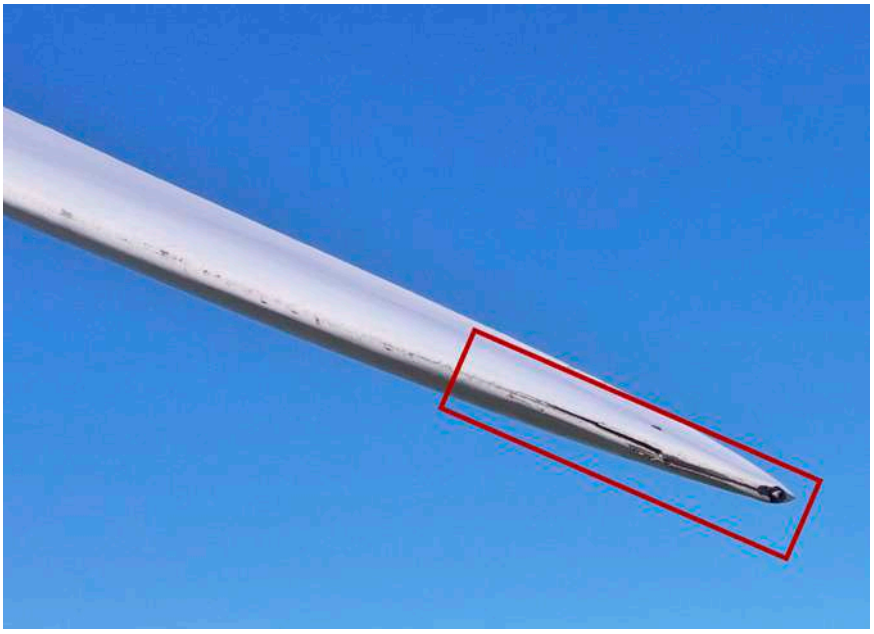
EMIWA Hiroki

Conclusion

NRGSync advocates a 100 percent energy transition and provides decentralised solutions for everything from domestic residences to industrial sites and municipalities. We welcome collaboration with other companies to help achieve this goal with our products. Our requirements are modest, but our values are all the more important. Which is why we are happy to work with partners who are also keen to advance modern energy production.

SkyVisor:
Ever thought of inspecting blades yourself?

SkyVisor enables wind farm operators to fully capitalize on their renewable energy assets by empowering their technicians to independently inspect their assets thanks to fully automated drone-based data collection.



A lightning strike impact on the tip of a GE 1,5SL , detected during a SkyVisor inspection

The SkyVisor drone taking off to start the automatic inspection

Nowadays, 22 percent of total O&M costs are related to blade maintenance, making wind turbine rotor blades a key component to inspect in order to reduce O&M costs . Yet, current inspection methods for rotor blades are complex and time-consuming and hence do not allow for comprehensive and timely identification of required maintenance measures, leading to more than 76,000 blade services each year.

These days, camera-based and rope access techniques constitute the two most prevalent methods for blade inspection. While the former does not provide high-quality results, the latter is rather expensive. Significantly, neither one of these techniques provides a digitalized and comprehensive set of data about the rotor blades' condition. This impedes a thorough understanding of their lifecycle and the reaching of critical maintenance decisions.

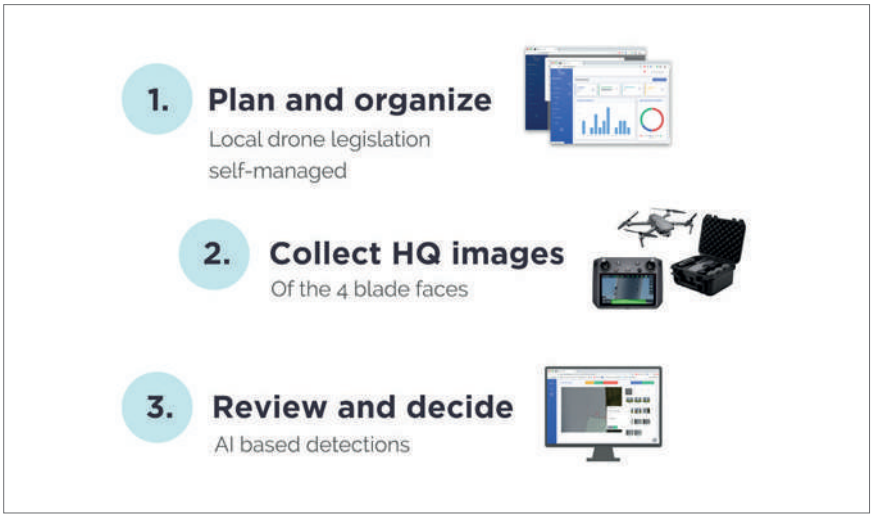
To resolve this issue, we at SkyVisor contrived a software solution which enables IPPs to inspect their assets in-house and reduce their inspection costs. With already 10 percent of French and Belgian wind turbines monitored by our SkyVisor solution, amounting to more than a thousand inspections per year, we are a well-established solution provider in Western Europe and have successfully empowered many wind farm technicians to independently inspect rotor blades.

SkyVisor
Industrial inspection by drone

SkyVisor
27 Rue du Chemin Vert
75011 Paris, France
Phone: +33 1 84255823
hello@skyvisor.fr
www.skyvisor.fr

Founding year	**2018**
Employees	**6**
Focus	**Fully automated, drone-based, in-house inspection of rotor blades with AI based data-processing and automatic report generation**
We offer	• **Internalization of blades and tower inspection processes** • **Fully automated, drone-based inspection of rotor blades – Anyone can fly it!** • **Acquisition of high-quality, comprehensive, and uniform data** • **AI based data-acquisition and processing**
We are looking for	• **IPP's O&M Managers** • **ISP's with a blade focus,** • **EU sales partners** • **investors for growth within the EU**

SkyVisor Wind is our precise, easily deployable, and fast inspection solution for rotor blades: It requires one rotor stop only and takes no more than 25 minutes to inspect all three blades while collecting comprehensive, high-quality, and standardized data in sub-centrimetric resolution. With SkyVisor Wind, IPPs can take control over the inspection of their assets' rotor blades by empowering their technical team to independently and flexibly inspect the assets with our fully automated, drone-based inspection solution.



The SkyVisor Wind solution deployment process

Notably, our SkyVisor Wind application is designed to be straightforward and easy-to-use: It features AI based data processing, the possibility to compare the data with past inspection results, as well as an automated report generation, simplifying and expediting the analysis of the inspection for a better predictive maintenance planning.

Founded in 2018 by Paul Fontaine, a passionate drone-specialist, and Fabien Sauvage, our experienced software engineer, we are constantly endeavoring to ameliorate and expand the scope of our products according to our clients' needs. That is why we naturally included tower inspection in our SkyVisor Wind product and launched our SkyVisor Solar solution.

At SkyVisor, we strive to become the predictive maintenance reference tool for renewable energy assets in Europe within the next five years. Therefore, we are excited about launching our product on the German market throughout the next months and are looking forward to enabling wind farm operators in Germany to fully capitalize on their assets and technical teams.

Enertrag's technicians deploying our SkyVisor Wind drone-based solution

Conclusion

At SkyVisor we value technicians and provide them with top-notch digital tools, to empower them to fully draw on their expertise in order to enable easy and fast rotor blade digitalization. After having successfully launched our product on the French and Belgian market, we are now excited to establish ourselves in Germany. Empower your technicians by including our SkyVisor drone and software solution in your wind farms' operational toolbox.

Vortex Bladeless: Wind turbines without rotation

Vortex wind turbines are a disruptive wind turbine that, instead of rotating, oscillates. Its first objective is to become the perfect tool for harnessing wind energy in urban and residential environments.

Vortex Bladeless S.L. is a Spanish company that is developing what could be considered the "simplest wind machine in the world". It is a technology without shafts, mechanisms, gears, bearings and does not need lubricants. Compared to other traditional solutions, it aims to fill gaps in the market that are not being successfully exploited by other traditional solutions, such as distributed energy with small-sized devices.

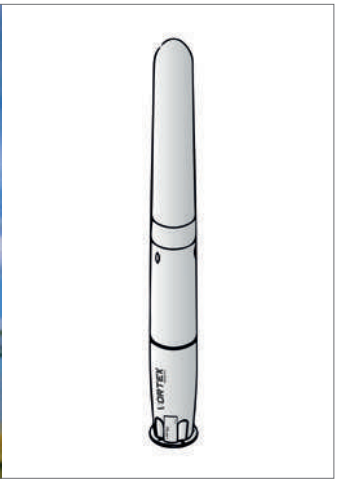
This solution is based on an aerodynamic resonance phenomenon known as "aeroelasticity". This is a great way to transmit the kinetic energy of the wind to a structure. To avoid having to orient the device depending on the wind direction, it is a circular section structure.

Inside is the alternator, which also has complete radial symmetry and, in addition to converting motion into electricity, modulates the stiffness of the machine to adapt to different wind speeds and thus maintains resonance.

One of the most attractive features of solar panels is their very low maintenance requirements. No one wants to climb on a roof to change parts or add lubricants. This could also be one of the strengths of this new type of wind machines. In addition, they could work on their own, but they can also be combined with solar panels. Statistically, the wind resource is strongest at night, when solar panels cannot work. The hybridization of photovoltaic and wind systems are strongly synergistic and allow a more stable energy production.

Vortex Bladeless S.L.
Paseo de la Estacion 20, Avila, SPAIN
Phone: +34 920 048648
vortexbladeless@vortexbladeless.com
https://vortexbladeless.com

Founding year	**2013**
Employees	**7**
Focus	**Radically new kind of wind power devices not based on rotation or blades but on aeroelastic phenomena, solving many problems of current wind turbines like maintenance cost, noise, wildlife casualties, safety systems and more.**
We are looking for	**Industrial partners who can enter the project with investment, industrial resources and industrial knowledge so we can start mass production and first definitive installations for private and public sector.**



The major benefits of the Vortex Bladeless technology are its low cost, minimal environmental impact and integrability in populated environments.

Vortex is formed by a small team of three engineers and other two workers and their current headquarters are a little space in Ávila, a town in Spain. As a small startup in a country which is not top in industry or economy, every help has been very appreciated. The real development started with a succesfull corwdfunding back in 2015 and the company hasn't stop since, working slow but steady as scientific development requires.

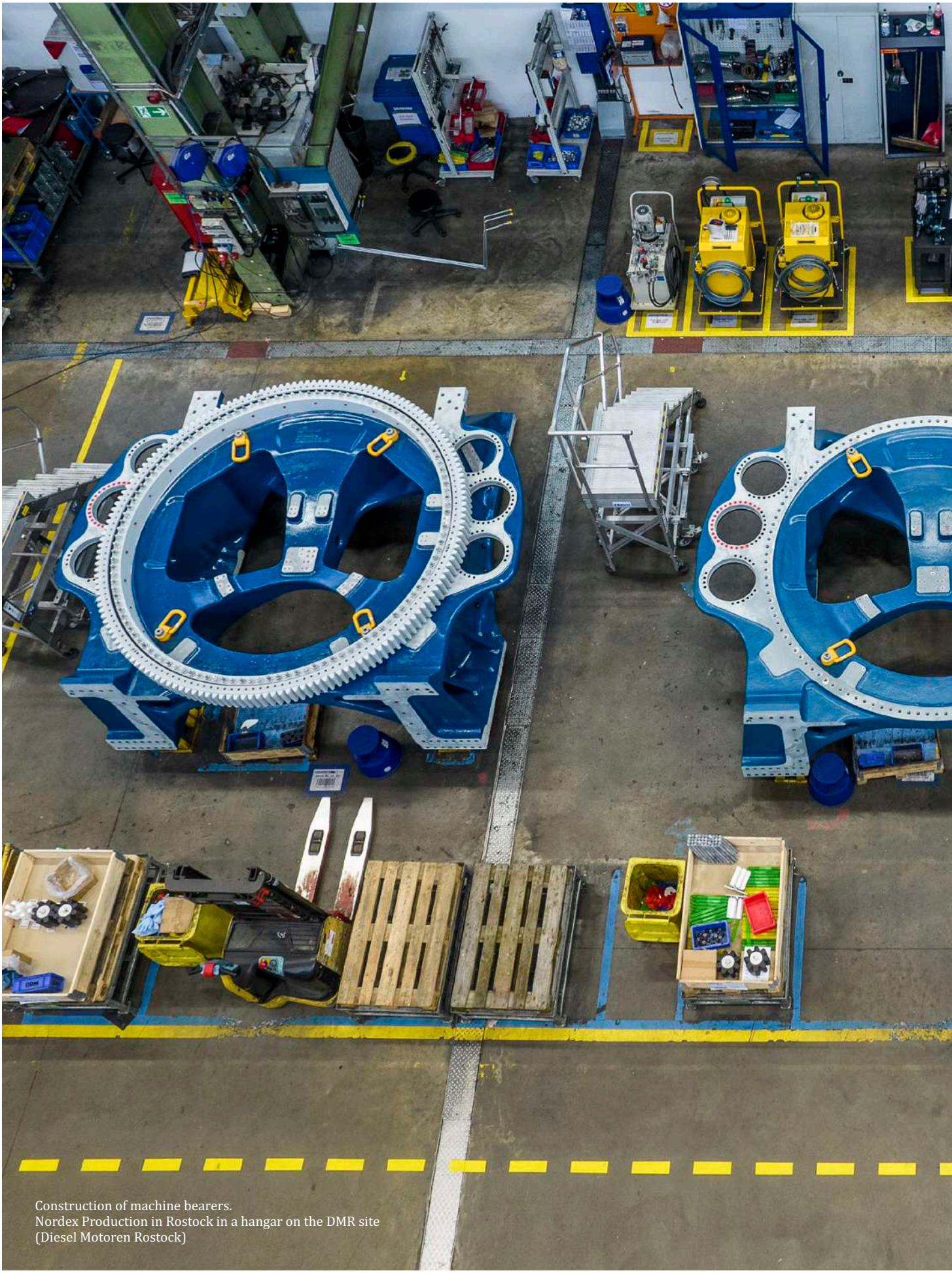
In 2018 the company was awarded with the Seal of Excellence on the Horzion 2020 programme of the European Commision for technology and innovation in Europe.

In 2020 Vortex participated alongside with Equinor for an acceleration programme, being awarded one of the 10 most promising tech and innovation startups of the decade. In 2021 the company was awarded by the European International Bank as one of the top 15 most promising energy and sustainability projects in Europe.

All of these help has given fruit in form of prototypes and pilots that are currently being produced, a first pre-series of 100 units of the very small device model, called "Vortex Nano". These units are being installed worldwide in universities and research centers for study and data gathering. With this, the company intends to accumulate enough experience and technological maturity to start introducing its product in the market. Over time, its size will be scaled up to larger devices with a wider scope of application.

Conclusion

Vortex Bladeless is a Spanish startup developing a radically alternative and innovative way to harness energy from wind, working with oscillation and with no need for blades, shafts, gearbox, big foundations or lubrication. It aims for even greener wind power, being completely harmless to birds or any wildlife, completely silent, easy to install and operate, cheap and with almost zero maintenance costs. By now the tech is under development with pilots being installed in universities around the world for study and data gathering.

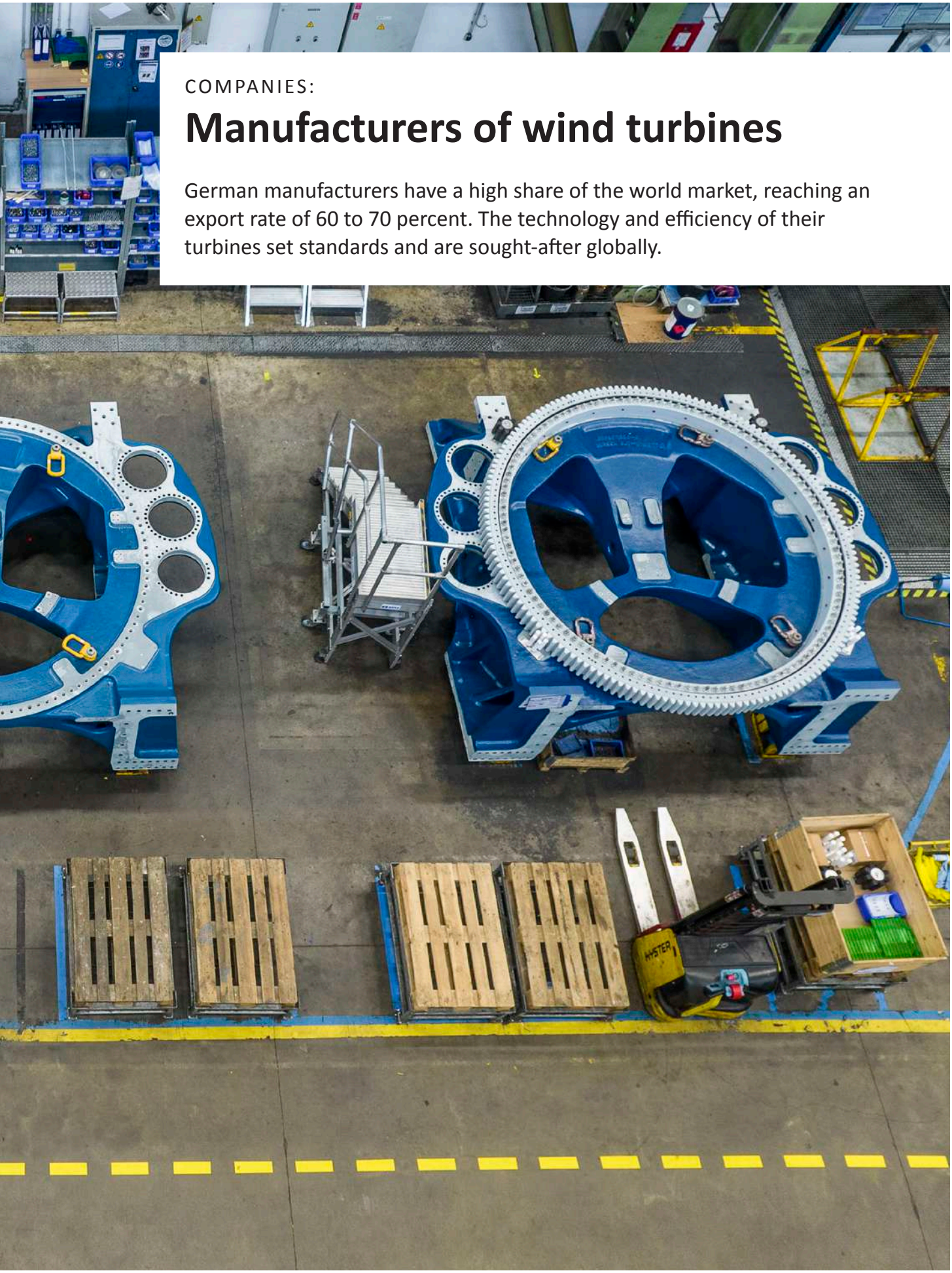


Construction of machine bearers.
Nordex Production in Rostock in a hangar on the DMR site
(Diesel Motoren Rostock)

COMPANIES:

Manufacturers of wind turbines

German manufacturers have a high share of the world market, reaching an export rate of 60 to 70 percent. The technology and efficiency of their turbines set standards and are sought-after globally.



ENERCON GmbH

Innovative products and a forward-looking company.
ENERCON's product catalogue currently includes wind energy converters ranging from 2,000 to 5,560 kilowatts. The German wind energy converter manufacturer has installed over 31,160 wind energy converters worldwide with a total power of more than 56.1 gigawatts (status 10/2021).


01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01 | E-160 EP5 E2
02 | E-160 EP5
03 | E-160 EP5 E3
04 | E-138 EP3

ENERCON wind energy converters have been known for their innovative technology, outstanding reliability and excellent returns on investment for over 30 years. With a tried-and tested drive system, groundbreaking technological developments and high quality standards, the company is constantly raising the bar in the wind energy industry. As one of the leading producers of wind energy converters, ENERCON is always working to drive the global supply of renewable energy forward using its practice-oriented products and services.

For more than 30 years, ENERCON has been among the technology leaders in the wind energy sector. It was the first manufacturer to focus on a gearless drive design, and this is now a hallmark of all ENERCON wind energy converters. The company is also at the forefront in other areas such as rotor blade engineering, control systems and grid connection technology, and keeps proving its great innovation capacity with a variety of new technological developments.

Sophisticated drive technology
Constant research and development are the key to the company's continuing success, along with production and service. All the key components such as the rotor, the annular generator and the grid feed system are manufactured by reliable and highly-qualified certified suppliers. This ensures the high standard of quality and the outstanding reliability that are features of ENERCON wind energy converters.

04

Another essential factor is the customer-oriented service, which guarantees operators and owners 97 % technical availability of their WECs. This holistic concept sets high standards in technology, quality and safety, thus consolidating ENERCON's position as one of the leading manufacturers of wind energy converters worldwide.

ENERCON sets new benchmarks

The product portfolio currently includes wind energy converters with power outputs ranging from 2,000 to 5,560 kilowatts. The latest addition is the E-160 EP5 E3 wind energy converter with a rotor diameter of 160 metres. All ENERCON wind energy converter models are characterised by reliable technology, low maintenance and a long service life, and thus guarantee customers a high rate of return.

Compliance with latest grid code requirements

Thanks to their directly driven synchronous generator and the innovative and modular full-scale converter concept, ENERCON wind energy converters offer a wide spectrum of technical options for adapting to the grid conditions. This also includes a grid feed system certified to the latest grid codes, meaning ENERCON wind energy converters can be easily integrated into any supply and distribution grid structures.

Energy for the world

In keeping with the mission statement 'Energy for the world', ENERCON promotes renewable solutions for supplying power the whole world over. To support this, ENERCON is expanding its worldwide activities to meet demands. The company already has a decentralised service and sales network in over 45 countries internationally.

Financial security

ENERCON's independence was sealed when the Aloys Wobben Stiftung trust was established in autumn 2012. On 1 October, founder and owner of the company Aloys Wobben transferred his shares to the trust in order to set ENERCON's sustainable and forward-looking business strategy in stone. As a result, high quality and reliable WEC technology are not the only things ENERCON's customers can count on – they can also be sure of a high level of investment security.

ENERCON
ENERGY FOR THE WORLD

ENERCON GmbH

Address	Dreekamp 5 26605 Aurich
Phone	+49 (0)4941 927 102
Fax	+49 (0)4941 927 309
E-Mail	info@enercon.de
Web	www.enercon.de/en
Category	Manufacturers
Profile	Wind turbines (> 100 kW)
Founding year	1984

eno energy GmbH

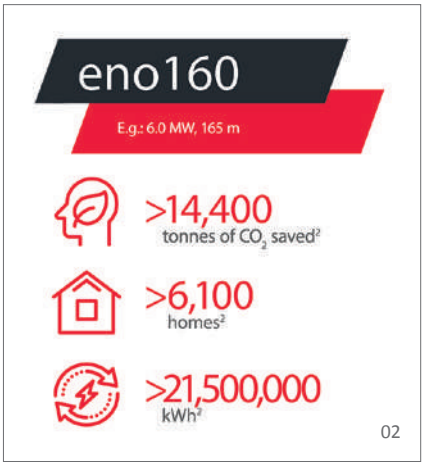
Moving the future of tomorrow today
The eno energy Group is Europe’s leading medium-sized manufacturer of premium wind turbines. At our locations in Rostock and Rerik we develop and produce durable and powerful onshore wind turbines in the 2.2 to 6.0 MW range.


01

Moving the future of tomorrow today! Benefit from our short delivery times, our experience and our high quality standards. Our products cover all types of locations and have been specially developed by our engineers for your needs:

With the highest quality from the north, the eno energy group has established itself from an engineering office to a premium wind turbine manufacturer. Eno energy has been successfully supplying and building wind energy projects in the European market for over 20 years.

High quality wind turbines are developed and built at the production site in Rostock. It is crucial that there are only a few steps from development to production – short decision-making paths and the associated flexibility ensure short delivery times of just 10 to 12 months. As an owner-managed family company, decisions are made quickly and your contacts can be reached quickly at any time and are always there for you.



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Thanks to the many wind farms in its own portfolio, eno energy can look back on a great deal of expertise. The many years of experience flow directly into the production of the premium wind turbines. With wind turbines that are individually tailored to specific needs, eno energy offers customers tailor-made solutions.

Thanks to the Gridmaster® concept patented by eno energy, the quality of the feed-in, the turbulence behaviour and power control can be positively influenced and create intelligent parking concepts.

The product range extends to high-quality and reliable wind turbines of the multi-megawatt class from 2.2 MW to 4.0 and 4.8 MW up to the enoventum class with 6.0 MW, with rotor diameters of 100 to 160 meters and total heights of up to to 245m.

With the extremely successful 4 MW platform, the eno energy Group offers excellent solutions, especially for repowering locations as well as locations with total height restrictions in Germany and France. The platform has rotor diameters of 114, 126 and 140 m. With selectable outputs from 3.5 to 4.8 MW and hub heights from 82 to 142 m, the 4 MW platform can be flexibly scaled to the respective location requirements. The full converter concept, which is standardized for all eno energy wind turbines and has been established for over 10 years, also guarantees a grid connection that always complies with the guidelines.

With the 6 MW enoventum class, eno energy now also offers its customers highly efficient wind turbines of the latest generation for locations with medium and weak wind conditions.

01 | Brusow wind farm
02 | Environmental facts using the example of the eno160
03 | Plauerhagen wind farm
04 | Production in Rostock
05 | Production in Rostock

ENO ENERGY
Success with wind.

eno energy GmbH

Address	Straße am Zeltplatz 7 18230 Ostseebad Rerik
Phone	+49 (0)3812 037 920
Fax	+49 (0)381 203 792 101
E-Mail	info@eno-energy.com
Web	www.eno-energy.com
Category	Manufacturers
Profile	Small wind turbines (> 100 kW)
Turnover	approx. € 100 million
Employees	250
Founding year	1999

Nordex Group

The Nordex Group offers powerful wind turbines for nearly all geographical regions across the globe.

The development, manufacture, project management and servicing of wind turbines in the onshore segment has been the core competence of the Nordex Group and its more than 8,500 employees worldwide for more than 35 years. As one of the world's largest wind turbine manufacturers, the Nordex Group offers high-yield, cost-efficient wind turbines that enable long-term and economical power generation from wind energy in all geographical and climatic conditions.

The focus is on turbines in the 3 to 6MW+ class, and the Group's comprehensive product portfolio offers individual solutions both for markets with limited space and for regions with limited grid capacities. In September 2017, the Nordex Group launched the N149/4.0-4.5, the first product in the new Delta4000 product series. This was based on the proven technology of the Delta generation turbines successfully installed since 2013 for locations with strong, medium and light wind speeds.

The N149/4.0-4.5 has a variable output of 4.0 to 4.8 MW and can be optimally adapted to the individual specifications of the grid operator, local wind conditions, and sound requirements. This worldwide first installed +4MW turbine was awarded the title of "Turbine of the Year 2018" by the trade magazine "Windpower Monthly". In April 2018, the N133/4.8, a variant of this turbine type specialized in strong wind regions, was also launched on the market. Based on the experience gained with the turbine presented two years ago, already installed and in series production since March 2019, the Nordex Group entered the 5MW class with its N149/5.X and the N163/5.X, followed by the entry into the 6MW class in summer 2021 with the N163/6.X.

As with the N149/4.0-4.5, flexibility is a key factor in the design philosophy and operating strategy of the new turbines. The turbines cover a wide range of power modes and suitably optimized for low and medium-wind regions. Depending on the investment criteria of the respective projects, the turbines can be operated flexibly in terms of capacity factor, rating, service life and noise requirements, and thus can also be optimized for the respective business model of the customer. The Nordex Group can also implement wind farms as part of different project types: from simply selling the equipment to turnkey projects. A global service network, with some 280 service points throughout 30 countries, delivers service quickly to keep our systems running smoothly.

The Group covers the needs of all customer segments within the global wind market, from large energy suppliers, to SMEs operating power plants. Nordex Group systems currently deliver more than 35 GW of sustainable energy each year and can be found in more than 80 % of the world's energy market (excluding China).

Nordex SE is listed on the MDAX and TecDAX of the Frankfurt Stock Exchange (ISIN: DE000A0D6554). The management holding company is headquartered in Rostock, while the executive board and administrative offices are based in Hamburg, both Germany. At production facilities in Germany, Spain, Brazil, the US, Mexico and India, the Nordex Group produces its own nacelles, rotor blades, and concrete towers. The Nordex Group maintains offices and branches in more than 40 countries.

NORDEX acciona Windpower

Nordex Group

Address	Langenhorner Chausee 600 22419 Hamburg
Phone	+49 (0)40 30030-1000
Fax	+49 (0)40 30030-1101
E-Mail	info@nordex-online.com
Web	www.nordex-online.com
Category	Manufacturers
Profile	Wind turbines (> 100 kW)
Turnover	> € 4.65 billion (2020)
Employees	> 8,500
Founding year	1985

Siemens Gamesa Renewable Energy GmbH & Co. KG

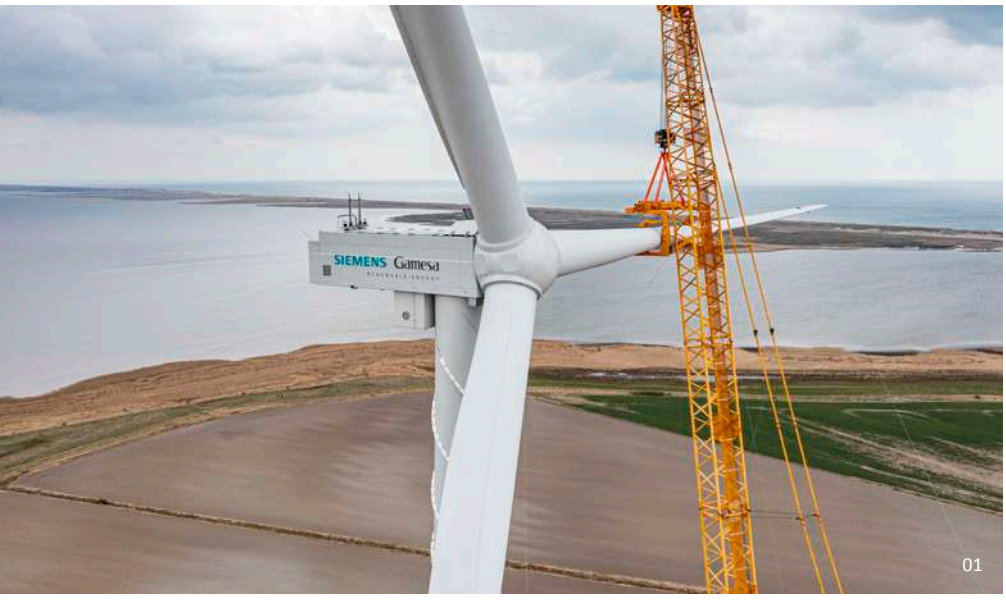
We make real what matters – Clean energy for generations to come
Siemens Gamesa Renewable Energy is a global leader in the wind energy industry. With an installed capacity of more than 117 GW worldwide, we produce and install onshore and offshore wind turbines. We also offer a wide range of services

A market leader in renewable energy Siemens Gamesa unlocks the power of wind. For more than 40 years, we have been a pioneer and leader of the wind industry, and today our team of more than 25,000 colleagues work at the center of the global energy revolution to tackle the most significant challenge of our generation – the climate crisis.

We have successfully executed projects in more than 90 countries. Our broad product portfolio includes both onshore and offshore technologies as well as maintenance and repair services. In Germany, we are represented by Siemens Gamesa Renewable Energy GmbH & Co. KG in Hamburg with further sales offices in Kiel, Bremen, Ulm and Berlin.

Onshore: tailor-made solutions for optimal yield
Siemens Gamesa offers you an extensive range of onshore wind turbines for all wind classes and site conditions. With the Siemens Gamesa 5.X we take your annual energy production to new heights. The turbine models SG 6.6-155 and SG 6.6-170 with a rated output of between 5.8 MW and 6.6 MW and the lowest electricity generation costs set new standards in the market.

The models offer maximum performance in strong, medium or low wind conditions. The rotor with a diameter of 170 meters is the largest in the onshore segment. Thanks to its highly flexible design, which enables an improved value chain, the platform is suitable for a wide range of sites due to its versatility.



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The first two SG 6.6-155 turbines in Germany will be commissioned in 2022 in Elbmarsch. This project will be realized via a framework agreement with ArGe Schleswig-Holstein Wind. It underlines the close and trustworthy cooperation as well as the strong local network we maintain with our partners and customers. We also received the first permits for the SG 6.6-170 under the Bundes-Immissionsschutzgesetz.

Together with our customers and partners we can master any challenge and find individual solutions to realize profitable wind farms even at demanding locations.

Always on site: our Service for every windpark
Our service is available wherever the wind blows. Following the merger of the former Senvion service business, our maintenance fleet is comprised of around 1600 onshore wind turbines throughout Germany. To reduce production downtime due to maintenance calls, we rely on digital solutions: Thanks to remote diagnostics and algorithm-based operational optimization, our services offer you the decisive advantage in profitability for your onshore and offshore fleet. In addition, we offer the latest digital technologies, such as rotor blade analysis using drones, and innovations such as our Smart Aviation Lights for demand-based obstruction lighting in accordance with current legislation.

01 | At 170 meters, the largest rotor diameter of an onshore turbine can be marveled at on the prototype of the SG 6.6-170 in Høvsøre, Denmark.
02 | Best service independent of the manufacturer – our technicians are always there where the wind blows.
03 | Siemens Gamesa envisages a carbon free future with the production of green hydrogen directly at sea.
04 | Clean energy from Cuxhaven is an export hit: SG 8.0-167 nacelles for the Yunlin (Taiwan) and Hornsea 2 (UK) offshore wind parks are ready at the port.


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We are continuously working to improve our service offering through innovative and creative ideas. In doing so, we benefit from our many years of experience in servicing Bonus, Siemens Wind Power, Adwen, Gamesa and Senvion turbines. In the growth market of Multibrand, we are building on this heritage to constantly expand our services to competently and reliably serve every service request, regardless of the turbine manufacturer. Your satisfaction and the availability of your wind farms is our daily motivation.

Unlocking the green hydrogen revolution
With our research project “Brande Hydrogen” and the goal of developing an offshore turbine with integrated electrolyzer, we are leading the way to a climate-neutral energy supply. The production of green hydrogen will provide an additional source of revenue for existing wind and solar farms as well as new projects. The potential is huge. At least 20 GW of wind power capacity for green hydrogen production will be needed just to be able to produce steel in Germany without emissions.


04

SIEMENS Gamesa
RENEWABLE ENERGY

Siemens Gamesa Renewable Energy GmbH & Co. KG

Address	Beim Strohhause 25 20097 Hamburg
Phone	+49 (0)40 822118000
E-Mail	Deutschland@ siemensgamesa.com
Web	www.siemensgamesa.com
Category	Manufacturers
Profile	Wind turbines (> 100 kW)
Turnover	€ 10,198 billion
Employees	26,000
Founding year	1976

VENSYS Energy AG

More energy for the future
Globally, some 30,722 wind turbines with a total of ~60 GW are currently using VENSYS technology.
- Five platforms with numerous rotor and tower variants
- Tailor-made project development and yield-optimised site adaptation
- Manufacturing and logistics capacities for projects around the world

VENSYS ENERGY develops and manufactures highly efficient gearless wind turbines for maximum yield. Their characteristic features include permanent magnet-excited multi-pole generators, toothed belt drives for maintenance-free rotor blade adjustment, a simple generator cooling system, and a full power converter system with power plant properties.

Our 1.5 MW to 6.2 platforms are made of only a few high-quality and durable components. The simple, compact design, low maintenance requirements, and benefits of wear-free system components already ensure increased output yields. But we also use our bespoke project development process to create optimised customer-specific wind turbines – even for small wind farms, incorporating local interests in Community Scales, or providing customised corporate power supply solutions.

VENSYS provides municipalities and investors with low-maintenance solutions, all the way from individual case-specific planning processes to installation and grid connection and an attractive service package with guaranteed availability over the entire contract period.

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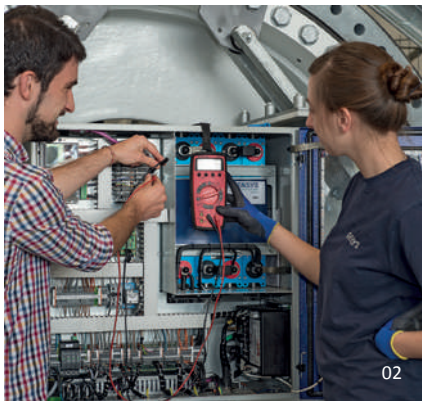
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Our small-scale manufacturing operation also gives us the flexibility to provide tailor-made features. The ongoing transfer of new developments into VENSYS products are based on our own production operations at our central plant in Germany. Therefore, technological innovations go hand in hand with solid workmanship, a complex quality management system, and short just-in-time lead times. Together with our subsidiaries we offer a comprehensive range of services that can be scaled to meet specific requirements. Our ongoing and coordinated development of central plant components guarantees seamless functionality and more added value throughout the entire supply chain and wind turbine life cycle.

The VENSYS Group product and service range includes full inverter and pitch systems, electronic components, grid connection, grid planning and integration, system certification, and in-house production as well as rotor blade development.

Operationally reliable and high-yield regardless of the location. Proven in tough conditions on four continents.

Our wind turbines, which are made in Germany, are currently connected to power grids in Germany, Poland, France, Great Britain, Spain, Cyprus, the USA, and Canada. Our subsidiary in Poland and VENSYS Inc. in the USA are currently helping us to develop additional markets.

VENSYS is exporting its proprietary products around the world and driving the development of advanced wind power generation technology. Our successful licensing model combines innovative German technology and expertise with serial production, market development, and logistics operations in an international corporate network, which enables us to implement our own large-scale projects anywhere in the world.

01 | The VENSYS production facility in Neunkirchen, Germany
02 | The VENSYS training centre in Neunkirchen, Germany
03 | VENSYS headquarters in Neunkirchen, Germany
04 | The VENSYS production facility in Neunkirchen, Germany
05 | Brake: ten VENSYS units being shipped to the USA

As high-growth multipliers, our most important licensees – Goldwind and ReGen Powertech – manufacture VENSYS systems for India, China, Asia, the USA, South America, Australia, and Africa. VENSYS wind energy technology has been proven on four continents under a huge diversity of climatic conditions, all imaginable power grid conditions, and even in regions with underdeveloped infrastructures. Some 30,722 VENSYS wind turbine systems have been installed around the world with an approximate combined output of 60 GW and are being supported by regionally adapted and customer-oriented service packages.

The new 5S platform, which builds upon the expertise of three decades of innovative engineering and has a capacity of between 5.8 and 6.2 MW, will be on the market as of 2022.

VENSYS

VENSYS Energy AG

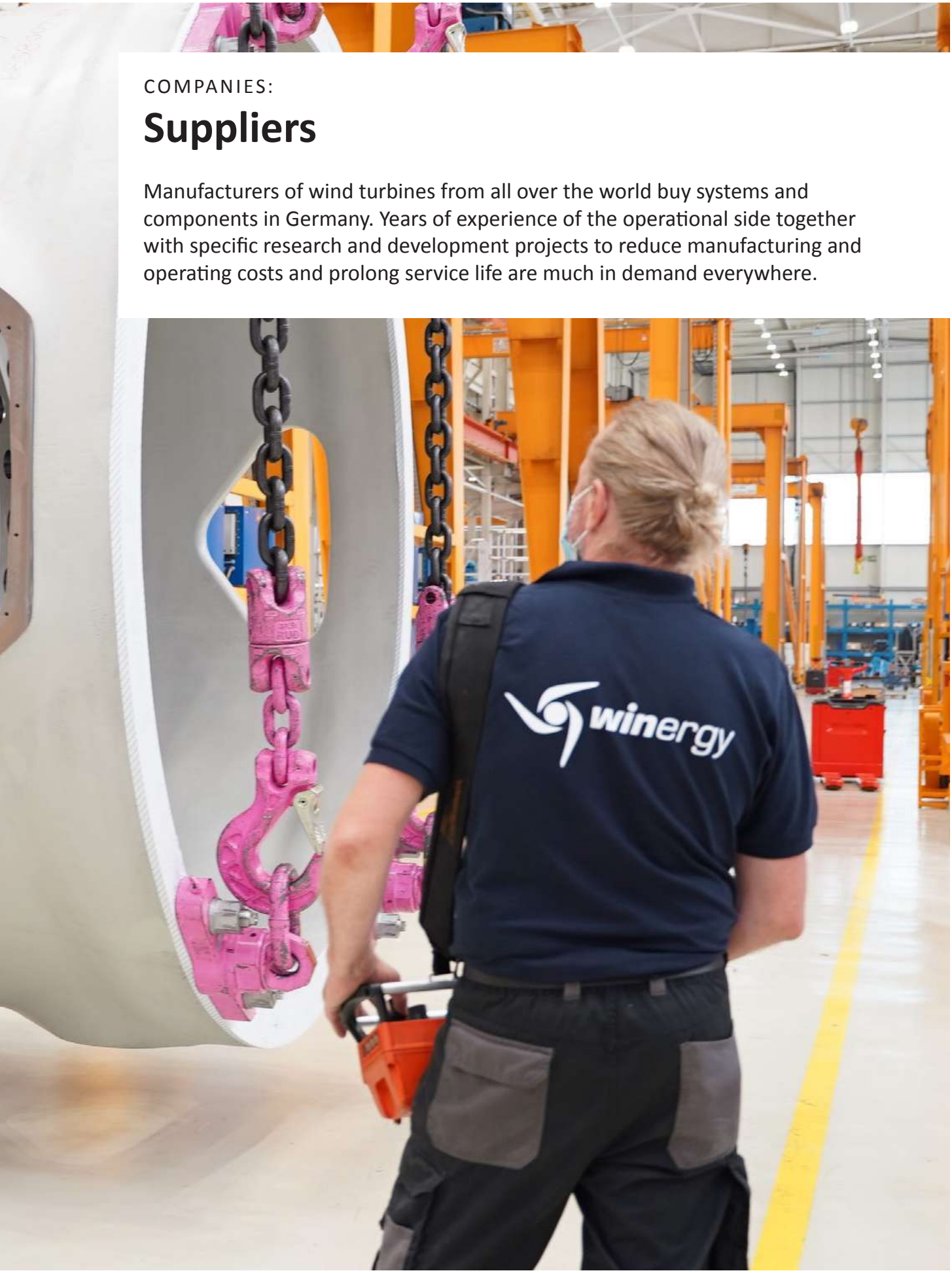
Address	Im Langental 6 66539 Neunkirchen
Phone	+49 (0)6821 9517-0
Fax	+49 (0)6821 9517-411
E-Mail	vertrieb@vensys.de
Web	www.vensys.de
Category	Manufacturers
Profile	Wind turbines (> 100 kW)
Turnover	€ 100 million
Beschätfigte	172 in Neunkirchen, 81 in Diepholz, in Spain, Pologne and USA ~ 40
Founding year	2000

Photo: Winergy

COMPANIES:

Suppliers

Manufacturers of wind turbines from all over the world buy systems and components in Germany. Years of experience of the operational side together with specific research and development projects to reduce manufacturing and operating costs and prolong service life are much in demand everywhere.



Bachmann electronic GmbH

Secure the future of your wind farm
Bachmann electronic offers automation solutions for the most demanding onshore and offshore applications. The Austrian manufacturer has equipped more than 120,000 wind turbines, making Bachmann the global number one in wind automation.


01

01 | Smart Turbine Automation: In order to be future-proof, wind turbines must do their part to provide complex data. Bachmann creates an alliance of control, SCADA, park control, condition monitoring and data.

bachmann.

Bachmann electronic GmbH

Address	Kreuzäckerweg 33 A-6800 Feldkirch
Phone	+43 (0)5522 3497 0
Fax	+43 (0)5522 3497 1102
E-Mail	info@bachmann.info
Web	www.bachmann.info
Category	Suppliers of electrical and electronic components
Profile	Controls, cables & switchgear cabinets
Turnover	€ 88 million
Employees	> 500
Founding year	1970

Bachmann delivers future-proof technologies, maximum availability and the highest quality from a single source. Above all, our customers benefit from 50 years of experience; we develop tailor-made solutions to solve the most demanding challenges in automation.

Automation solutions in every area of wind power
From controller systems and condition monitoring, to Wind Power SCADA and grid connection technology; we offer complete solutions for the wind industry. Our systems stand for extraordinary robustness, high performance and open, standardized interfaces. With our intelligent sensors and power management algorithms, your wind farm is open, flexible, and future-proof even under the most extreme conditions. Innovative, comprehensive system solutions allow for the efficient development of wind turbines and integrated predictive maintenance, increasing the overall productivity of your wind park.

Smart turbine automation / operations management
- Modular, hardware / software architecture
- Model-based engineering in PLC, C / C ++, Matlab / Simulink®
- Integrated safety technology
- Configurable access protection and logging
- Configurable, scalable turbine software templates according to the IEC standard
- Grid measurement / monitoring and grid protection
- Certified, integrated CMS

Smart grid / park controller
- Smart Power Plant Controller (SPPC) certified according to the new VDE-AR-N-4110/4120
- Scalable, configurable hardware / software
- Energy / telecontrol protocols IEC60870, IEC61850, IEC61400-25, Modbus, etc.
- Web-based user / diagnostic interface

SCADA / visualization
- Modular, flexible, web-based SCADA system (atvise®)
- “Ready-to-use”: wind-specific, configurable widgets and dashboards
- OPC UA interface and IEC61400-25 based data structures
- Integrated, configurable access management
- Cascadable server structure

Lifetime Extension
- Remote monitoring software and service
- Turbines: Tower vibration / structure monitoring
- Rotor blade monitoring (load, structure)
- Retrofit solutions for turbine control, CMS, SCADA and park controllers

Maintenance / service / diagnosis
- Comprehensive service and diagnostic tools
- “ServiceCenter” for convenient, efficient software updates Data recorder for network monitoring and analysis
- Comprehensive support and training program

Bachmann Monitoring GmbH

Your turbines are in good hands!
Bachmann Monitoring delivers measuring systems for condition-based maintenance. Investment security and high turbine availability are founded on these Condition Monitoring Systems. From our competence center, we monitor many thousands of systems of a variety of turbine types and manufacturers.

At Bachmann Monitoring, our core competency is the measurement and analysis of vibrations, enabling the precise monitoring of onshore and offshore wind turbines.

Intelligent Solutions: Certified remote monitoring service is the basis for the efficient surveillance of decentralized systems. The early detection and localization of weak points ensures the operation and increases the yield in the long term.

The impact sound-based condition monitoring of the drive train components can be complemented with diagnostic functions such as blade load and structure monitoring. The cantilever sensor – the latest development, enables not only ice detection, but also robust rotor blade load measurement and, in particular, structural monitoring of the rotor blades.

As an additional service, Bachmann can also generate offline and online vibration analysis reports.

We offer both controller-integrated condition monitoring solutions and type-independent CMS versions. These systems enable, for example, the safe monitoring of rotor imbalance and the alignment of the drive train components.

All Bachmann CMS meet international standards, for example IEC 61400-25-6. The compatibility of the information models and the exchange of information are always guaranteed. Extensive CMS integration into existing network structures and control room systems is possible.


01

01 | Experts in Condition-Based Monitoring

Acquisition:
In January 2021, Bachmann expanded its scientific expertise through the acquisition of Indalyz Monitoring & Prognostics GmbH. This step further strengthens Bachmann's Condition Monitoring service offering, enabling real-world problems to be solved through the application of scientific, mathematical approaches.

International:
Our customers all over the world trust in the service and technology from Bachmann.

bachmann.

Bachmann Monitoring GmbH

Address	Fritz-Bolland-Str. 7 07407 Rudolstadt
Phone	+49 (0)3672 3186-0
Fax	+49 (0)3672 3186-200
E-Mail	vertrieb-monitoring@bachmann.info
Web	www.bachmann.info
Category	Suppliers of electrical and electronic components
Profile	Condition monitoring systems
Employees	> 60
Founding year	1998

Beckhoff Automation GmbH & Co. KG

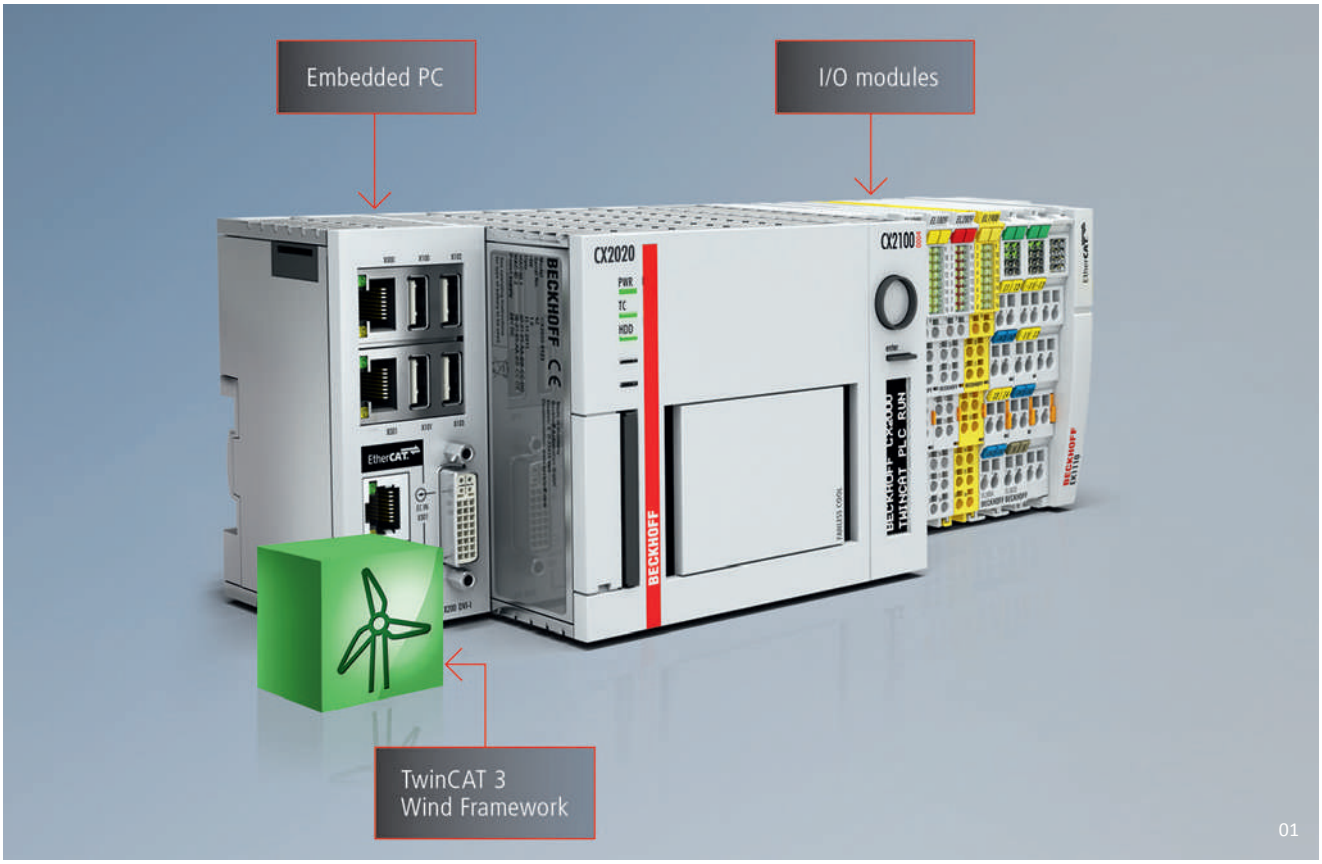
Beckhoff know-how from over 85,000 wind turbines
On the basis of the PC-based control and EtherCAT technology, Beckhoff makes system solutions available for wind turbines that have been tried and tested worldwide: more than 85,000 wind turbines all over the world up to a size of 14 MW have been automated using Beckhoff technology.

In this respect, our control architecture is perfectly suited to the requirement profile of the industry: openness and scalability, flexibility in the design of the controller and a high degree of integration.

PC-based control: the universal control platform for wind turbines

All processes, from the operational management and control of pitch, converter, gearbox and brakes through to wind farm networking, are executed in software on an Industrial PC. Safety technology and condition monitoring are integrated seamlessly into the terminal segment via corresponding I/O modules. A separate CPU can thus be dispensed with.

The real-time Ethernet system EtherCAT offers full Ethernet compatibility and outstanding real-time characteristics. Beyond that, it is characterized by flexible topology and simple handling. In the new TwinCAT 3 Wind Framework, the turbine manufacturer has a software tool at its disposal that gives it optimum assistance in the programming of its facilities and ports the Industrie 4.0 approach to wind energy.



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Another advantage: Lower-level fieldbuses such as CANopen, PROFIBUS and Ethernet TCP/IP can be relocated to the field via fieldbus master or slave terminals for the control of subsystems. Software libraries and hardware components specially developed for the wind power industry round out Beckhoff's wide range of solutions.

The expertise acquired over more than 20 years of collaboration with turbine manufacturers in the wind energy industry makes Beckhoff a reliable partner with high solution competence. Together with the international Beckhoff subsidiaries, our expertise team in Lübeck offers worldwide support for all areas of wind turbine control: The services offered range from developing application-specific software libraries to support during the commissioning phase and control cabinet construction.

With PC-based control, you benefit from:

- a universal control platform for operational management, pitch control, farm networking and condition monitoring
- high flexibility when it comes to controller design
- performance-related scalability
- modular expandability
- reduced hardware and engineering costs
- increased efficiency and cost-effectiveness
- improved competitiveness

According to the customer's specifications, the Beckhoff engineering department takes on the complete control cabinet construction, starting with wiring diagram design through to prototype or serial production.

01 | A Beckhoff Embedded PC with line-connected I/O modules, EtherCAT as the universal communication system and TwinCAT automation software functions as the central control platform for wind turbines. Sturdy, modular and scalable hardware components as well as the utilization of industrial communication standards give turbine operators optimum protection of their investment and maximum flexibility in controller design..

BECKHOFF
New Automation Technology

Beckhoff Automation GmbH & Co. KG

Address	Wahmstraße 56 23552 Lübeck
Phone	+49 (0)451 203988-0
E-Mail	wind@beckhoff.com
Web	www.beckhoff.com/wind
Category	Suppliers of electrical and electronic components
Profile	Controls, cables & switchgear cabinets
Turnover	€ 923 million (2020)
Employees	4,500
Founding year	1980

Bathan AG

We focus on our customer's performance
Ceramic lubricants and additives reduce gearbox & engine performance losses. BATHAN's ceramic greases guarantee smooth operations and extended lubrication intervals and contribute towards sustainability by reducing the quantities used.

BATHAN®
swiss made lubricants

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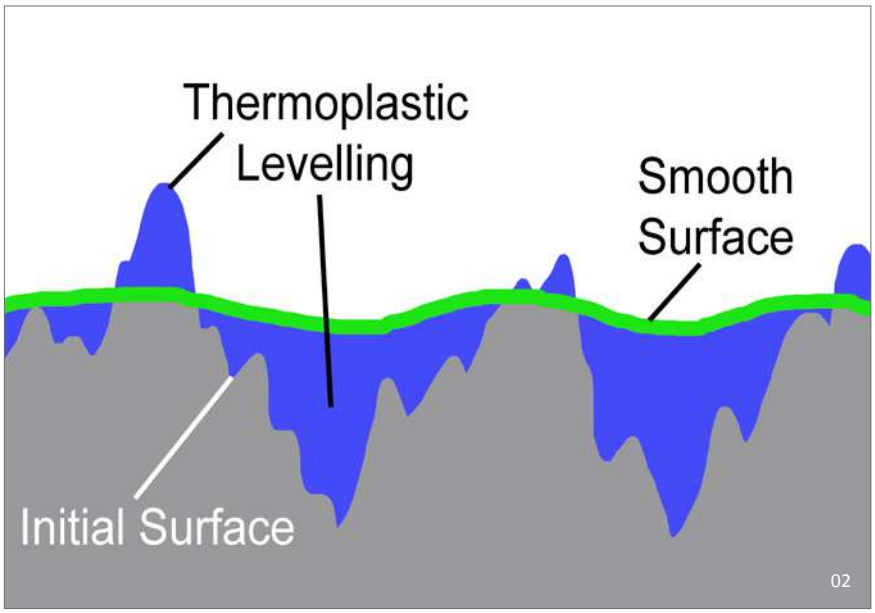


02

We help our customers meet the challenges posed by wear and tear, resource optimisation, and ecological responsibility. Our superior lubricants reduce wear and minimize downtime as well as performance losses in engines and gearboxes. BATHAN's ceramic greases guarantee smooth operations and extended lubrication intervals and contribute towards sustainability by reducing the quantities used.

High Performance Ceramic Lubricants – Made in Switzerland

BATHAN ceramic greases are suitable for all challenging applications in main bearings, gear bearings and pitch and clearly surpass the performance of conventional lubricating greases. The BATHAN additive for gears protects tooth flanks, reduces vibrations and improves smoothness.

BATHAN®
swiss made lubricants

Bathan AG

Address	Alte Steinhauserstr. 19 CH-6330 Cham
Phone	+41 (0)41 740 45 27
Fax	+41 (0)41 740 45 29
E-Mail	info@bathan.ch
Web	www.bathan.ch
Category	Suppliers of mechanical components
Profile	Lubricants & lubrication systems

01 | Bathan AG
02 | Thermoplastic Levelling

DBK David + Baader GmbH

Together, whatever the climate
Your partner for heating, cooling and temperature control. Customize solutions are our specialty. Together, we will find the best solution for your application – from modified standard to a patented new product development.

Industrial Thermal Management

Electrical heating & cooling solutions for industrial applications.

DBK is a well-established brand when it comes to high-quality, innovative products for global markets. The company offers a wide range of individual components or system solutions based on both, state-of-the-art PTC heating technology and conventional wire heating.

Such as their solutions for wind power plants – suitable for operation in cold or warm climates, onshore and offshore, able to prevent frost or condensation, for heating and climatization – DBK will find the right fit for your complete assembly or functional unit, such as collectors in generators.

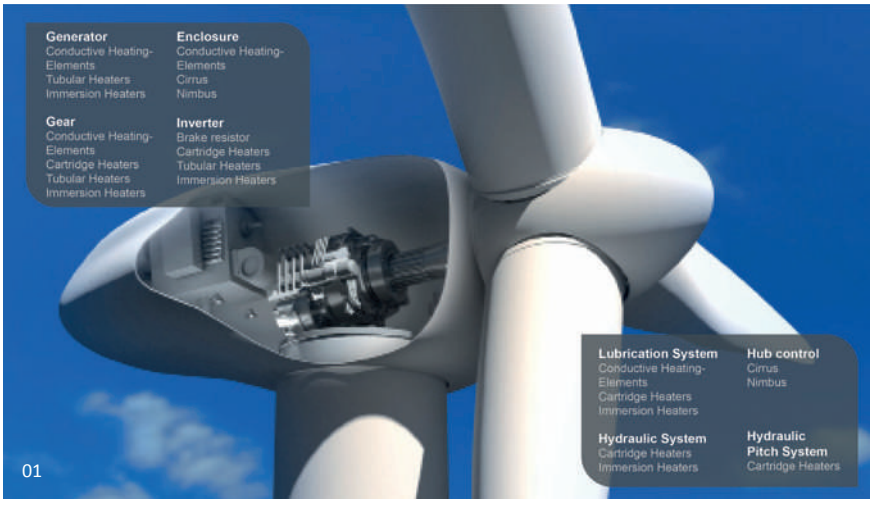
02

DBK is your development partner. With 75 years of experience, they offer an all-round engineering service, from specification through the entire project journey, to your final solution for wind power plants.

01 | Heating solutions for wind turbines
02 | DBK Headquarters Rülzheim
03 | Heating solutions Wire & PTC
04 | Temperature control in enclosures

03

04



01

DBK

DBK David + Baader GmbH

Address	Nordring 26 76761 Rülzheim
Phone	+49 (0)7272 7704 10
E-Mail	itm-de@dbk-group.com
Web	www.industrial-de.dbk-group.com
Category	Suppliers of electrical and electronic components
Profile	Cooling & climatisation
Employees	700
Founding year	1946

HAWART Sondermaschinenbau GmbH

Wind power in motion – our passion – your success!
We meet our customer's requirements using innovative solutions. Our design and production facilities at Lower Saxony and our mechanical and electrical engineering activities meet the highest quality standards. Our customers associate HAWART with flexibility, reliability, and know-how.


01


02

OUR SERVICE OFFERINGS:

- Concept and feasibility studies
- Project planning and production layout
- Design: mechanical, hydraulics, pneumatics, electrical engineering
- Control systems Documentation and certification
- Prototype construction and load testing
- Installation and commissioning
- Classroom and on the job training
- Service and maintenance

OUR PRODUCTS:

- Rotor blade manufacturing equipment
- Spreader and lifing tools
- Assembly tools
- Logistics components
- Storage fixtures
- Mechanical processing systems
- General mechanical engineering

U-BIT

The U-BIT enables our customer to assemble or disassemble rotor blades weighing up to 27.5 tons directly on the wind turbine. Minor adjustments to the blade seats guarantee flexible use for many different blade contours. The U-BIT comes in a 40 ft. open top container for effective and safe transportation to the construction site. It takes just one hour for assembly and ready for use. For transportation around a wind farm, the U-BIT can be folded-up in a few simple steps and transported on an open flat trailer.

Universal blade transport system

In the field of logistics, HAWART has been one of the leading manufacturers of land and sea transportation and storage systems for rotor blades, tower sections and other wind turbine components. Together with the vehicle manufacturer DOLL, HAWART has developed a U-BTS (Universal blade transport system) for transporting blades by road. The blade root, is connected in the flange area to the hydraulic lifting adapter on the towing vehicle. The maximum load capacity is 35 tons. The blade tip is safely held in two transport clamps and carried on a HAWART designed tandem frame. Thus creating a trailer with precise self-steering-characteristic.

01 | U-BIT – the universal rotor blade installation tool
02 | U-BIT – test on the HAWART premises
03 | The powerful HAWART Hinge


03

HAWART
windpower in motion

HAWART Sondermaschinenbau GmbH

Address	Handwerksweg 8 27777 Ganderkesee
Phone	+49 (0)4222 941390
Fax	+49 (0)4222 9413960
E-Mail	info@hawart.de
Web	www.hawart.de
Category	Suppliers of large components
Profile	Rotor blades & rotor blade materials
Turnover	€ 17 million
Employees	100
Founding year	1993

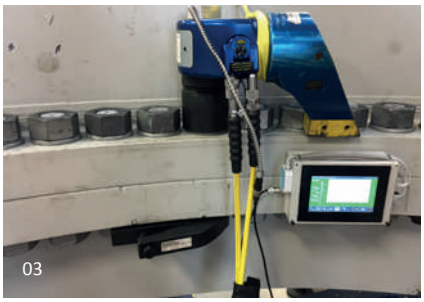
HYTORC (Barbarino & Kilp GmbH)

HYTORC – Mobile industrial bolting technology

As the world's leading manufacturer for industrial bolting technology, HYTORC developed various tightening methods in order to increase process safety and enable seamless bolting documentation. This way costly inspections and maintenance efforts can be reduced. Furthermore, mobile and flexible bolting technology enables light construction methods.

01

02



03

Our digital, battery powered (18V / 36V) electric torque tools can be used for bolting applications from 30Nm to 6.799Nm.

LITHIUM SERIES II is the first electric torque tool with innovative TorcSense™ Technology which directly measures torque providing more repeatable results. The tool features an intuitive user interface, Bluetooth wireless technology and easy configuration directly via display. The LST II can also be operated via app.

The hydraulic pump Eco2TOUCH is the ideal tool for digital, mobile and process-reliable bolting from 60Nm to 80.000Nm. The integrated documentation ensures secure fastening for safety-critical bolt joints in the wind power industry – even for coated components.

HYTORC's tightening methods ensure automated bolting, assessment, documentation and statistics:

- DGA: Torque-controlled tightening
- DGD: Torque-controlled/angle-monitored tightening
- DGS: Torque-controlled/yield point-monitored tightening
- DDW: Torque-angle-controlled tightening
- SGA: Yield point-controlled tightening
- SGD: Yield point-controlled/angle-monitored tightening
- EXT: Externally controlled tightening with random measuring sensors with standard industry interface

The Eco2TOUCH pump is intuitively operated and controlled via a touch screen. A scanner or specific software can be used as well. Automated documentation ensures process safety with in form of text, statistic and graphic-chart of all process-parameters for stability considerations. This results in manipulation-proof documentation through consistent monitoring, system transparency, system analysis, bolt management and visualization of process data – especially for high-risk bolted joints.

Find our more: https://www.hytorc.de/en/mobile-digital-bolting/

04

01 | Electric torque tool "LITHIUM SERIES II" with digital screen and smart features.
02 | XLCT-Trolley-Set for safe, comfortable and digitized bolting in windturbine-towers
03 | Digitized, process-reliable bolting in the wind power industry
04 | NEW: MXT+: Durable hydraulic torque multitool

HYTORC

HYTORC (Barbarino & Kilp GmbH)

Address	Justus-von-Liebig-Ring 17 82152 Krailling
Phone	+49 (0)89 230 999 0
Fax	+49 (0)89 230 999 14
E-Mail	info@hytorc.de
Web	www.hytorc.de
Category	Suppliers of mechanical components
Profile	Tools & machine tools

Lanthan GmbH & Co. KG

Combining aviation safety and acceptance by residents
Acceptance by residents and aviation safety are two outstanding tasks for the wind energy sector – and they are not incompatible. Lanthan produces products that impress in terms of their durability, sustainability, and local acceptance.


01


02

For 20 years, the core competence of the Lanthan companies and their 70 employees has been the development, production and planning of airborne obstruction lights, lighting systems and demand-controlled night-time identification systems for on- and offshore use around the world. Our comprehensive product portfolio includes bespoke solutions for all requirements and markets. Our passion for the challenges faced by our customers is what makes us unique. Our engineering team develops flexible solutions and provides support until the goal is reached.

Minimising costs through sustainability: We have never discontinued a product, because we develop them for long life and reparability, and even keep older product lines updated. We rework every returned lamp to produce an as-new replacement at a favourable price.

Acceptance by residents as a challenge: One of Lanthan's key areas of expertise is the development of solutions that help gain local acceptance. Our beacons shine only as brightly as necessary. The ARC-SIRIL, for example, is a modification of existing beacons with reduced visibility from the ground, whilst maintaining the same level of aviation safety. With special permission, the system can be used in Germany.

lanthan SafeSky
03

We have been pursuing the development of **demand-controlled night-time identification systems,** which are based on transponder signals, ever since the company was founded and have been working towards its introduction for many years – successfully: **Lanthan Safe Sky GmbH** was founded in April 2020. With over 20 employees, the company is working on implementing demand-controlled night-time identification systems, the first of which has been recognised under the new administrative regulations.

Lanthan Safe Sky builds on the expertise of the three participating companies RECASE, AirAvionics and Lanthan.

01 | Lanthan obstruction lights by night
02 | Beaconing concept ARC-SIRIL
03 | Lanthan Safe Sky GmbH
04 | Offshore obstruction lights


04

LANTHAN

Lanthan GmbH & Co. KG

Address	Jakobistr. 25A 28195 Bremen
Phone	+49 (0)421 696 465 0
Fax	+49 (0)421 696 465 11
E-Mail	info@lanthan.eu
Web	www.lanthan.eu
Category	Suppliers of electrical and electronic components
Profile	Aviation obstruction markers & lighting systems
Employees	60 (Wind energy: 40)
Founding year	2004

BWE
German Wind Energy Association

The Who's Who of the German wind industry

Your company is not listed in the publication?
You'd like to be included again next year?
Then don't hesitate!

Print & Online

Specification:

Company profile and/or **Address entry**
- in the print publication
- as pdf
- and in the online database

Free distribution around the world at trade fairs and conferences

Free copies for your own marketing

We'll be glad to advise you:
Klaus Barkeling:
k.barkeling@wind-energie.de
Nikos Fucicis:
n.fucicis@wind-energie.de

Published in German and English.

Windindustry in Germany
www.windindustry-in-germany.com

Next release date: September 2022

Megger GmbH

Megger products cover almost every application within the electrical testing and mensuration technology sector from power generation to domestic power sockets.

01 | Megger's new site in Aachen
02 | Training station for protective relay testing
03 | Training area for practical applications

Megger has been a global leader in electrical testing and mensuration technology for 130 years. Megger products cover almost every application within the electrical testing and mensuration technology sector from power generation to domestic power sockets.

Our products are **divided into seven main application segments:** cable testing and diagnostics, protective relays and systems, circuit breakers, transformer testing and diagnostics, low-voltage systems, general electrical testing and motor and generator testing.

We have production facilities at various **locations in Germany, the USA, the UK, and Sweden.** Our head office is in Dover, England, and there are sales offices all over the world. Megger has undergone significant growth through acquisitions, including Programma (2007, Sweden), SebaKMT (2012, Germany), Baker Instruments (2018, USA), Power Diagnostix (2019, Germany), STEVO Electric's BALTO product line (2020, Belgium) and the electrical certification company Vespula Ltd. (2020, UK).

We have a deep emotional identification with our corporate values. Our corporate culture not only makes us a successful company, but also, first and foremost, an innovative and reliable business partner to help you meet the challenges of the wind energy sector, a fact that is also evident in our comprehensive further education and training programme.

Megger's testing and mensuration technology can support you in the following areas:

- cable fault detection, cable testing and diagnosis
- protection relays and switchgear
- circuit breakers
- transformer testing and diagnosis
- low voltage systems
- general electrical testing equipment
- motor and generator testing
- battery testing
- earthing tests

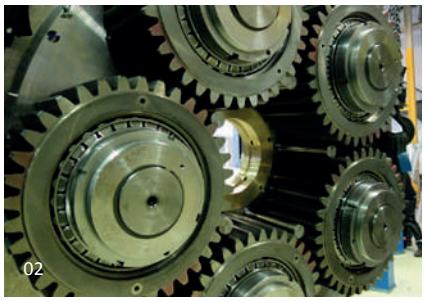
Megger GmbH

Address	Weststraße 59 52074 Aachen
Phone	+49 (0)241 91380 500
Fax	+49 (0)241 91380599
E-Mail	info@megger.de
Web	https://de.megger.com
Category	Suppliers of electrical and electronic components
Profile	Measurement equipment & measuring masts
Founding year	1889

Multigear GmbH

Dialogue with Experts
Spare- and exchange gearboxes • Overhaul & Upgrades • Own gearbox testbench • Gearbox repair on site / Up-Tower repair • Maintenance & Inspection / Endoscopy • Consultacion & Training • Spare parts management • 24h-Hotline


01


02


03

The team of Multigear GmbH, since decades in gearbox business, is thinking about one thing only: Service.

Our long-term experience in handling gearboxes and their damages offers the unique combination of know-how from a gearbox manufacturer and the absolutely goal to serve perfect service to the customer.

After working many years for a manufacturer of gearboxes for Wind Energy it has been realized, that essentials such as reliability, efficiency and confidential cooperation are the most important requirements in service business. In order to fulfill these essential criteria according to our conceptions, we are able to convert these points consequently, even under the pressure of daily business.

You are in good hands, independent by which manufacturer your gearbox has been built.

Our promise is always at your service: Within 24 hours (Europe) and 48 hours (worldwide) on site. Promised!


04

01 | Exchange gearboxes
02 | Overhaul and Upgrades
03 | Workshop
04 | Repairs on site

MULTIGEAR
DIALOGUE WITH EXPERTS

Multigear GmbH

Address	Am Flugplatz 34 56743 Mendig
Phone	+49 (0)2652-936050
Fax	+49 (0)2652-9360520
E-Mail	info@multigear.de
Web	www.multigear.de
Category	Suppliers of mechanical components
Profile	Gears
Turnover	€ 7 million
Employees	38
Founding year	2010

NGC Gears – NGC Transmission Europe

Geared for a Better Future
Our brand NGC GEARS has been one of the largest international suppliers of main gearboxes and pitch and yaw drives for on- and offshore wind turbines for more than fifty years.
At NGC future-oriented drive train solutions and professional services go hand in hand.

80,000

main gearboxes in operation worldwide

01

02

NGC GEARS

We understand the diverse challenges that gearbox technology has to cope with in the wind energy sector and cater to different performance classes and environmental conditions.

Currently over 80,000 NGC main gearboxes are setting the pace in wind turbines in more than thirty countries around the world.

NGC Gears – NGC Transmission Europe

Address	Schifferstr. 196 47059 Duisburg
Phone	+49 (0)203 509 600 0
Fax	+49 (0)203 509 601 90
E-Mail	wind-eu@NGCtransmission.com
Web	www.NGCtransmission.de
Category	Suppliers of mechanical components
Profile	Gears

DRIVE TRAIN SOLUTIONS

Our portfolio includes standard series gearboxes of different performance classes as well as customized gearbox series. Our engineering team ensures that every NGC gearbox is optimally designed through the application of precise calculations, extensive analyses, and the latest simulation technologies. Reliability is our highest priority.

CATALOGUE OF SERVICES

- Consulting
- Project planning
- Service engineering
- Simulation and analyses
- Repairs Up-/Down-Tower
- Maintenance
- Inspections
- Independent oil analyses
- Gearbox replacement
- Spare parts, spare part kits
- Documentation

SERVICE SOLUTIONS

We guarantee a fast and flexible gearbox service. Thanks to the high availability of spare parts and replacement gearboxes, as well as our pool of qualified in-house service teams and service partners certified by us, we are ready to do our job on every wind turbine at short notice. Not only do we offer damage repairs, we also offer gearbox overhauls and design service and maintenance contracts according to your needs.

01 | NGC in numbers
01 | NGC around the world
03 | NGC Field Service

03

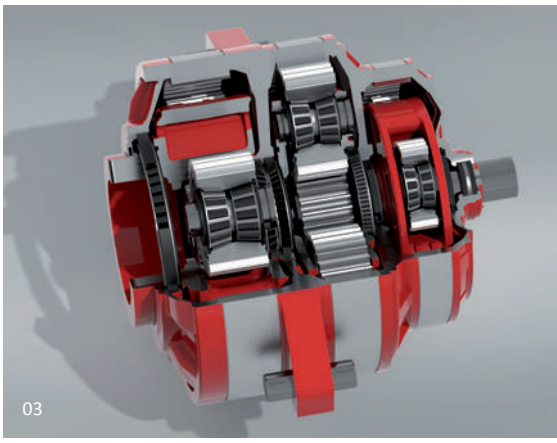
NSK Deutschland GmbH

Partnership based on Trust – Trust based on Quality
For two decades NSK has been a partner of the wind industry and one of the main suppliers of roller bearings for wind energy gearboxes and bearings for main rotor shafts and generators.

Combined know-how
Skills from sales and application technology are combined in the wind energy team – and also include the latest research results from our technology centres. Bearings are specifically designed using highly developed calculation and simulation tools. Our experienced engineers take account of load cycles, lubrication, deformation, thermal response and also extreme and maximum conditions. This is the only way to produce a construction with cost-optimised components that also reliably function under maximum loads and have a long service life.

NSK wind standard
As the first manufacturer, NSK defined the pioneering wind standard U303 for roller bearings back in 2008 – including a one hundred percent traceability of the components of every single bearing and all essential processes. NDT methods (non destructive testing) are also available to avoid grinding burn, fractures in material and structural breakdowns.

Long service life with BOC (black oxide coating) and patented materials
BOC treatment of bearings prevents untimely bearing failures caused by white etching cracks (WEC). The patented special material AWS-TF (anti white structure-tough) is also available for high-level requirements and reliably prevents damage caused by WEC. Our STF material (super-tough) has proved ideal when it comes to increasing the load rating and service life, especially for contaminated lubricants. Certification by DNV GL confirms: Using Super-TF material means that the basic dynamic load rating can be improved by 23 % in roller bearings, and 26 % in ball bearings. This is equivalent to a doubling of bearing fatigue life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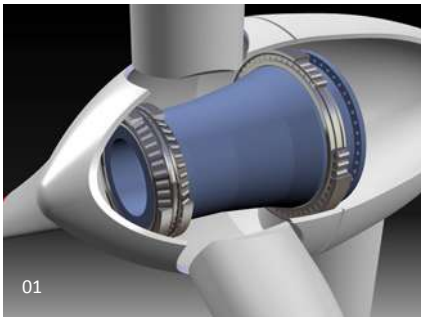
MOTION & CONTROL™
NSK

01 | Main rotor shaft bearing
02 | Planet wheel gear and bearing
03 |Main gearbox for wind turbines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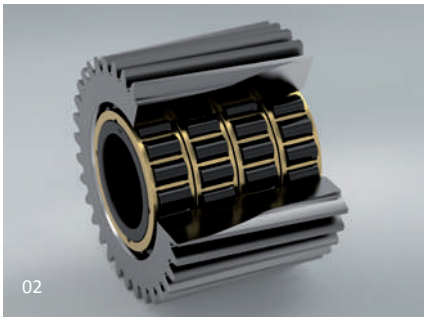
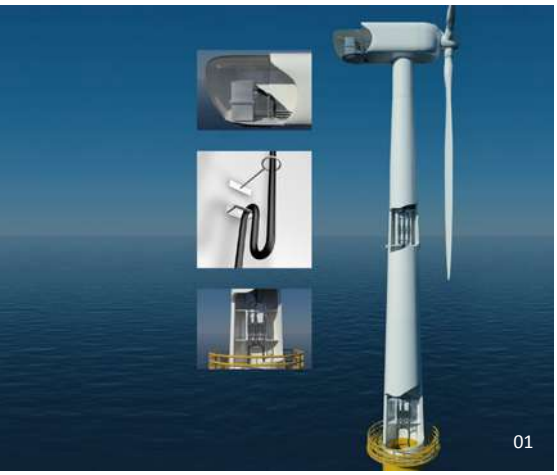

02

NSK Deutschland GmbH

Address	Harkortstraße 15 40880 Ratingen
Phone	+49 (0)2102 481-0
Fax	+49 (0)2102 481 2151
E-Mail	info-de@nsk.com
Web	www.nskeurope.com
Category	Suppliers of mechanical components
Profile	Bearings
Turnover	Global: ~ € 5,646 mill (as per March 2021)
Employees	Global: ~ 30,400 (as per March 2021)
Founding year	1916

Prysmian Kabel und Systeme GmbH

Harnessing the wind of change.
The Prysmian Group is the world's leading manufacturer for cables and systems for the segments energy, telecom, data and industrial.



01 | Moveable, free hanging or fixed. Prysmian cables can be used in many areas.
02 | New Cable laying vessel "Leonardo da Vinci" of the Prysmian Group
03 | Prysmian Group's product portfolio covers all your needs
04 | Harnessing according to customer requirements

To meet an ever-growing need for power, the world is increasingly turning to renewable and sustainably-sourced energy. In response to this demand, Prysmian's cables are helping wind turbine manufacturers around the globe to harness the true potential of this natural power source.

As a world leader in special cables for wind turbines, we are able to manufacture products for the wind industry for all voltages or, if required, fully assembled cable sets in our German and international production sites:

Nacelle & Loop
Special cables (optional halogen-free / flame retardant) with increased oil, heat and ozone resistance, as well as optimized torsion properties, up to 66 kV. **Our high-voltage cables are now available as lead-free version!**

Tower
Special cables (optional halogen free / flame retardant) for fixed installation with copper or aluminium conductors with excellent installation properties, up to 66 kV. **Our high-voltage cables are now available as lead-free version!**

Wind farm cabling
From the low- and medium-voltage cables for the wind farm infrastructure, through to the high-voltage grid, we supply all cables for onshore and offshore applications. In addition, we are able to supply cables as pre-assembled cable sets, as well as a service for fitting / commissioning or maintenance / turbine monitoring.

Our certified quality management with a worldwide focus ensures that product quality is always at the highest level, from the procurement and production processes, right through to the delivery process. With a focus on sustainable and environmentally friendly production processes, the Prysmian Group ensures that the fundamental principles of sustainable energy concepts are also implemented in its own company.

Prysmian Kabel und Systeme GmbH

Address	Alt Moabit 91 D 10559 Berlin
Phone	+49 (0)30 3675 40
Fax	+49 (0)30 3675 4571
E-Mail	kontakt@prysmiangroup.com
Web	www.prysmiangroup.de
Category	Suppliers of electrical and electronic components
Profile	Controls, cables & switchgear cabinets
Turnover	€ 11 billion
Employees	28,000
Founding year	1879

REWITEC GmbH

Longer lifetime and greater efficiency for your wind turbine(s)
Our innovative REWITEC technology protects and repairs the surfaces of gears and bearings in wind turbines.

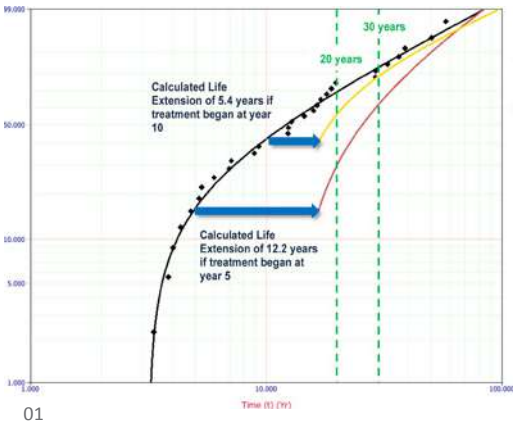
REWITEC, a medium-sized company based in Lahnau, was founded in 2003 and has been part of the English chemical group Croda International Plc since 2019. REWITEC has developed a patented and innovative surface-treatment technology for gears and bearings, which uses nano- and microparticles, the effectiveness of which has been proven scientifically.

Based on our 13-year experience in the wind industry and having treated more than 3000 wind turbines, we provide assistance to our customers around the world to address such issues as (micro-) pittings, run through marks, standstill damage and many other risk factors that could result in wind turbine failure. We offer our customers individual solutions, on-site application, and pre- and post-application surface analyses.


02

Our technology
Our technology uses lubricants as a carrier to form a self-repairing silicon layer of particles on the metal surfaces of gears and bearings. This ensures greater reliability, improved energy efficiency and a longer lifetime in so-called tribo-systems by significantly reducing surface roughness, friction, and temperature, which results, among other things, in a more even load distribution on the tooth flanks and in the bearing components. The technology can be used in both oil and grease lubricated systems.

REWITEC Keyfacts
- Extends the lifetime of drivetrain components
- Increases operational smoothness and reduces wear and tear
- Repairs damaged surfaces in gearboxes and bearings
- Scientifically proven friction reduction and increased efficiency
- Appropriate for use in old and new wind turbines
- The earlier the application, the greater the effect



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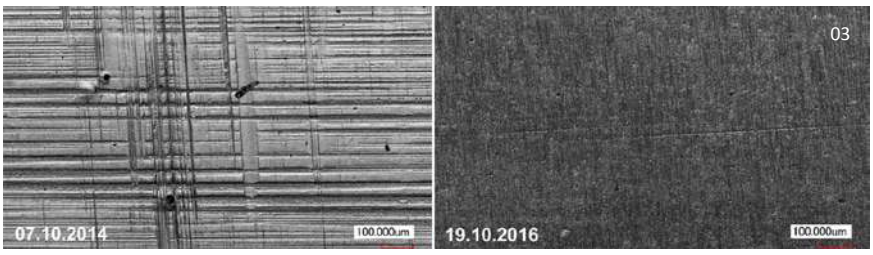


03

01 | The calculated service life extension of an SKF main bearing (1.5 MW Acciona WTG) through the use of REWITEC is up to 12 years – A study carried out in collaboration with Sentient Science.
02 | Drivetrain and bearing applications in the global on- and offshore sectors.
03 | Development of wear on the side of a Bosch Rexroth gear cog tooth (GE 1.5 SL WTG) over a two-year period. Surface imprint without (left) and with (right) the application of REWITEC technology.

REWITEC™
Part of Croda International Plc

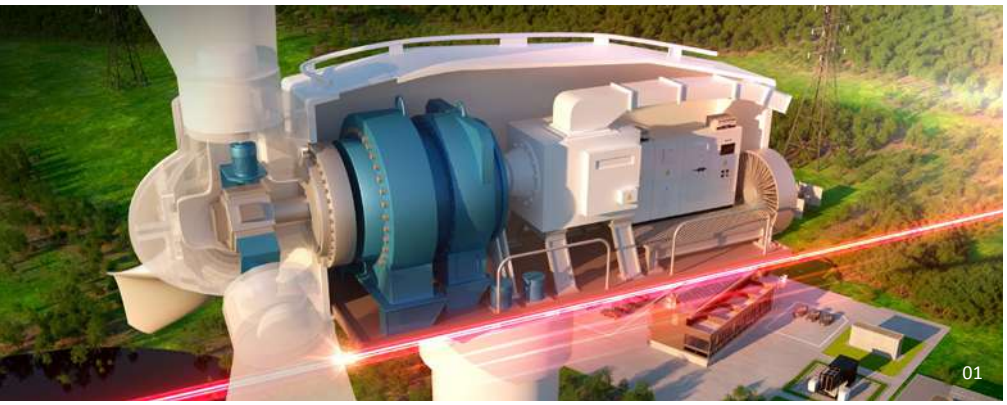
REWITEC GmbH

Address	Dr.-Hans-Wilhelmi-Weg 1 35633 Lahnau
Phone	+49 (0)6441 44599-0
Fax	+49 (0)6441 44599-25
E-Mail	rewitec.info@croda.com
Web	www.rewitec.com
Category	Suppliers of mechanical components
Profile	Lubricants & lubrication systems
Founding year	2003

Rittal GmbH & Co. KG

Higher speed and lower costs

Wind turbine manufacturers face enormous challenges in the construction and operation of turbines. With this in mind, Rittal and Eplan offer effective solutions to radically accelerate the planning and production processes which can significantly reduce costs.



01 | From the rotor hub to the nacelle to the tower – solutions from Rittal are used in wind turbines.
02 | Rittal is one of the world's leading system suppliers of enclosures, power distribution, climate control and IT infrastructure, as well as software and services.

Rittal GmbH & Co. KG

Address	Auf dem Stützelberg 35745 Herborn
Phone	+49 (0)2772 505-2219
E-Mail	hain.f@rittal.de
Web	www.rittal.com
Category	Suppliers of electrical and electronic components
Profile	Controls, cables & switchgear cabinets
Turnover	€ 2.6 billion (2019, Friedhelm Loh Group)
Employees	9,100 worldwide (Rittal); 11,600 (Friedhelm Loh Group)
Founding year	1961

We supply all wind turbine manufacturers worldwide, directly or indirectly via panel-building and switchgear engineering, and tap into significant cost-cutting potential through automation solutions and digitally integrating processes along the entire value chain," says Dr René Umlauft, Managing Director of Sales at Rittal.

In close collaboration with sister company Eplan and their software tools, Rittal is digitising and automating processes in enclosure design, planning, configuration and integration that were previously manual. The result is greater efficiency leading to compelling benefits in the investment and operation (CAPEX, OPEX) of wind turbines.

Rittal products deliver the strength, vibration resistance and corrosion protection vital to turbine dependability.

Highly solid and durable AX compact enclosures help ensure the pitch system located in the **rotor hub** operates reliably. To shield frequency inverters and control and safety components in the **turbine's nacelle** or **tower,** Rittal offers modular solutions based on its new VX25 large enclosure system.

The company also provides the Blue e+ climate control system, the world's most advanced and efficient cooling units, to ensure that perfect temperature and conditions are maintained in the enclosures. Furthermore, thanks to the IoT capability of the units, targeted maintenance can be planned and organised more intelligently.

Rittal's modular Ri4Power system allows for the configuration of low-voltage switchgear in compliance with any relevant standards. In addition, options for energy storage systems range from individual enclosures to complete containerised solutions.

Rittal also offers modular edge data centres, featuring low latency and maximum security for processing data.

Röchling Engineering Plastics SE & Co. KG

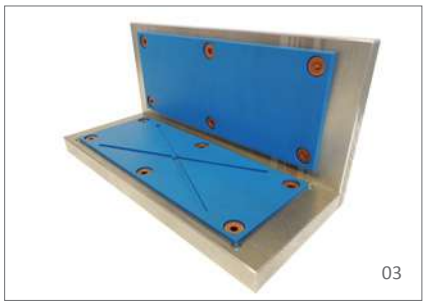
Increased efficiency with plastic!
For the development of wind turbines, Röchling Industrial offers a broad range of composites and thermoplastics used onshore and offshore by renowned manufacturers worldwide.

With strong wind, blade tip speeds of up to 300 km/h and strong UV radiation, wind turbines are permanently exposed to high loads. Designers are faced with the question of how a turbine can be efficient, reliable and safe to operate even under heavy loads. The potential of wind energy is enormous, but only turbines in operation make money. High efficiencies and reduced downtimes are required.

Röchling Industrial offers a comprehensive range of composites and thermoplastics. The high-performance materials help to **develop efficient and reliable systems.** Röchling products are used worldwide by well-known manufacturers in the rotor blade, tower and nacelle, and as electrical insulation parts. The goal is always to provide the designer with the ideal material for the task at hand.


02

For example, pultruded spar caps made of carbon fibre-reinforced or glass fibre-reinforced Durostone® ensure high-performance rotor blades thanks to their strength and structure. **Sliding pads** made of tribologically optimised materials developed jointly with OEMs ensure a fast, precise alignment of the nacelle in the azimuth system. Durostone® **trailing edge serrations** support noise optimisation and efficiency thanks to their high mechanical strength and UV resistance. The range also includes machined components for drive wheels, connecting elements, cable mounts and labyrinth seals.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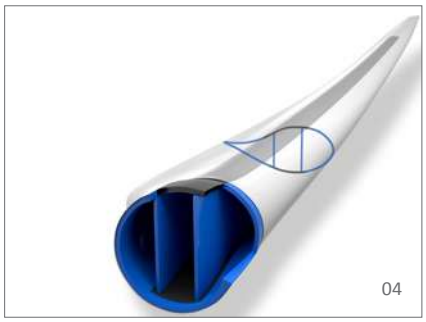

04

Get advice now!
The specialists from Röchling Industrial also provide advice during development. With 42 locations worldwide, the Röchling Industrial offers a comprehensive range of materials and manufacturing know-how close to customers everywhere.


01

01 | Röchling Industrial is a world leader for engineering plastics and composites in technical applications (Aerial foto of the site in Haren (Ems)/Germany).
02 | Durostone® trailing edge serrations support noise optimisation and efficiency.
03 | Sliding pads made of tribologically optimised materials ensure a precise alignment of the nacelle in the azimuth system.
04 | Pultruded spar caps made of carbon fibre-reinforced or glass fibre-reinforced Durostone® ensure high-performance rotor blades thanks to their high strength and structure.

Röchling

Röchling Engineering Plastics SE & Co. KG

Address	Röchlingstr. 1 49733 Haren (Ems)
Phone	+49 (0)5934 701-0
Fax	+49 (0)5934 701-299
E-Mail	info@roechling-plastics.com
Web	www.roechling.com/industrial
Category	Suppliers of mechanical components
Profile	Synthetic Components
Turnover	€ 801.7 million
Employees	3,863
Founding year	1916

SpanSet-Gruppe Deutschland

Quality and safety – made in Germany

The construction of ever more powerful and larger wind turbines increases the demands placed on grippers, cross beams, and heavy-duty round slings. Technical developments are required for secure slinging and lifting, which is what the SpanSet Group achieves in collaboration with testing institutes.


01

Internationally active, the SpanSet Group's core business is centred on hoisting technology, load securing, fall protection systems and safety management. Our own production facilities and sales organisations in Europe, the USA, Asia, and Australia employ around 1000 people and our 22 companies based in 19 countries provide global customer services. The SpanSet Group Germany includes SpanSet GmbH & Co. KG in Übach-Palenberg, SpanSet secutex GmbH in Geilenkirchen, and SpanSet Axzion GmbH in Langenfeld. The Group holding company is based in Wollerau on the banks of Lake Zurich.

Our product range for the wind power industry reflects the product range of the entire corporate group and includes load suspension equipment produced by SpanSet Axzion GmbH, a machine and steel construction company, textile slings and load and height safety devices produced by SpanSet GmbH & Co. KG, and coatings and surface protection elements produced by SpanSet secutex GmbH. The coordinated product ranges produced by these three manufacturers can be readily combined for various applications before being deployed as a complete tested and certified operational system: this is one of the great benefits that SpanSet has to offer as a homogeneous group of companies. Our site in Neustrelitz, Mecklenburg-Vorpommern has been certified as a manufacturer of load handling equipment for offshore use by DNV (Norway).


02


03

01 | The Upending Tool – the largest gripper worldwide with a capacity of 2,500 tonnes.
02 | The Tower Tool Kit – the proven solution for secure erection of steel towers.
03 | Turning rollers – super handy with Magnum-X heavy-duty round slings.
04 | The Vario-J-Hook for quick and careful turning.
05 | Magnum-X heavy-duty round sling with a load capacity of up to 500 tonnes.
06 | Reliable fall protection with the ClimaTech safety harness.

Complete solutions from a single source
SpanSet Axzion has established a seven-point programme known as Quality Seven (Q7), with which the company monitors and optimises its own performance from product development, materials procurement, drives and control technology through to production, testing, documentation and service delivery. Over 80 percent of all products we deliver are bespoke modifications. One of our prime areas of focus is on special solutions for the transportation and assembly of wind turbines.

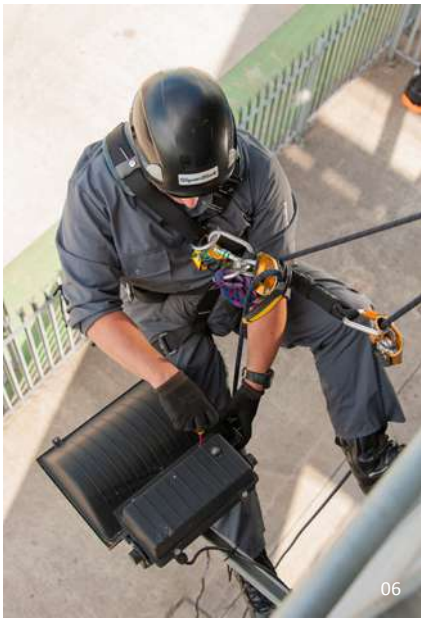
Upending Tool – all in hand
The "Upending Tool" for lifting and erecting monopiles is one of the products frequently used in this environment. With its six tongs, its three-arm grab can lift up to now 2500 tonnes. Whilst the tool's basic construction always remains the same, Axzion makes project-specific adjustments according to the customer's specification.

Tower Tool Kit – perfectly matched
The "Tower Tool Kit" components for lifting and erecting steel towers, which include the Magnum-X heavy-duty round sling, the pulley with turning rollers, the tower attachment point Vario-TAP, and the new Vario J-Hook XL which can lift up to 120 tonnes, all form part of the SpanSet Group's portfolio.


04


05

Magnum-X – extremely robust and compact
The Magnum-X heavy-duty round sling, whose outstanding feature is its compact design, has a maximum load capacity of 500 tonnes. It is up to 50 percent narrower and lighter than conventional round slings thanks to a fibre core comprised of high-performance fibres and a compact hose cover, which reduces wrinkling at the load reversal point and ensures a long service life. This design principle has also opened up new areas of application. For example, the carrying pins on heavy machines are often designed for wire ropes and standard commercially available round slings are only partially suitable for use with them. The Magnum-X fits neatly into the contour of the support pins thanks to its slim design, which means they can be used together with turning rollers when lifting steel towers.


06

ClimaTech – PPE for the worst case scenario
SpanSet has designed ClimaTech especially for work on wind power plants and metrological masts. The chest and back-mounted fall arrest points mean that ClimaTech can be used both as a fall arrest harness and as a work positioning harness.

Axzion®

SpanSet-Gruppe Deutschland

Address	Winkelsweg 172 40764 Langenfeld
Phone	+49 (0)800 299 466 457
Fax	+49 (0)2173 20 89228
E-Mail	info@axzion.de
Web	www.axzion.de
Category	Suppliers of mechanical components
Profile	Tools & machine tools
Turnover	> € 50 million
Employees	340
Founding year	1966

Schraubenwerk Zerbst GmbH

Fasteners for wind turbines
We fasten your wind turbine components safely and reliably. Wind turbine and component manufacturers around the world rely on Zerbst screws and fasteners.

SCHRAUBENWERK ZERBST GMBH SZ

Schraubenwerk Zerbst GmbH

Address	Altbuchsland 22 39261 Zerbst/Anhalt
Phone	+49 (0)3923 713-102
Fax	+49 (0)3923 713-200
E-Mail	info@schraubenwerk.com
Web	www.schraubenwerk.de/index_en.html
Category	Suppliers of mechanical components
Profile	Bolts & fasteners
Turnover	€ 65 million
Employees	275
Founding year	1919

The Zerbst plant has been manufacturing high-quality screws and fasteners for 100 years.

Schraubenwerk Zerbst has been supplying screws made of high-quality steel to the automotive industry as early as the 1920s. At that time, 30 % of overall production was exported to the US, UK, India and the Netherlands.

Nowadays the plant in Zerbst is a highly sophisticated production plant for fasteners. In addition to an extensive product range for rail track technology, Zerbst supplies industrial screws and screw fasteners to many industries. Customers around the world from the crane industry, automotive engineering, mechanical and plant engineering trust the Zerbst brand.

Sustainable production and sustainable business management are among the corporate principles of Schraubenwerk Zerbst GmbH.

Products in the field of renewable energy and wind turbines are ideally suited to this philosophy and are a dynamically growing business segment for the company.

Tower construction: HV sets up to M72 and stud sets up to M100, ready for installation with a preset friction c oefficient.

Offshore: Screw fasteners joining wind turbines to the seabed.

Rotor blade: Combination of cross bolts and specially designed thermo bolts, from smaller rotor blades to over 100m long rotor blades for offshore wind turbines.

Nacelle and components: Standard screws, specially designed screws and bolts in strength categories 8.8, 10.9 and 12.9.

Services and logistics: From the warehouse to punctual delivery to building sites around the world.

Coatings: Galvanised and lamellar zinc coated fasteners can be supplied as standard. In addition, customers can order whatever type of coating they require.

STEGO Elektrotechnik GmbH

Enclosure Climatisation. Perfect.
STEGO heating elements, regulators, fans, lamps and accessories protect your sensitive electronic components against harmful climatic influences.

01

02

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STEGO products are used in all places where sensitive electronic components must be protected from humidity and other climatic influences. Heating elements, regulators, fans and STEGO accessories help you to optimise operating conditions and to reach maximum protection for your installations. So that you can be sure of lasting success!

Perfect thermal management.
Since it was founded in 1980, STEGO Elektrotechnik in Schwäbisch Hall, Germany, has been developing, producing and selling an ever-growing range of products for the protection of electric and electronic components. All STEGO products are aimed at reaching optimum climatic conditions in the most varied environments, ensuring that all sensitive components work reliably at all times.

Tried and tested temperature and humidity control systems ensure these optimised climatic conditions. If temperature and/or humidity are too low or too high, the necessary countermeasure is immediately initiated, for example a heater is turned on or a filter fan circulates cool air. A diversity of conditions such as the change from day to night, or particularly warm or cold regions, make climatisation an ever-increasing and challenging task. To meet this challenge, STEGO offers everything that is needed to protect sensitive components from corrosion and malfunction.

Worldwide service supporting quality worldwide.
STEGO's thermal management solutions are exported internationally and find use in the most diverse areas of application and climatic conditions.

01 |Electronic Hygrotherm ETF 012
02 | Semiconductor Fan Heater CSL 028
03 | STEGO Headquarters in Schwaebisch Hall

SIMPLY INNOVATIVE. BETTER FOR SURE.

STEGO Elektrotechnik GmbH

Address	Kolpingstraße 21 74523 Schwäbisch Hall
Phone	+49 (0)791 95058 0
Fax	+49 (0)791 95058 45
E-Mail	info@stego.de
Web	www.stego.de
Category	Suppliers of electrical and electronic components
Profile	Cooling & climatisation
Founding year	1980

TotalEnergies Marketing Deutschland GmbH

The company has united all important energy divisions under a single entity now known under the new name TotalEnergies. This represents another milestone towards the goal of achieving CO_2 neutrality by 2050.

By changing the company name in Paris at the end of May, the French parent company took a significant step in the transition to a multi-energy company. This is not just reflected in the new name, but also in the new visual identity. The different energy areas provided by TotalEnergies are now represented as different colours in the logo. Historically, the brand's colour was red, which also serves as the starting point for the transformation. Each of the other six colours stands for one of the energy forms supplied by the company, and together they stand for TotalEnergies.

The company has been active in the renewable energies sector for several decades. TotalEnergies produces and supplies wind energy through its subsidiary Total Eren (in which it holds a 30 percent stake), which gives the group a diverse network of wind, solar, and hydroelectric power stations spread across Asia, Africa, and Latin America. This enables the development of projects in regions in which renewable energies are a particularly appropriate and sustainable solution to the burgeoning energy demand.

The multi-energy company continues to focus on achieving strong growth with a view to becoming a major international force in the renewable energy sector: by 2030, TotalEnergies wants to be one of the top 5 companies worldwide, which is one of the reasons why 60 billion dollars in funding will be made available for renewable energy projects within the next ten years.

Wind concept Plus from TotalEnergies

TotalEnergies is committed to taking a holistic view of developments in the renewable energies sector and to their continuous improvement. The Wind Concept Plus plan is based on three important, correlated pillars:

- *Innovation and specialisation.* Not only does TotalEnergies wish to drive innovation in the form of new lubricants for industrial customers, but also to take full advantage of the potential for new developments.

- *Customer satisfaction.* TotalEnergies provides high-quality lubricants and places equal importance on excellent service. Customers benefit from professional advice from competent application engineers as well as value-added services, which include the rationalisation and organisation of lubrication tasks, maintenance, laboratory analyses of operating materials as well as lubricant training for employees.

- *High performance products with a long service life.* Our high-performance Carter WT 320 gear oil, a PAO-based product that provides excellent protection against micro pitting in gears and guarantees an extension of the replacement intervals of up to 10 years is an excellent example. Its high viscosity index results in improved characteristics at extremely low temperatures and specifically reduces wind turbine downtime.

TotalEnergies' gross renewable energy production capacity has already more than doubled in a single year, increasing from 3000 MW in 2019 to 6500 MW at the end of 2020. Among other things, this growth is reflected in numerous new projects around the world:

- in excess of 5000 MW of wind power in France, Great Britain, and South Korea
- more than 2000 MW of solar plants in India
- over 5000 MW of solar projects in Spain
- an 800 MW solar park in Qatar

TotalEnergies

TotalEnergies Marketing Deutschland GmbH

Address	Jean-Monnet-Str. 2 10557 Berlin
Phone	+49 (0)30 202 76 787
Fax	+49 (0)30 202 77 96 634
E-Mail	rm.industrie@totalenergies.com
Web	services.totalenergies.de/industrie
Category	Suppliers of mechanical components
Profile	Lubricants & lubrication systems
Turnover	€ 9 billion
Employees	4,000
Founding year	1955

TECHNO-PARTS GmbH

Innovative sealing systems and moulded parts for modern technology.
In sealing technology, the smallest details are critical for reliable functioning. Our products have been doing their job reliably for years, from the tried-and-tested to the innovative component.

01 | Shaft seals for wind turbines and for heavy machine construction.
02 | Most modern storage technology and more than 20,000 different articles in stock.
03 | Headquarter in Essen

Over 50 years of experience in the sealing field for hydraulics, pneumatics, chemicals and plant engineering have made us a high-performance company. We cover almost all applications – from miniature pneumatics to heavy-duty hydraulics, from chemicals and plant construction to offshore wind turbines. We continuously put our experience to work in the development and optimisation of our growing product range.

Our staff's wide-ranging expertise ensures a comprehensive service – from technical advice to our customers on-site to flexible order handling and on-time delivery.

A warehouse with well over 20,000 different items and flexible production for machined and injection-moulded products, combined with in-house tool-making, enable us to meet most customer requests in the shortest possible time.

A well-equipped laboratory for physical and chemical testing, comprehensive experiments and certification in accordance with DIN EN ISO 9001 make a significant contribution to our high quality standards and the further development of our products.

Individual packaging is just as much a part of our services as our own eKanban system and a quick service for urgent repairs and prototypes.

For the special requirements of wind turbines, we also supply radial shaft seals with high-strength, fabric-reinforced elastomer backs and excellent sliding properties. The shaft seals are available for internal and external sealing, also in split design with diameters up to 4,000 mm. This facilitates repairs and alleviates difficult installation conditions.

TECHNO PARTS
Dichtungs- und Kunststofftechnik
Sealing and Plastics Technology

TECHNO-PARTS GmbH

Address	Alte Bottroper Straße 81 45356 Essen
Phone	+49 (0)201 86606-0
Fax	+49 (0)201 86606-68
E-Mail	vk@techno-parts.de
Web	www.techno-parts.de
Category	Suppliers of mechanical components
Profile	Seals & vibration control
Founding year	1981

Weidmüller Gruppe

Weidmüller – Your partner in Industrial Connectivity

Nowadays, the wind industry energy sector is faced with the challenge of meeting growing profitability requirements. Weidmüller meets this demand with reliable components and customized solutions to reduce the investment and operating costs.

Weidmüller – Your Partner in Industrial Connectivity

As experienced experts we support our customers and partners around the world with products, solutions and services in the industrial environment of power, signal and data. We are at home in their industries and markets and know the technological challenges of tomorrow. We are therefore continuously developing innovative, sustainable and useful solutions for their individual needs. Together we set standards in Industrial Connectivity.

Wind Solutions

Customer specific solutions for the wind industry

Nowadays, the wind industry energy sector is faced with the challenge of meeting growing profitability requirements. Turbine manufacturers are continuously seeking possibilities to reduce the LCOE (levelized cost of energy). Weidmüller meets this demand with reliable components and customised solutions to cut down the capital and operational expenditures. Further trends are condition monitoring systems and data driven business models like Data Analytics. In these fields of automation and digitalisation Weidmüller is able to provide tried and tested solutions to reduce downtimes and increase yield.

01

Weidmüller product highlights for Wind:

- Rotor blade monitoring and ice detection with BLADEcontrol®
- Condition monitoring for screw connections
- LED solutions for tower and nacelle Customer specific assemblies

Weidmüller is international – we have six manufacturing plants, 31 sales companies and more than 60 representations all around the world.

In financial year 2020 Weidmüller generated sales of 792 Mio. € with around 5,000 employees.

04

02

01 | Customer specific assembly
02 | BLADEcontrol®
03 | LED Solution
04 | Weidmüller Wind

03

Weidmüller

Weidmüller Gruppe

Address	Klingenbergstraße 26 32758 Detmold
Phone	+49 (0)5231 14291229
Fax	+49 (0)5231 1428 116
E-Mail	Hans.Schlingmann@ weidmueller.com
Web	www.weidmueller.com/wind
Category	Suppliers of electrical and electronic components
Profile	Condition monitoring systems
Turnover	€ 792 million
Employees	5,000
Founding year	1850

Weitkowitz GmbH

Always a safe connection. Guaranteed!
Weitkowitz has been manufacturing and supplying cable terminals, connectors, ferrules, cable ties, pressing and cutting tools for over 100 years.
We'd be glad to collaborate with you to develop special wind solutions.


01

Weitkowitz GmbH has stood for quality products in the electrical sector for decades. Our "WM press-fit geometry", which was originally developed by Franz Weitkowitz, personifies our claim to quality, functionality and the longevity of all our products and services, which is as valid today as it always has been.

Our slogan "A secure connection guaranteed!" is a promise that reputable clients from all over the world rely on every day. Of course, our company is also ISO9001 and ISO ITS16949 certified and, therefore, meets the highest quality requirements for various sectors including the automotive industry.

Clients from the fields of electrical installation, switchgear and transformer construction, cable assembly, lightning protection, railway engineering, wind energy and photovoltaics have been successfully using Weitkowitz products in their products and systems for many years.

Special solutions, such as our rectangular cable terminals and connectors, offer protection from such things as the chamfering of surge arresters. Press-fit and screw connectors allow for the quick and easy installation of cable harnesses when setting up wind-energy turbines.

Talk to us and let us know your requirements: we'll be happy to work with you to find the perfect solution for your specific needs.


02


03

04

01 | Aerial view of the company
02 | Hydraulic press head APW 18
03 | Rectangle cable lugs and connectors, connectors for wind applications
04 | Equipment for wind turbines

WEITKOWITZ intercable group

Weitkowitz GmbH

Address	Woltorfer Straße 125 31224 Peine
Phone	+49 (0)5344 969 587-0
E-Mail	vertrieb.lengede@intercable.com
Web	www.weitkowitz.de
Category	Suppliers of electrical and electronic components
Profile	Energy & data transmission
Turnover	€ 24 million
Employees	170
Founding year	1918

Wieland Electric GmbH

Safe solutions for wind turbine towers – from engineering to service
Wieland Electric provides wind turbine manufacturers, tower construction firms and wind farm operators with bespoke, flexible internal tower lighting and power distribution concepts.

The system's modular and plug-in design facilitates extremely short planning and installation times, flexible assembly options, and maximum availability.

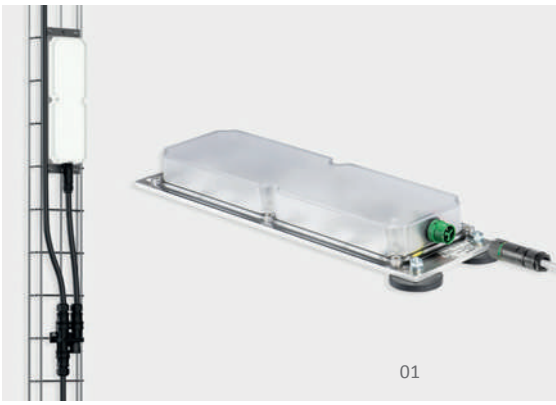
Wieland Electric offers robust and low-maintenance LED lamps as plug & play components for reliable tower lighting, which can be installed quickly and efficiently using an innovative installation system. They can be mounted without tools using quick mounting plates on the grid cable duct or in steel towers with magnets directly on the tower wall. A battery-supported UPS powers the lighting system in the event of a power outage, thus enabling staff to descend safely.


02


03

With the Podis® flat cable system and the RST® round cable system, two innovative solutions for flexible infrastructure cabling are available. All wind turbine components, whether it is lighting, maintenance sockets, control cabinet or the service lift, can be plugged together in a quick, safe, and fault-free manner either in the factory or on the construction site. This can reduce installation times by up to 70 %.

To avoid system failures, secure data communications and reliable control technology are essential. Long-distance data transmission is possible by means of robust switches that can be expanded with fiber optic converters. In addition, reliable IoT and remote maintenance components ensure a secure communication link for the plant and make service assignments easier to plan.


01

01 and 03 | Podis® LED – In tubular steel towers, lamps can be attached without using tools, either by fastening them directly to the tower walls using magnets or to the cable basket tray using quick-mounting plates.
02 | Various-sized power sockets can be placed anywhere within the tower thanks to the plug-in system.

wieland

Wieland Electric GmbH

Address	Brennerstraße 10-14 96052 Bamberg
Phone	+49 (0)951 9324 0
Fax	+49 (0)951 9324 198
E-Mail	info@wieland-electric.com
Web	www.wieland-electric.com
Category	Suppliers of electrical and electronic components
Profile	Light fittings & emergency light fittings
Founding year	1910

Winergy

Flender GmbH

With 40 years of experience, Winergy offers gearboxes and generators for on- and offshore application up to 20 MW. This is complemented by comprehensive service offerings. Winergy sites are in Europe, China, India, and the U.S., while the base of service locations is continuously being expanded.


01

01 | Broad service portfolio including uptower services
02 | Production process according to APQP routines & VDA-6.3. quality standards
03 | Product portfolio
04 | HybridDrive

Partner of choice for a sustainable future
In 1981, Winergy started to manufacture gearboxes specifically designed for wind turbines. To date Winergy has supplied over 200 GW of gearbox capacity and more than 50,000 generators. Reliable, efficient and at low lifecycle costs Winergy gearboxes and generators ensure that wind turbines all over the world convert windpower into electrical energy.

To support your customers globally – you must be represented locally
Since Winergy's foundation, we have successfully implemented a globalization strategy and today operate production facilities in Europe, USA, China and India. Apart from that Winergy is continuously expanding their service locations for example in Australia, Japan and Brazil.

Quality is more than just a word to us – it is the essence of our products
The quality that we demand from our products is also reflected in our processes. Our customers all around the world benefit from our high-quality products and short delivery times.


03

This is achieved with our comprehensive and fully integrated process management, lean operation and zero defect tolerance.

Our drive train components are as unique as your requirements
Detailed wind turbine specification is the foundation of individual drive train development. Winergy takes its long-term experience into account to develop cost-effective solutions that perfectly fulfill customer requirements. The result: mechanical and electircal components which increase energy efficiency.

Reliable service solutions
We have service concepts that are individually tailored to the requirements of our customers. The objective is to ensure high availability of your systems, resulting in reduced operating costs.

Winergy

Address	Am Industriepark 2 46562 Voerde
Phone	+49 (0)2871 92 4
Fax	+49 (0)2871 92-2487
E-Mail	info@winergy-group.com
Web	www.winergy-group.com
Category	Suppliers of mechanical components
Profile	Gears
Founding year	1981 first wind gearbox


02


04

BWE
German Wind Energy Association

The Who's Who of the German wind industry

Your company is not listed in the publication?
You'd like to be included again next year?
Then don't hesitate!

Print & Online

Specification:

Company profile and/or **Address entry**
- in the print publication
- as pdf
- and in the online database

Free distribution around the world at trade fairs and conferences

Free copies for your own marketing

We'll be glad to advise you:
Klaus Barkeling:
k.barkeling@wind-energie.de
Nikos Fucicis:
n.fucicis@wind-energie.de

Published in German and English.

Windindustry in Germany
www.windindustry-in-germany.com

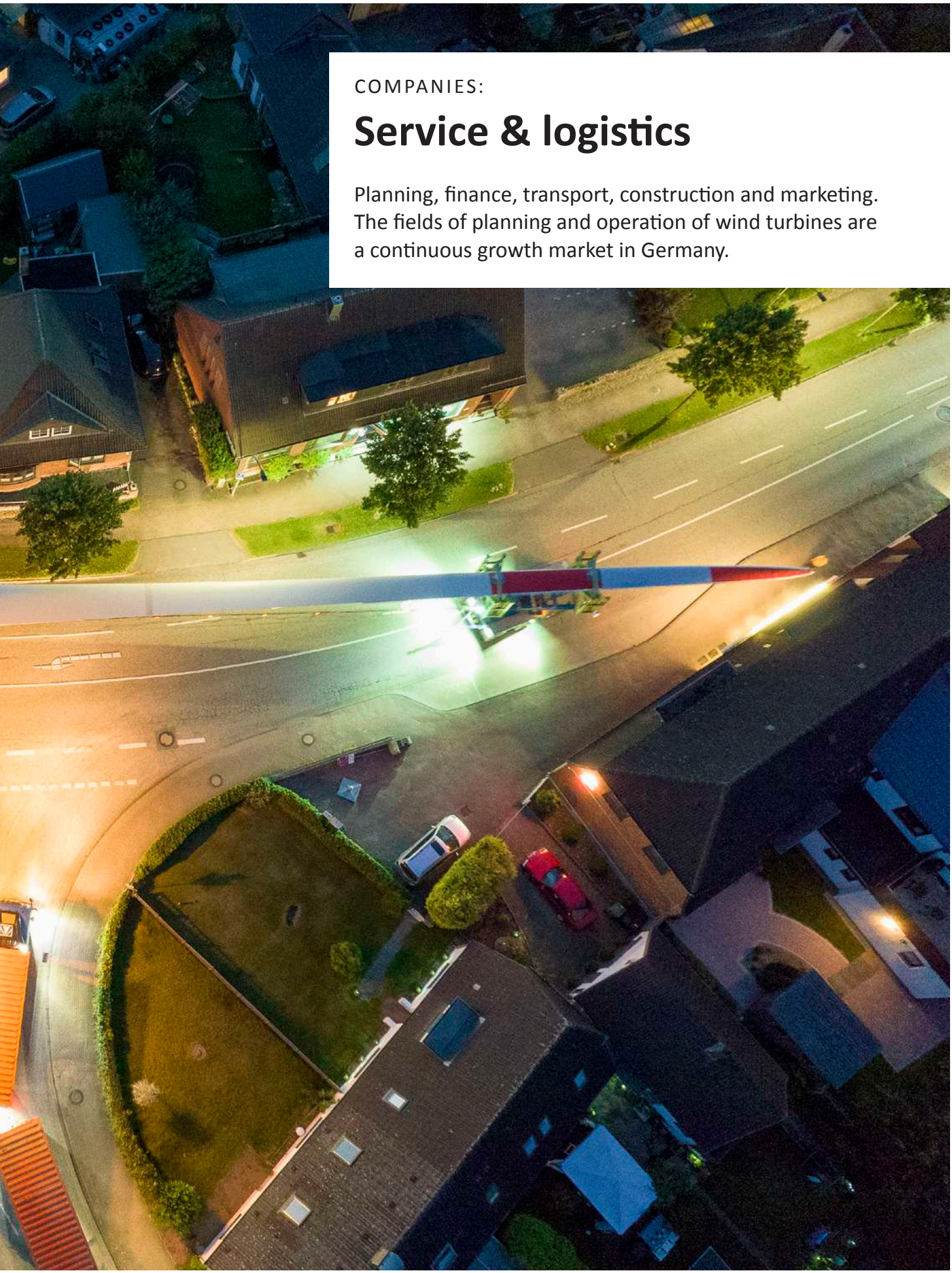
Next release date: September 2022

N163/5.X prototype at Janneby citizens' wind farm test site.
Transporting the blade at night, navigating the town of Wanderup.
Photo: Ulrich Mertens

COMPANIES:

Service & logistics

Planning, finance, transport, construction and marketing. The fields of planning and operation of wind turbines are a continuous growth market in Germany.



Alterric

Shaping the future with renewable energy

New wind energy for a climate-neutral energy future: Since spring 2021, the Aloys Wobben Foundation, the sole shareholder of ENERCON, and EWE AG have been pooling their many years of experience in onshore wind energy in the Alterric joint venture.

01

Thirty years ago, the wind energy pioneers ENERCON and EWE used their combined strength to implement projects with a lighthouse effect on the industry. One of these was the Pilsum wind farm in 1989. With a total output of three megawatts, it was among the largest energy revolution projects in the world at the time. In the following decades, the Aloys Wobben Foundation and EWE both developed successful companies for the development and operation of wind power on land. In March 2021, both turned these divisions into one cooperating company: Alterric GmbH, headquartered in Aurich in northern Germany.

Sustainable wind expansion

Alterric develops, plans and operates onshore wind farms. With 2,300 megawatts of installed capacity in their operation, Alterric is one of the largest generators of renewable energy in central Europe. The pipeline for new wind projects comprises more than 9,400 megawatts. Alterric believes that climate targets in Europe can only be achieved through more intensive expansion of wind energy onshore. With this perspective, more than 280 experienced experts are driving the expansion toward 100-percent renewable energies. “This is how Alterric wants to make a significant contribution to climate protection, sustainability and the conservation of the planet,” explains Dr Urban Keussen, board member at EWE AG and Managing Director of Alterric.

Strong and reliable wind experts

To achieve these goals, Alterric is bringing over 30 years of experience in the wind business, solid credit, high technical standards and skills in the economics of energy. Alterric also boasts committed employees with teams who have the energy revolution in their very DNA. They bring profound knowledge to every aspect of wind energy work in the planning and development phases and

01 | Wind power for a sustainable energy supply
02 | Over 30 years of wind strength from northern Germany
03 | Alterric stands for ambitious goals and strong implementation


02

comprehensive expertise for the technical and commercial sides of operation.

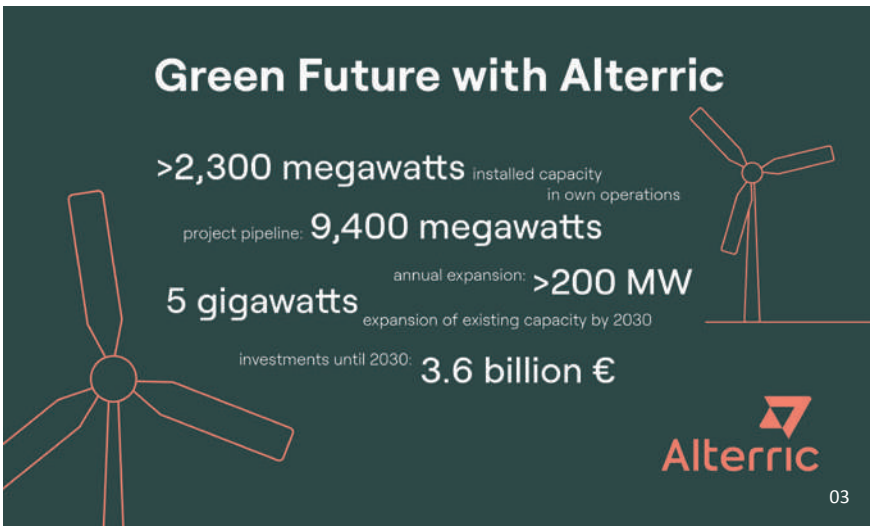
Even more value comes from the Alterric team's remarkable interdisciplinary knowledge. Whether it's technical innovation, network connections, energy trading, electricity storage systems or the broad spectrum of expanded green energy applications through sector coupling, at Alterric you will meet experts who take a holistic approach to the renewable energy future.

Things run smoothly with Alterric
Alterric offers you everything in one place when it comes to wind turbines – planning, building and operation. And there's more: Whether it's acquiring property, opening tender processes, taking over project development risks, repowering or investment models, the opportunities for customised and productive cooperation are manifold.

Alterric solutions promote the energy revolution in communities and create offerings to energy suppliers and industries. They also support project companies in the complex market environment. For wind energy entrepreneurs who want to devote themselves to other projects, Alterric offers the option to take over existing rights or wind farms. Alterric also plans and builds wind energy projects independently of manufacturers. The optimal type of plant is chosen for each location after thorough analysis.

Partner on equal footing
With its ambitious expansion path, Alterric wants to shape a successful energy revolution in Germany and Europe. The company and its teams will stick to their values that made the wind business of the two mother companies into success stories. Reliability, transparency, continuity, and equitable relationships.

If you are looking for a successful and trustworthy partnership, Alterric is ready for you. Contact us, we would love to hear from you!



03

Alterric

Alterric	
Address	Holzweg 87 26605 Aurich
Phone	+49 (0)4941 6041-100
E-Mail	kontakt@alterric.com
Web	www.alterric.com
Category	Planning
Profile	Planers & project developers
Employees	280 (Wind energy: 280)
Founding year	2021

ABO Wind AG

Full Service Provider for Development, Construction & Maintenance
ABO Wind is one of Germany's renowned renewable energy specialists, offering the full range of development, financing, construction and grid connection. The company also provides operational management, services and technical solutions for an optimised output.

01 | Skilled technicians repair a gearbox at ABO Wind's central warehouse.
02 | Our technical service team provides inspections and repairs of wind farms and large components.
03 | The control room monitors renewable energy plants across Europe.

25 Years of Wind Energy Expertise
Since 1996 ABO Wind has developed and sold renewable energy projects with a total capacity of more than 3,600 megawatts. The company has also built and delivered around half of these as turnkey projects. Currently, more than 900 committed employees are working on the development of new wind and solar farms with a total output of around 17 gigawatts worldwide.

Project Development and Repowering
ABO Wind initiates wind, solar and battery projects, acquires land or existing projects, carries out all technical and commercial planning and engineering, prepares bank financing and builds the plants on a turnkey basis. Among municipalities, landowners and energy cooperatives, ABO Wind is known as a fair and reliable partner.

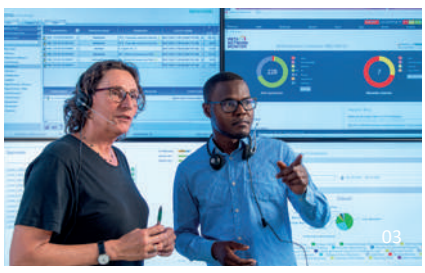
Operational Management & Technical Services
Remote monitoring, on-site service, contract management, and accounting: Our flexible modules offer the perfect fit for each wind farm. In addition, experienced engineers develop smart solutions such as the access control "ABO Lock", which allows operators to digitally control and log access to their wind farms. ABO Wind also offers maintenance, repair, safety checks, inspections and troubleshooting from a single source.

Large Components
Our technical experts assess all major plant components including foundation, tower, drive train and rotor blade. When needed, our technicians replace and repair gearboxes, generators and main bearings.

ABO WIND

ABO Wind AG

Address	Unter den Eichen 7 65195 Wiesbaden
Phone	+49 (0)611 267 65-0
Fax	+49 (0)611 267 65-599
E-Mail	kontakt@abo-wind.de
Web	www.abo-wind.de
Category	Planning
Profile	Planers & project developers
Turnover	€ 500 million (project volume)
Employees	900
Founding year	1996



BDO Oldenburg GmbH & Co. KG Wirtschaftsprüfungsgesellschaft

Your partner for the renewable energy sector
Our team of industry experts is your perfect partner for wind energy company and project consulting in relation to auditing, tax consulting, legal advice, corporate finance and IT.

The BDO Oldenburg GmbH & Co. KG Wirtschaftsprüfungsgesellschaft has regional roots, a strong national presence, and excellent international networks. Our team currently employs 100 qualified staff members in Oldenburg. Almost 1900 BDO employees at 27 locations throughout Germany are available as partners for the corporate success of our clients.

We have been actively supporting and helping to shape the rise of the renewable energy sector since the early nineties. We are a founding member of the Oldenburger Energiecluster OLEC e.V., which operates on a nationwide basis, and are a member of the relevant industry associations within the Bundesverband Erneuerbare Energien e.V. (BEE e.V.).

We use these strong networks with qualified partners as well as our collaboration with our colleagues from the BDO AG Wirtschaftsprüfungsgesellschaft to combine various strands of knowledge and guarantee our clients a broad spectrum of industry knowledge. We have been organising the “Renewable Energies” forum in Oldenburg with top-class external speakers for many years.

01 | Key figures BDO national and international

Our main consultancy areas include:

- conception and participation/financing concept structuring, in particular in collaboration with citizen energy societies,
- business plans, profitability analyses, financial modeling,
- sale prospectus (VermAnlG, KAGB and WpPG) preparation, investment information sheets (VIB) for crowed investing,
- support for BaFin proceedings,
- company valuations (IDW S1/S10),
- due diligence reviews (tax, financial, legal),
- transaction advice,
- yield certificates for extended initial remuneration,
- complex tax declarations for investment companies, and
- annual financial statement audits in compliance with specific VermAnlG regulations.

BDO Oldenburg GmbH & Co. KG Wirtschaftsprüfungsgesellschaft

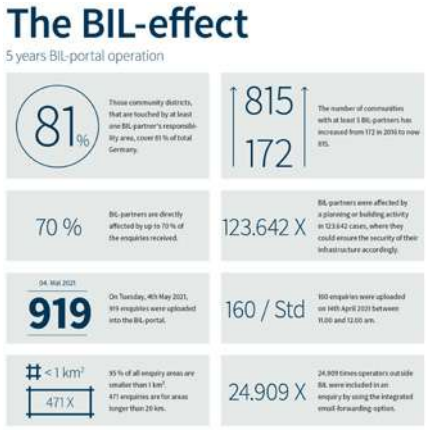
Address	Moslestraße 3 26122 Oldenburg
Phone	+49 (0)441 980 50 0
Fax	+49 (0)441 980 50 180
E-Mail	erneuerbare@bdo-oldenburg.de
Web	www.bdo-oldenburg.de
Category	Finance & Law
Profile	Tax accountants
Founding year	1995

BIL eG

Dual benefits for the wind energy sector

BIL, the national information system for underground infrastructure, is a central planning enquiry portal for building contractors and operators of wind turbines. Over half a million planning enquiries of more than 35,000 users have been processed successfully using the BIL portal since February 2016.

By participating in the BIL process, wind turbine operators can significantly increase their operation reliability. As the distances between the generation point and the grid feed-in point are often quite long, it is particularly important for building contractors to identify the operators of underground energy and telecommunication infrastructure to avoid damaging existing supply cables. Unknown operators in particular benefit from the volume of enquiries from the well-known pipeline operators and receive an improved overview of the construction measures planned within the area in which their own pipelines and cables are installed.



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The BIL process provides users with a positive/negative list in real time in response to their online request. The automated check identifies the operators who are actually responsible for underground infrastructure in a certain area. Non-relevant enquiries are not forwarded to the pipeline or network operator, which saves a considerable amount of processing time. A significant reduction of so-called non-responsibilities is sufficient for even small network operators to cover their BIL fee. BIL offers a bespoke fee model aimed specifically at the wind energy sector.

For the first time in Germany, a cooperative initiative of pipeline and network operators from all sectors, known as BIL, is providing a free online planning enquiry portal. Their objective is to increase the security of pipeline and cable networks by establishing a single point of contact for all planning enquiries. There are currently over one hundred companies participating in the BIL portal, which is supported by eight industry associations.

For more information, please visit www.bil-leitungsauskunft.de

Die Leitungsauskunft.

BIL eG

Address	Josef-Wirmer-Str. 1–3 53123 Bonn
Phone	+49 (0)228 92 58 52 90
E-Mail	info@bil-leitungsauskunft.de
Web	www.bil-leitungsauskunft.de
Category	Other services
Profile	Software solutions
Turnover	€ 1.2 million
Employees	6
Founding year	2015

01 | The BIL effect – 5 years of portal operation
02 | The BIL effect 2020
03 | Enquiry volume 2020
04 | Wind energy enquiry area

Centrica Energy Trading GmbH

We move and trade energy to satisfy the changing needs of customers worldwide
About us Centrica Energy Trading (former Neas Energy) is since its acquisition of Centrica plc a part of Centrica's Energy Marketing & Trading (EM& T) business unit.

We trade gas, power, and LNG and provide the route to market for our upstream and power generation operations. Around 600 people work in Centrica EM& T in our offices in Denmark, the UK, Germany, Sweden, Norway, and Singapore.

Centrica EM& T´s headquarters are in London. Our trading floor is located in Aalborg, Denmark and our German subsidiary is seated in Hamburg, Germany.

Centrica Energy Trading is one of the leading energy service companies in Europe. We provide our clients with the best route-to-market services available to the market today, integrating sophisticated software, trading and structuring and optimizing exposures all the way from long term risk management down to physical trading seconds before delivery. Our trading floor in Aalborg, Denmark, works 24/7 and a team of traders is supporting the European nightshift from our trading office in Singapore.

Our services
Direktvermarktung and the marketing of Post-EEG assets, as well as power purchase agreements (PPAs), are our key competences on the German market.

Centrica has over 15 years of experience from the PPA business in the Nordic countries where deals with complex structures are part of our day-to-day business.

Currently, Centrica Energy Trading manages a power generation portfolio in Europe of more than 14,2 GW.


01


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01 | Windpark
02 | Traderoom, CET
03 | Traderoom, CET
04 | Solarpark

centrica

Centrica Energy Trading GmbH

Address	Gustav-Mahler-Platz 1 20354 Hamburg
Phone	+49 (0)40 228 676 953
Fax	+49 (0)40 228 676 958
E-Mail	cet-Coordination@centrica.com
Web	www.centricaenergytrading.com
Category	Direct marketing
Profile	Direct marketers
Employees	300 (Wind energy: 30)
Founding year	1998

Connected Wind Services Deutschland GmbH

Service & Maintenance – Large component exchange – Up-tower repairs – Spare parts
Connected Wind Services – progress and innovation since 1987. We are exploring new ways to optimise the operation of wind turbines in order to support the transition to sustainable energy.

With over 30 years of experience, Connected Wind Services is one of the leading independent service providers in the renewable energy sector. We are a top quality single-source provider of everything involved in the maintenance of wind turbines.

Maintenance and servicing are indispensable for the most efficient operation of wind turbines and wind farms. Our core competencies include maintenance and repairs to the base, tower, and rotors as well as the internal components, such as generators and gearboxes, the replacement and provision of spare parts and the refurbishment (repowering) of complete turbines, in addition to retrofitting and fault clearing. However, it is not necessary to wait until the damage has already occurred before repairing turbines:

innovative methods, such as condition monitoring and predictive maintenance, e.g., of wind turbine drive trains, can significantly minimise downtimes and major damage.

We always tailor our solutions and service concepts to reduce downtime and ensure longevity, maximum yields, and resource conservation.

We want to be a driving force for positive change. Having a strong local presence and guided by the principles of trust and transparency, our clients can rely on us. We see ourselves as your professional partner who continuously monitors the condition and performance of your turbines - to ensure that wind is always our strength.

CONNECTED WIND SERVICES

Connected Wind Services Deutschland GmbH

Address	Mühlenberg 19 25873 Rantrum
Phone	+49 (0)4848 90 128-0
Fax	+49 (0)4848 90 128-22
E-Mail	info.de@connectedwind.com
Web	www.connectedwind.de
Category	Operation & Service
Profile	Service, maintenance & repair
Turnover	€ 9.7 million in Germany / € 29.5 million on group level
Employees	70+ in Germany / 180+ on group level
Founding year	1987

01 | Connected Wind Services – Advancing your future movement
02 | Service and maintenance
03 | Over fifty service teams will tend to your needs.
04 | You can rely on us to maintain the highest level of safety with dedicated technicians certified to the highest GWO training standards.

Dornier Construction and Service GmbH

The future has arrived

We intend to grow as an independent service provider that are contributing to the installation, operation and maintenance of renewable energy assets and other key infrastructure.

Dornier Construction and Service, member of the Dornier Group, is proudly announcing its extension of construction and operation services by adding industrial-scale onshore wind and solar services to its portfolio. This is part of the Dornier Group's strategy towards full decarbonization. We intend to grow as an independent service provider that are contributing to the installation, operation and maintenance of renewable energy assets and other key infrastructure.

Our new services are:

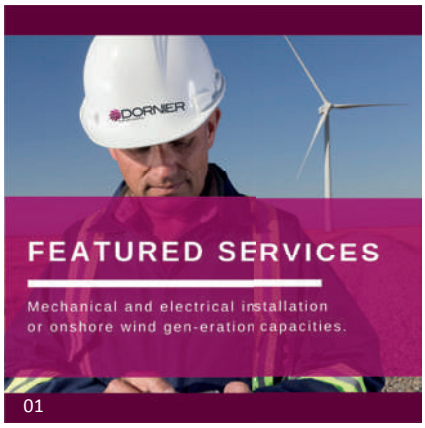
- Mechanical and electrical installation for onshore wind generation capacities.
- Operation and maintenance for onshore wind generation capacities incl. blades inspection and repair for a seamless energy production and an increased lifespan of the assets.
- Mechanical and electrical installation for onshore solar photovoltaic technologies incl. civil works and commissioning.

Renewable power production has already become by far cheaper than fossil fueled power production, despite the additional system costs for renewables.

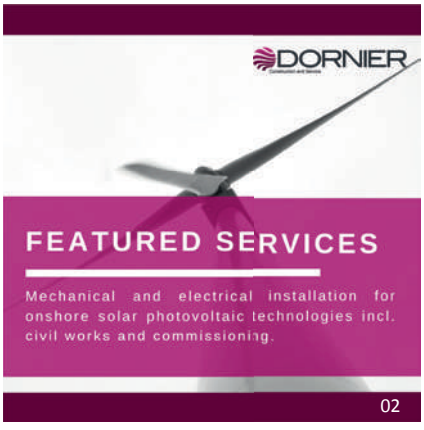
This leads to the domination of today's new energy capacities market by renewable and hybrid energy projects.

New businesses of that kind are always requiring intelligent, comprehensive and advanced as well as predictive and strategic planning. Delivering, assembling and commissioning of new systems serving with new concepts and components are the steps towards new solutions that pays in for a viable and sustainable future. Full integration of new energies into new optimized systems and structures are key to that future – that's why being a one-stop shop for strategic and technical planning, project management, system deliveries, field erection & commissioning is our role.

We don't expect the future, we build it.



01–03 | Featured Services of Dornier Construction and Service



DORNIER Construction and Service

Dornier Construction and Service GmbH

Address	Kraftwerkstraße 22 03226 Vetschau
Phone	+49 (0)35433 75 0
E-Mail	tolga.ozkarakas@ dornier-group.com
Web	www.dornier-construction-service.com
Category	Operation & Service
Profile	Service, maintenance & repair

Deutsche Windtechnik AG

Independent full scope O&M provider for multibrand WTG technologies on-/offshore
Deutsche Windtechnik is an independent specialist in the technical maintenance of wind turbines. Over 2,000 employees ensure that the wind turbines operate reliably around the clock, with the focus on Vestas, Siemens, Nordex, Senvion, Fuhrländer, Gamesa, Enercon and GE turbines.


01

01 | More than 400 service teams operate for Deutsche Windtechnik internationally.
02 | Our day-to-day business includes the planning and implementation of maintenance, repair, upgrading and inspection procedures.
03 | Deutsche Windtechnik offers the complete service for offshore wind farms as well from foundation, to turbine, to blade, to offshore substation.

Comprehensive expertise, flexibility and more value for lower costs – this is what sets apart the quality of our service. With our diverse range of core competencies, we are able to offer the full package of services from a single source. We now service over 7,600 wind turbines as part of permanent maintenance contracts (basic maintenance and full service). Our objectives are to ensure technical systems operation and to carry out our work in the most cost-efficient way possible.

Independent O&M worldwide
Our decentralised service network enables us to move swiftly between the customer, the wind turbine and spare parts warehouses. Our company's head office is based in Bremen, Germany. In addition, Deutsche Windtechnik is also active abroad: locations in Denmark, France, The Netherlands, Poland, Sweden, Spain, Taiwan, United Kingdom and the United States provide the foundation for high-quality system maintenance around the world.

Full scope from A to Z
Whether it is the entire wind turbine, the control system, nacelle, rotor or the foundation, from large components to the smallest electronic components or even the substation, our team of experts understands your wind turbine portfolio and can provide economic benefits from a service point of view. Onshore and offshore.

Our range of services includes:
- Individual, needs-based and modular service offering from the basic service to the full maintenance contract, which also covers external damage including major components
- Repair and optimization
- Control and power electronics
- Technical engineering, e.g. own development of ADLS system
- Expert appraisals for a range of scenarios
- QHSE and project support
- Offshore operations management
- Repowering
- Development and sale of spare parts

All services are freely combinable.

Deutsche Windtechnik AG

Address	Stephanitorsbollwerk 1 (Haus LEE) 28217 Bremen
Phone	+49 (0)421 69105 0
Fax	+49 (0)421 69105 499
E-Mail	info@deutsche-windtechnik.com
Web	www.deutsche-windtechnik.com
Category	Operation & Service
Profile	Service, maintenance & repair
Turnover	€ 221 million (in 2020)
Employees	over 2,000
Founding year	2004


02


03

DunoAir Windpark Planung GmbH

The energy transition comes first

As a specialist for the planning, construction and management of sites for wind turbines in Germany and abroad, DunoAir promotes climate and environmental protection.

As a family-related company, it is important to us that the future of our descendants is secured. The energy transition is an essential step towards a time in which access to energy is clean and affordable. This goal strengthens our motivation anew every day.

DunoAir originally began with Arjen C. F. Ploeg as a project buyer. The company developed dynamically in the years that followed and successfully established itself on the market. By creating our own planning department in 2009, DunoAir Windpark Planung GmbH, we have finally developed into a successful full-service company: From planning and construction to operation, DunoAir offers all relevant areas. We take on projects in all planning stages and offer competent support for the technical management of the wind farms.

Without our motivated and committed team, the success of the last few years would not have been possible. This is the only way that DunoAir has been able to develop into an international company with headquarters in Germany, the Netherlands and Ireland and can now show projects with a total installed output of around 225 MW.

Both the municipalitites and local companies are closely involved in project development and are regularly informed about the current status. The resulting transparency like this creates trust and serves as the basis for good and sustainable collaboration, with the prospect of regional added value.

The DunoAir team looks forward to giving investors, planners and operators the benefit of its expertise. Contact us and discover a reliable partner for the successful realization of your projects.

01

01 | Relaxed into the future looking – Wind farm festival in Weibern-Rieden
02 | Company founder Arjen C. F. Ploeg
03 | Assembly of a nacelle in the wind farm Dahlem-Baasemer Wald


02

03

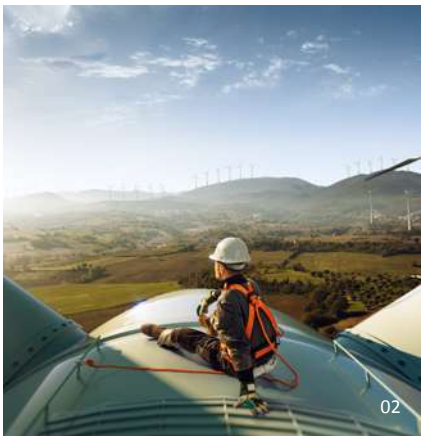
DUNOAIR

DunoAir Windpark Planung GmbH

Address	Hawstraße 2a 54290 Trier
Phone	+49 (0)651 99 98 89-13
Fax	+49 (0)651 9998 8999
E-Mail	c.wuertz@dunoair.com
Web	www.dunoair.com/en
Category	Planning
Profile	Planers & project developers
Employees	12
Founding year	2004

ecozins powered by AUDITcapital GmbH

Realize climate-friendly returns
ecozins is a sustainable crowdinvesting platform specialized in (re)financing renewable energy and energy efficiency projects.



ecozins in numbers:

- Launch of the platform: 2019
- Successfully placed projects: 12
- Capital raised: around 3.6 million euros
- Capital amortized: around 600,000 euros

The ecozins-crowd:

- Registered users: more than 1,100
- Demography of the crowd: Ø 50 years old and predominantly male (78 %)
- Investors: 538
- Investors with two or more investments: approx. 50 %
- Ø amount invested: 6,500 Euros

01 | Achieve climate-friendly returns
02 | Your individual public participation solution
03 | The simple way to invest online in projects that generate returns and simultaneously protect the climate.

Due to many years of experience within the sector of renewable energies, the proprietors of AUDITcapital know and understand the challenges project developers face within the industry. With this knowledge we can offer individual solutions for the (re)financing of renewable energy projects and the implementation of public participation concepts through the established crowdinvesting platform ecozins.

Since 2016, AUDITcapital has been advising project developers in finding individual financing and public participation solutions for projects in the fields of renewable energies and energy efficiency. With the launch of the crowdinvesting platform ecozins in 2019, an easy and effective solution for (mezzanine)capital procurement and for the implementation of citizen participation concepts was established.

AUDITcapital acts as an intermediary between project developer and private investors. As a full-service provider AUDITcapital sees through the procurement of the investments and accompanies the marketing and placement of the campaign on ecozins. Furthermore AUDITcapital handles the investor management throughout the investment period. In addition to the option of placement through the established platform ecozins, individually branded white label platform solutions are available.

ecozins
Klimafreundlich Rendite erzielen

ecozins powered by AUDITcapital GmbH

Address	Pilgrimstein 35a 35037 Marburg
Phone	+49 (0)6421 80 41 910
E-Mail	kontakt@ecozins.de
Web	www.ecozins.de
Category	Finance & Law
Profile	Banks, financial institutions & financial service providers
Employees	8
Founding year	2016

EMD Deutschland GbR

windPRO, windOPS, energyPRO – Training and Support
A/S for central europe, the balkan states and the German speaking countries.

windPRO – software for wind energy project design and planning

windPRO is a module-based software package suited for project design and planning of wind farms and photovoltaic power plants. windPRO covers different areas, from energy yield calculations via wind data analysis, performance checking and environmental impact calculations to grid connection calculation. With its integrated online data services, a user friendly interface and continuous development to integrate new research and knowledge, it is now the world leading software for wind energy project design. windPRO is used by project developers, independent experts, WTG manufacturers, grid operators, banks, authorities and others.

energyPRO – software for the simulation of distributed energy systems

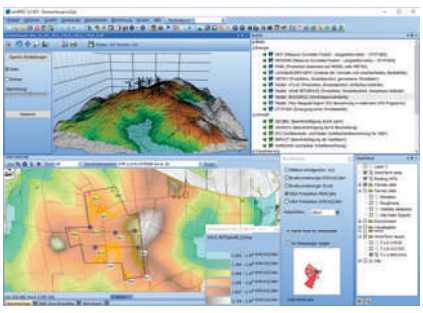
energyPRO is the most advanced and flexible modelling software for combined techno-economic optimisation and analysis of a variety of heat, CHP, process and cooling related energy projects. In energyPRO you can model virtually any type of technologies from well-known, fossil fuel based production units to state-of-the-art renewables.

windOPS – web software for performance analysis of your wind farm

windOPS is a web-based wind power management and analytics software service developed for the daily performance monitoring and to compare, analyse and report operational and financial data for wind farm assets on a regular basis. Present and past operation data of WTGs from different manufacturers are shown in a unified view and summarized in a well-arranged portfolio view.

01 | Wind resource mapping in windPRO
02 | Photorealistic visualisation for PV plants and wind farms

01



02

EMD Deutschland GbR

Address	Breitscheidstraße 6 34119 Kassel
Phone	+49 (0)561 31059-60
Fax	+49 (0)561 31059-69
E-Mail	emd-de@emd.dk
Web	www.emd.dk
Category	Other services
Profile	Software solutions
Turnover	> € 5 million (EMD Int. A/S)
Employees	10 (EMD Deutschland) (Wind energy: 6)
Founding year	1999

EnBW Energie-Baden Württemberg AG

A competent partner with know-how for third parties – also abroad
Development, acquisition, construction, operation, direct marketing or repowering of wind turbines from a single source.

01 | EnBW's Langenburg wind farm with 12 turbines
02 | Bibby Wavemaster Horizon, a special purpose vessel, ensures operation and maintenance for the offshore wind farms EnBW Hohe See and Albatros.

EnBW Energie-Baden Württemberg AG

Address	Schelmenwasenstr. 15 70567 Stuttgart
Phone	+49 (0)711 289 0
E-Mail	windkraft@enbw.com
Web	www.enbw.com/windkraft
Category	Energy services
Profile	Construction, operation, direct marketing
Turnover	€ 12.7 billion (6,2021)
Employees	24,894 (6,2021)
Founding year	1997

With around 24,000 employees, EnBW Energie Baden-Württemberg AG supplies around 5.5 million customers in Germany and Europe with electricity, gas and water, as well as energy solutions and energy-related services.

By the end of 2025, EnBW's installed capacity from renewable sources will be 50 percent of the total portfolio. This is already having a noticeable effect on CO_2 emissions, which EnBW aims to halve by 2030. The ambition is to achieve climate neutrality in line with the Paris Agreement by 2035 at the latest.

For the wind energy sector – offshore and onshore – a capacity of 4,000 MW is to be achieved.
Onshore, EnBW has currently expanded its portfolio across Germany to over 550 MW. In its further expansion, EnBW is focusing on repowering.

Following the Baltic Sea wind farms EnBW Baltic 1 and Baltic 2, EnBW commissioned Germany's largest offshore project "EnBW Hohe See and Albatros" in the North Sea in January 2020 with a combined capacity of 609 megawatts. In 2025, the offshore wind farm "He Dreiht" with a capacity of 900 megawatts is scheduled to go online without government subsidies. In the auction for the award of seabed rights by the British The Crown Estate, EnBW and its London-based partner bp have now been awarded two large areas in the Irish Sea, which are estimated to be the highest-value areas in the first auction of offshore wind rights in England and Wales for ten years. Two wind farms with a total capacity of three gigawatts are scheduled to go into operation here from 2028.

EnBW remains on course for growth, focusing on its core country of Germany, but also on selected foreign markets. In the onshore sector, for example, we are active via national companies in France and Sweden. We are also represented offshore in the UK and in the USA and Taiwan via subsidiaries.

enercity Erneuerbare GmbH

Full wind speed ahead!
We are driving the energy transition.

We develop and operate large-scale onshore wind projects, enjoying difficult projects at unusual locations. The construction of wind farms on disused opencast mining sites is one of our specialities and partnership-based collaboration is our highest priority. We can provide you with a bespoke operational management service for your wind farm to meet your specific requirements. Whether you need maintenance, repairs, aircraft detection lighting systems (ADLS), bat protection or continued operations, we know what is required and can provide you with qualified support in the management of your wind farm. Let us help you to optimise your long-term wind farm profits.

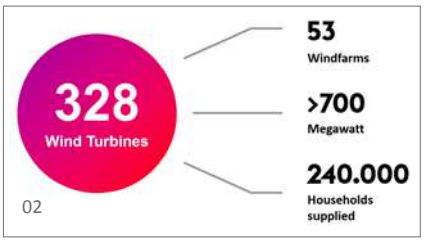
Our services include:
- Commercial management
- Accounting
- Controlling
- Funding
- Contract management
- Insurance and claims management
- Energy management

Technical management
- 24/7 remote monitoring
- Technical operations management and reporting
- On-site service
- Legal conditions and the environment

Project development
Our expertise ranges from the initial concept to the completion of all construction tasks. Our integrated project management service enables all stakeholders to benefit from a smooth and efficient implementation of the wind farm project. We exploit local potential, always in close collaboration with the local public, landowners, and municipalities. When planning your wind farm project, we place great importance on collaboration from the outset and focus on transparency and fairness.

Our services include:
- Site selection/assessment
- Funding
- Planning
- Approval procedures
- Securing land and initial planning
- Construction
- Repowering

enercity Erneuerbare GmbH is a wholly owned subsidiary of enercity AG



02


01

01 | Wind Turbine Technician from enercity Erneuerbare GmbH in a hub of a vestas turbine.
02 | Wind farm portfolio of enercity Erneuerbare GmbH

enercity Erneuerbare GmbH

Address	Nessestraße 24 26789 Leer
Phone	+49 (0)491 91240 600
Fax	+49 (0)491 91240 699
E-Mail	info@enercity-erneuerbare.de
Web	www.enercity-erneuerbare.de
Category	Operation & Service
Profile	Technical & commercial operational management

Energiequelle GmbH

Energy transition? We are doing it.
Energy transition? We are doing it. Energiequelle GmbH has been active in the renewable energy sector since 1997. With over 300 employees and having installed more than 750 facilities, we are an industry leader – passionate, bold, and innovative.


01


02

An experienced full-service provider
We have been implementing renewable energy projects for more than 20 years. We develop, construct, and operate wind energy and photovoltaic plants, substations, and energy storage systems. We also work on innovative energy supply solutions, manage the repowering of older facilities and market sustainably produced green electricity to end users via our eqSTROM subsidiary.

We are currently responsible for the electrical, technical, and commercial operational management of over 730 facilities. Our customers attest to our excellent customer services and praise our friendly attitude, accessibility, and ongoing reliability. In terms of funding and sales, we maintain long-standing cooperative relationships with plant manufacturers, credit institutions and investors, which translates to innovative and bespoke financing solutions for our national and international clients.

Collaboration and project acquisition
In addition to maintaining existing project development collaborations, it is important to us to continuously expand our partner portfolio with a view to bundling competencies and advancing projects in a collaborative manner. We are happy to acquire national projects as well as foreign rights packages at any stage.

New business field for innovative energy concepts
Our business development colleagues are working on extending our energy source range, which includes self-supply solutions for industrial and commercial clients in the power, heat, and mobility sectors, as well as power-to-X project implementation.


03

01 | Wind turbines in Feldheim, Germany's first energy self-sufficient village
02 | Michael Raschemann, Managing Director
03 | Lithium-ion storage
04 | Our offices
05 | Solar park

04

Internationally act

Our head office is in Kallinchen near Berlin, and we have a total of 17 offices in Germany, France, and Finland. Our first project in Finland went into operation last year. Others are currently under construction and our pipeline includes an additional 1,000 MW. We have already assembled over 100 facilities in France and are very well networked within the French market through our P & T Technologie subsidiary. We want to advance the energy transition in two further markets by 2025, thereby contributing to sustainable corporate growth.

05

Business segments:

- Wind energy
- Photovoltaics
- Biogas
- Grid connectivity
- Energy storage
- Sales and distribution of electrical power
- Innovations

Services

- Project development
- Management
- Funding, sales, and distribution
- Repowering
- Project acquisition & collaborations

References

We have already installed over 1,400 MW of power output to date. We also have a completed and operational 10 MW lithium-ion storage system as well as a power-to-heat system in use in Feldheim, an energy self-sufficient village in Germany. We are currently working on a power plant for the production, use, storage, and reconversion of hydrogen in the Lusatia region. Personal, fair, and down-to-earth Our corporate philosophy has not changed since our founding. In spite of the significant growth we have experienced, we remain a family business and cultivate the personal exchange of ideas both with our partners and among ourselves. It is important for us to treat each other as equals, always to deal with each other honestly and fairly, and to be reliable at all times. This keeps us together in our shared mission.

energiequelle
TOMORROW'S ENERGY.

Energiequelle GmbH

Address	Hauptstraße 44 15806 Zossen OT Kallinchen
Phone	+49 (0)33769 871 100
Fax	+49 (0)33739 871 105
E-Mail	info@energiequelle.de
Web	www.energiequelle.de
Category	Planning
Profile	Planers & project developers
Turnover	approx. € 80 million
Employees	300
Founding year	1997

energy consult GmbH

Your Life-Cycle-Service Provider for wind energy and photovoltaic
Energy consult GmbH, based in Cuxhaven and in Husum, has been one of the leading operating companies in the wind energy sector for 30 years, is active throughout Europe and currently manages over 800 wind turbines with a total installed capacity of more than 2 gigawatts.

01 | Our experts at work
02 | Technical servics and inspections

Today, the company and its subsidiaries energy consult Prüfgesellschaft GmbH in Husum and MEB Safety Services GmbH in Bremen combine their concentrated expertise in the commercial and technical management of wind farms, solar parks and substations.

All services from a single source
In addition to wind farm management, energy consult offers further services along the life cycle of a wind or solar park. These include full service for equipment safety and technical services, arranging and negotiating power purchase agreements (PPAs), continued operation concepts, grid connection planning, on-demand night-time marking as well as construction management and financial services.

As a Life-Cycle-Service Provider, we offer all services from a single source and take care of all your concerns. We increase the profitability of your wind farm through ongoing potential, operating cost and marketing analyses and reduce your operating expenses at the same time.

Internationally active with own branches
Energy consult has been active at the international level for almost a decade and today serves customers across Europe in all areas of operation of renewable energy plants. Since 2021 energy consult has been operating with its own subsidiaries in Poland (energy consult Polska) and in Sweden (energy consult Sverige).

Strong network within the Group
Our corporate structure guarantees you financial security and minimises your economic risk. Thanks to our many years of market experience and our association with the PNE Group, we actively shape change and react flexibly to unforeseeable events. We also benefit from our active involvement in the German Wind Energy Association (BWE) and the German Association for the Promotion of Wind Energy (FGW).

ENERGY CONSULT
LIFE CYCLE SERVICES

energy consult GmbH

Address	Peter-Henlein-Straße2–4 27472 Cuxhaven
Phone	+49 (0)4721 718 08
Fax	+49 (0)4721 718 399
E-Mail	info@energy-consult.net
Web	www.energy-consult.net
Category	Operation & Service
Profile	Technical & commercial operational management
Employees	90
Founding year	1991

ENERTRAG

One energy ahead

01

Since our founding, we have been working to build a secure and sustainable energy supply based on renewable energy. As an independent energy producer, we generate electricity, heat, and hydrogen exclusively from renewable sources and supply safe, affordable renewable energy for all areas of life and energy sectors.

At ENERTRAG, around 800 people worldwide develop and build innovative solutions and products for the energy transition. Thereby, we benefit from our experience in the project planning of renewable energy projects and more than 770 wind turbines in our own portfolio.

In addition, we integrate all business areas important for energy generation under one roof: planning, financing, commercialization, operation, software solutions and service.

We plan, implement and support projects along the entire value chain. The ENERTRAG Powersystem operating platform, which is accessible to every operator, monitors and controls thousands of energy plants in Europe and beyond, in a highly efficient manner. In addition, ENERTRAG Service offers reliable and predictive maintenance.

Our integrated power plants create well-paid jobs in rural areas, where they also provide a low cost source of energy. Together with many municipalities, ENERTRAG ensures the optimal planning of energy systems, ensuring the lowest possible impact on the environment and people.

ENERTRAG
One energy ahead

ENERTRAG

Address	Gut Dauerthal 17291 Dauerthal
Phone	+49 (0)39854 6459-0
Fax	+49 (0)39854 6459-420
E-Mail	enertrag@enertrag.com
Web	www.enertrag.com
Category	Sector Coupling
Profile	Sector Coupling

01 | View onto the headquarters Dauerthal

ENGIE Deutschland

ENGIE is your reliable partner over the entire life cycle of your wind farm
You want to invest in renewable energies and are looking for an experienced partner? We develop and operate wind farms and PV plants, market the electricity and ensure continued operation after the subsidy has expired. With ENGIE, your project will benefit from the global know-how of our group.

At ENGIE everything revolves around “Zero Carbon” and the transition to climate neutrality. Our renewable generation activities are geared towards this and for this we develop green energy solutions for companies and municipalities.

Experienced partner for successful project development
In Germany we plan, build, operate and market wind turbines on land. We combine our experience from decades of partnerships with local energy providers with the extensive technical and commercial skills and know-how of a world market leader in renewable energies.

As a reliable partner, we offer you all the services for your wind power project from a single source – from the acquisition of land to the planning, approval, construction and operation of your wind farm to the marketing of the energy generated. At ENGIE Germany, we get involved in project development at an early stage. In this way, we can achieve optimized conditions for you in development and procurement and minimize risks. And we understand the local needs and offer flexibly adaptable models of citizen participation.

As the operator of 300 MW wind turbines in Germany, we know all the levers to optimize commercial and technical management. In the background we have the experience of the ENGIE Group with 3,000 wind turbines at different locations and from different manufacturers. The group’s testing and materials laboratory and the technical experts provide all the information needed for the best possible operation.

Direct Marketing and PPA
As one of the largest participants in the electricity market, ENGIE manages a direct marketing portfolio of 3,500 MW, which includes onshore and offshore wind parks and solar parks. Our central trading platform in Brussels is staffed around the clock and has access to all European electricity markets, from forwards to the intraday market.

01

We offer individually designed models for system operators who want to optimize the income from their wind farms, gain long-term planning security and meet the legal requirements:

- Direct marketing
- Short-term PPAs for post-EEG systems
- Long-term PPAs for new systems without funding
- PPAs for subsidized plants

Second life for your wind farm
We are there for you to find the best solution for your wind farm a few years before or after the EEG subsidy expires.

Would you like to continue to operate your wind farm yourself and generate calculable income in the process? Then a power purchase agreement (PPA) with ENGIE is the right option. This also applies to owners of new systems who prefer marketing outside of the EEG subsidy. Our offer includes both fixed prices and indexed prices and floor structures, depending on your risk profile. The term is usually 1–10 years.

You dont want to bear the risk and complexity of continuing to operate, but would like to realize the profit now? We buy your wind farm and continue to operate it.


02

01 | One of around 3,000 wind turbines from ENGIE worldwide.
02 | Construction of a wind farm in Belgium.

Any questions?
Please do not hesitate to contact us:

Gerd Töpken
for Post EEG and continued operation
gerd.toepken@engie.com

Florian Zickfeld
for project development
florian.zickfeld@engie.com

Tobias Heyen
for PPA and direct marketing
tobias.heyen@engie.com

Renewable energies at ENGIE worldwide

- Over 800 locations worldwide
- 31.1 GW of installed renewable capacity, including 10.1 GW of wind energy onshore and 3.1 GW of solar energy
- 3 to 4 GW of additional renewables every year
- 3,500 MW direct marketing worldwide
- Over 2,000 MW Green Power Purchase Agreements with terms of 10 to 15 years
- Active on all major European trading platforms
- Best credit rating

ENGIE Deutschland

Address	Ella-Barowsky-Straße 44 10829 Berlin
Phone	+49 (0)1607056310
E-Mail	alexa.schroeder@engie.com
Web	www.engie-deutschland.de
Category	Energy services
Profile	Construction, operation, direct marketing

GMA-Werkstoffprüfung GmbH

Wind Energy Inspection, Maintenance and Access Solutions

GMA specializes in safely accessing, inspecting, and repairing on- and offshore wind turbines, with a focus on ensuring safe and efficient operations and minimizing downtime of the asset.

GMA performs inspection and maintenance services on on- and offshore utility-scale wind turbines and farms in order to help our clients optimize maintenance spending and ensure safe operations. With more than 35 years of experience in materials testing and quality assurance, we are a DIN EN ISO 17025 accredited service provider offering the following services:

Safe & cost-efficient access methods for rotor blades

- Visual inspections (VT) & Ultrasonic testing (UT)
- Replacement & repair of aerodynamic profiles (vortex generators, serrations, etc.)
- Measurement & digitisation of individual rotor blade profiles for the production / development of add-on parts to optimise performance curves and noise reduction
- Inspection & testing of lightning protection systems
- Torque testing of rotor blade bolting
- Recurring inspections
- Composite Lab Testing Services

GMA helps you solve problems before they start with our destructive testing (DT), mechanical testing, chemical analysis and metallography services. Our lab testing solutions support wind turbines throughout development, process certification, production, and potential damage analysis stages.

3D Industrial Measurement & Automation Technology

With highly accurate geometry measurements and reverse engineering, we ensure your components for wind turbines and support your manufacturing processes. For rapid ultrasonic inspection of large areas, GMA has developed the Spider SA scanner. This automated and ultra-mobile solution is used for non-destructive testing (NDT) of large areas and for quality assessment of metals, carbon fibre reinforced polymers (CFRP) and glass fibre reinforced polymers (GFRP).

01 | Ultrasonic Testing rotor blade with Rope Access
02 | 3D Scan & Digitisation of rotor blade profiles
03 | Lab Testing Services with chemical analysis
04 | Automated UT scanner on rotor blade

GMA GROUP
A MEMBER OF MISTRAS

GMA-Werkstoffprüfung GmbH

Address	Julius-Leber-Weg 24 21684 Stade
Phone	+49 (0)4141 7944-0
Fax	+49 (0)4141 7944-299
E-Mail	stade@gma-group.com
Web	www.gma-group.com
Category	Operation & Service
Profile	Service, maintenance & repair
Employees	300
Founding year	1984

GP JOULE GmbH

We develop values: From green field to electricity and hydrogen station
GP JOULE is your reliable partner for integrated management and development of energy projects, for successful implementation of projects based on our expertise, experience and reliability at every phase – from securing the location to continued operation, including post-EEG.

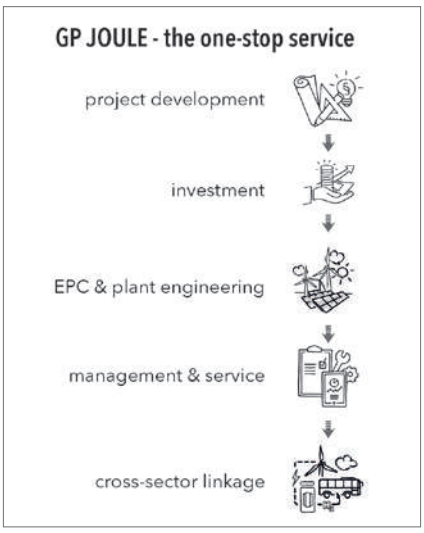
Since we were established in 2009, we have installed over 750 megawatts of renewable power plant capacity in Germany and abroad and now ensure the smooth operation of 750 megawatts in technical and 400 megawatts in commercial operations. GP JOULE also stands for expertise across the entire value chain of renewable energies and offers a full range of services from project development to wind power upgrading through Power-to-X in hydrogen, heat and mobility.

Landowners and municipalities benefit in a special way from our broad range of services. We realise energy projects together with you and, as native farmers, handle the land entrusted to us particularly responsibly.

We help **wind farm operators** secure and optimise their returns by providing our technical and commercial management. Our modular range of services delivers ISO-certified quality.

With us, old plants can be turned into new ones – in addition to repowering, GP JOULE possesses extensive project experience in the continued operation of post-EEG plants, also with regard to the topics of power marketing and power ugrading into hydrogen, heat and mobility.

Investors benefit from our expertise as project planners and operators, our direct and exclusive access to the market and from intelligent usage models with added value. We offer you sustainable investment strategies for value creators.



GP JOULE
TRUST YOUR ENERGY.

GP JOULE GmbH

Address	Cecilienkoog 16 25821 Reußenköge
Phone	+49 (0)4671 6074-0
Fax	+49 (0)4671 6074-119
E-Mail	info@gp-joule.de
Web	www.gp-joule.de
Category	Planning
Profile	Planers & project developers
Employees	410
Founding year	2009

Green Wind Group

With the power of wind

The Green Wind Group operates internationally both on- and offshore and covers project development, technical and commercial operational management, offshore maintenance management, engineering services for wind turbine optimisation, integrated energy systems, and full maintenance services.

01

10 years – a success story

The company, which has its headquarters in Berlin and branches in Aarhus and Copenhagen, celebrates its tenth anniversary as an independent company in 2021. and has been developing continuously since its inception. The foundations of many regional green wind projects that are currently operating had already been laid when the company was launched ten years ago. At that time, Green Wind began by securing sites and completing the approval processes for initial projects in Brandenburg, the first of which was the largest repowering project to date: The Vormark/Prignitz wind farm comprises 14 wind turbines and its own transformer station. A total of 33 wind turbines have been completed to date, and 15 more are going through the approval phase in 2021.

A growing team of experts

The independent company currently employs over 80 people in five divisions. In 2020 alone, the year of Covid, 20 new staff members joined the team. The Group's core subsidiaries include Green Wind Energy, responsible for the development and repowering of wind and PV projects, and Green Wind Operations responsible for the technical and commercial management of onshore facilities with a total output in excess of 600 MW. The offshore sector was added in 2015, among other things by taking on the maintenance management contract for the DolWin3 grid connection system (provision of the "technical support line"). The first wind farm in Denmark, which resulted from the company's acquisition of two Danish companies, went online with three Enercon wind turbines in the anniversary year 2021.

New directions 2021/2022

Green Wind once again took decisive steps towards the future in 2021: Green Wind provides support for the partial and full maintenance service of the newly founded WindNOW! GmbH with its 24/7 control room. Green Wind completed its portfolio with two further pillars: Green Wind Engineering GmbH and Green Wind Innovation GmbH & Co. KG.
PV technology must also be integrated to enable the efficient development of hydrogen projects, which are currently been pursued.

02

01 | Green Wind will be celebrating its tenth anniversary as an independent wind energy sector company in 2021. With these new developments, the company now covers everything needed for project development and operations from the greenfield site to dismantling, and from technical services to engineering services and sector coupling.

03

Ensuring that everything turns smoothly
Managing Director of Green Wind Engineering, Michael Melsheimer, uses his vast experience to take a look precisely at "those places where components rotate. As a specialist in engineering services for the technical optimisation of wind turbines, our focus is on balancing rotating parts, producing expert reports, and bespoke data collection projects." Their world-renowned experts have been firmly established in the wind energy sectors for many years and specialise in rotor dynamics: ensuring that everything turns smoothly.

The future is hydrogen
Green Wind Innovation is a start-up initiative founded by two young employees, Natalie Klette and Kilian Fromm. Under the leadership of Managing Director Manuel Lasse, they have dedicated themselves to providing consultancy services and to the development of integrated energy systems, among other things, in relation to hydrogen. Their current project involves the development of detailed concepts for electrolysis plants in conjunction with wind and photovoltaic systems in collaboration with regional energy companies in Thuringia.

"We cover everything now!"
According to Green Wind co-owner Manuel Lasse: "We now cover everything that is necessary for project development and operations from the greenfield site to dismantling, and from technical services to engineering services and sector coupling." "Of course," says company founder Martin Kühl, who runs the Group together with Lasse: "we will continue to be dependent on how wind energy is assessed in Germany and other European countries. But we do believe that we can make the world a little better through our efforts and by building independent structures."

02 | Denmark: Green Wind's first project in Scandinavia: the Torrild/Odder wind farm comprises three wind turbines manufactured by Enercon. It was constructed and commissioned in 2020/2021.
03 | Green Wind Engineering employs world-class engineers on all continents who work with on- and offshore wind turbines from all manufacturers and specialise in rotor dynamics, balancing rotating parts, and bespoke data collection projects. Attaching temporary test weights to the rotor.
04 | Saxony-Anhalt: the Rottelsdorf wind farm which comprises two Vestas V126 wind turbines and produces a rated output of 6900 kW and includes the Freist/Saxony-Anhalt transformer station was connected to the grid in 2021. Green Wind is responsible for the technical and commercial management of the wind turbines. A noteworthy fact is that it was constructed during the Covid-19 pandemic.


04

greenwind
With the power of wind

Green Wind Group

Address	Alt-Moabit 60a 10555 Berlin
Phone	+49 (0)30 3512 886 30
Fax	+49 (0)30 3512 886 33
E-Mail	info@greenwindgroup.de
Web	www.greenwindgroup.de
Category	Operation & Service
Profile	Technical & commercial operational management
Employees	87
Founding year	2011

greenmatch AG

Financial Software & Financing Expertise for Renewable Energies
With green[::]match you can structure, manage and market your wind energy, photovoltaic, hydropower and biomass projects reliably and efficiently. Digitalise and optimise your transaction, asset and portfolio management processes with our software and services:

01

01 | greenmatch Cashflow-Waterfall
02 | symbolic picture Onshore-Wind Farm
03 | greenmatch Portfolio-Aggregation

- **Valuation:** Efficient and reliable project evaluation

Valuation is a certified and web-based financial modeling software for renewable energies. Thanks to **the standardised financial model,** unnecessary discussions about calculation methods are obsolete. Even the **most complex project structures** can be **modeled, simulated** and **aggregated into a portfolio** in a short time.

- **Asset Controlling:** Monitor & optimise financial performance

With the help of the Asset Controlling tool, you can keep a constant eye on your projects **throughout their life cycle, optimise** them and thus **increase their returns.** The intuitive overview about all target and actual figures for your projects also provides you with a wide range of **reporting options.**

- **Portfolio & Reporting:** Aggregate projects at portfolio level, maintain an overview and report efficiently to investors and banks

With our portfolio tool you **keep track of your renewables' portfolio.** You decide which projects you want to aggregate and manage. This way you can keep the financial overview and also run **internal benchmarks.** Do you **have individual reporting needs** towards **your investors & banks?** You can also fulfil these with the help of green[::]match!

- **Services:** Consult expertise

With our **tailor-made consulting services,** you will be closely supported throughout **the entire project life cycle** and are **at the right address with us** for all questions concerning the financing of your projects.

Our team offers **highly specific expertise** and many years of experience in **project financing and optimisation** of renewable energies (at project and portfolio level).

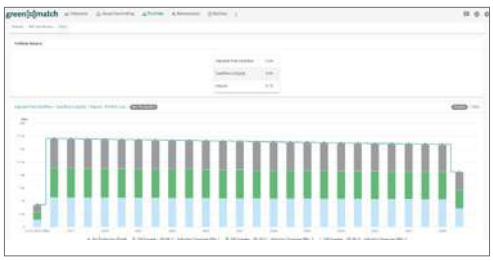
Convince yourself: **www.greenmatch.ch**

green[::]match

greenmatch AG

Address	Greifengasse 1 CH-4058 Basel
Phone	+41 (0)61 301 50 00
E-Mail	info@greenmatch.ch
Web	www.greenmatch.ch
Category	Other services
Profile	Software solutions
Employees	11
Founding year	2013

02



03

Grzib Elektrotechnik GmbH & Co. KG

Service provider with more than 20 years of experience in the wind industry
We are not only available in Germany, but also in other European countries: So far, we have successfully installed around 3,100 wind turbines all over Europe.

The requirements of planning and erecting a wind farm are diverse. Especially external partners need to be reliable, flexible and professional, demonstrating their work experience at its best in order to complete these projects successfully and failure-free. With us, our customers have found a qualified and flexible partner. We know the challenges in project planning and are therefore able to offer customer-oriented services to avoid disturbances and difficulties.

Our range of services during new construction projects and repowering includes:

- Work in the low-voltage range
- Visible installations such as inner and outer tower lighting
- Cabling of power cables (Connection converter to transformer)
- Implementing transformer and plant protection

Work in the medium-voltage range

- Connection of medium-voltage switchgear to transformer
- Commissioning of transformers and medium-voltage switchgears
- Switching operations in the medium-voltage range up to 36 kV
- Implementation of earthing and lightning protection concept

Work in the field of measurement and control technology

- Cabling of superior parking controllers and their signal exchange

Maintenance and service of transformer, medium-voltage switchgear and converter

Other services

- Installation of cable support systems in steel and hybrid towers
- Delivery of WTG-specific safety equipment
- Assembly of medium-voltage cable bridges according to customer requirements

For more information go to
www.grzib-elektrotechnik.de

01 | Andreas Grzib (Managing Director)
02 | Lothar Grzib (Founder & Managing Director)

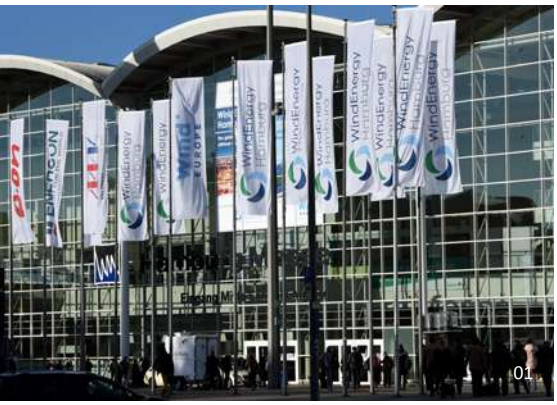
Grzib Elektrotechnik GmbH & Co. KG

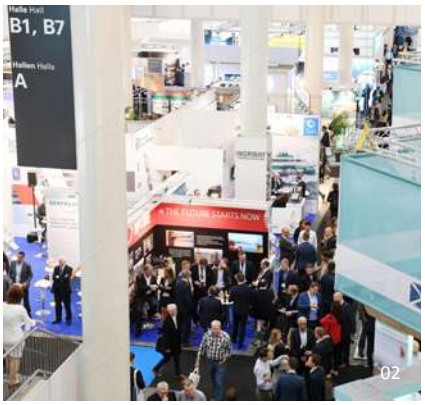
Address	Zur Kokerei 21 46117 Oberhausen
Phone	+49 (0)208 884 839 24
Fax	+49 (0)208 884 839 26
E-Mail	info@grzib-elektrotechnik.de
Web	www.grzib-elektrotechnik.de
Category	Operation & Service
Profile	Service, maintenance & repair
Turnover	€ 3.5 million (Wind energy: € 3.5 million)
Employees	25
Founding year	1998

Hamburg Messe und Congress GmbH

The global on & offshore event

With 1,400 exhibitors, around 35,000 visitors from 100 countries, and a gross exhibition area of 68,500 sqm, WindEnergy Hamburg is the foremost global meeting place of the wind energy industry.





01 | The next WindEnergy Hamburg will take place from 27 to 30 September 2022
02 | 1.400 exhibitors and 35.000 visitors attend the WindEnergy Hamburg on a regular basis.
03 | WindEnergy Hamburg's press conference

Since 2014 the leading international wind industry expo has been providing a common platform to all key players of the industry, including specialised suppliers and start-ups from all stages of the value chain for the onshore and offshore segments. The programme features product launches by major wind turbine manufacturers and component suppliers, and showcases services custom-tailored to address the challenges of the global wind industry.

One of the key purposes of this trade fair is to provide international companies, industry associations, and political decision-makers with a direct networking opportunity. Through its innovative featured topics, WindEnergy Hamburg looks ahead to the future of wind energy production, integration and storage.

Solutions for sector coupling, i.e. the use of wind power for mobility, heating and industrial applications, are high on the agenda, as well. Covering all these specific areas, the world's leading wind industry expo is a major force driving the global energy transition towards a carbon-free energy supply for the world. And for the first time the "H2 Expo and Conference", the new international meeting place focused on the generation, distribution and use of green hydrogen, will be part of WindEnergy Hamburg 2022.

The next expo will for the first time be accompanied by admission-free conference sessions featuring top-ranking experts on four stages set-up in the middle of the exhibition halls. The WindEnergy Hamburg team are developing this program jointly with their partners, including the Global Wind Energy Council (GWEC), the European organisation WindEurope, the national industry associations VDMA and BWE, leading industry media and exhibitors, and others.

The next WindEnergy Hamburg will take place from 27 to 30 September 2022.
For up-to-date information go to windenergyhamburg.com or to LinkedIN.

WindEnergy Hamburg
The global on & offshore event

Hamburg Messe und Congress GmbH

Address	Messeplatz 1 20357 Hamburg
Phone	+49 (0)40 3569-2263
Fax	+49 (0)40 3569-692263
E-Mail	andreas.arnheim@ hamburg-messe.de
Web	www.windenergyhamburg.com/en
Category	Other services
Profile	Trade fairs & conferences for the wind energy industry
Employees	more than 300
Founding year	1972

Helling GmbH

Innovative surface crack detection on wind turbines

In materials testing, the detection of the smallest material defects is crucial for the safe operation of wind turbines. As a leading company in the field of non-destructive testing, HELLING GmbH is continuously working on making surface crack detection more reliable and cost-effective.

As a long-standing partner of the wind industry, HELLING GmbH supplies high-quality systems, equipment, and consumables for non-destructive testing.

In addition to the widely used HELLING magnetic particle suspensions, state-of-the-art UV-LED technology, and the well-known penetrant testing systems, HELLING has increasingly focused on the development of magnetisation equipment for crack detection on components for the wind industry. Furthermore, UV LED technology for the inspection of large components, weld seams and gears of wind turbines is being continuously developed. Also, there are significant new developments in the field of non-hazardous and ecologically compatible testing media. For example, a new type of dry concentrate of magnetic particles has been developed for the preparation of water-based suspensions. There are also significant innovations in the field of systems and equipment for crack detection: From ergonomic hand magnets to powerful high-current generators with pulse magnetisation, and PLC-controlled magnetic benches.

The well-known Dykem® products supplied by HELLING are used with great success to monitor the properties of gear components in operation and to check the load-bearing capacity of gears. The DGZfP Training Centre Hamburg/ HELLING offers qualification courses in most NDT procedures such as VT, PT, MT, RT and UT according to DIN EN ISO 9712, as well as in the training of inspectors (PT, MT and UT) according to DIN 54161 and in radiation protection. A well-equipped optical measuring laboratory, complex test series and certification according to DIN EN ISO 9001 make a decisive contribution to ensuring a high-quality standard and the further development of our products.


01


02

01 | Fluorescent Magnetic Particle Inspection with Super Magna LY 2500 and UV-Inspector 711 IP 65 – UV-LED-Hand-held Lamp verified with Reference Block No. 1

02 | Contrast Penetrant Testing with TORNIA TRES-CHECK PREMIUM Typ 4103 Penetrant red-visible-TGL und Hell-Light VT13 verifiied with Reference Block No. 1 according to DIN ISO 3452-3

HELLING
WERKSTOFFPRÜFUNG · UMWELTSCHUTZ
MEDIZINTECHNIK · SICHERHEITSTECHNIK

Helling GmbH

Address	Spökerdamm 2 25436 Heidgraben
Phone	+49 (0)4122 922 0
Fax	+49 (0)4122 922 201
E-Mail	info@helling.de
Web	www.helling.de
Category	Operation & Service
Profile	Service, maintenance & repair
Founding year	1873

in.power group

An experienced, innovative and independent direct marketing services provider
Whether you need direct marketing, continued operation of of plants after 20 years, PV PPAs, metering point operation, remote controllability, redispatch 2.0 or regional green power products for end customers: The in.power group with its wide range of services is the right partner for you!

01 | Josef Werum (left), Matthias Roth (right), Managing Partners of the in.power Group
02 | www.inpower.de

Ever since 2006 and as one of the first companies in Germany, the Mainz-based **in.power group** has been involved in the direct marketing of renewable and environmentally friendly energies. “in.power” is short for “independent power” and illustrates the company’s explicit independence of big groups of companies. In addition to the traditional **direct marketing** of EEG and CHP facilities, in.power offers innovative solutions for the **continued operation of wind power and PV plants after 20 years.** The transparent open-book model enables operators to fully participate in the market and also offers the option of providing end customers with regional green electricity products. in.power offers numerous services related to direct marketing via its subsidiaries.

in.power metering GmbH, for example, is an independent metering point operator. In addition to online metering and a dedicated Internet portal where operators can view all relevant metering and revenue variables for each facility, this service also includes the implementation of remote-control facilities.

in.power also supports customers and third parties, whose facilities are not being marketed directly, with **re-dispatch 2.0** and offers solutions **for third party volume delimitation.**

Throughout Germany, the subsidiary **grün.power GmbH** supplies end users with regional green electricity based on a simultaneous comprehensive supply from solar, wind, and hydro facilities. Large corporations and utilities can also purchase this green electricity via in.power for their procurement portfolios.

As a joint venture platform, **in.power network GmbH** offers market partners (as of 200 MW) a comprehensive range of services in addition to direct market access. It also functions as a highly specialised incubator for new, innovative subsidiaries.

in.power

in.power GmbH

Address	An der Fahrt 5 55124 Mainz
Phone	+49 (0)6131 69657-0
Fax	+49 (0)6131 69657-29
E-Mail	kontakt@inpower.de
Web	www.inpower.de
Category	Direct marketing
Profile	Direct marketers
Employees	approx. 15
Founding year	2006

infrest – Infrastruktur eStrasse GmbH

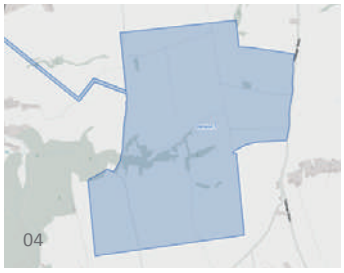
Still searching for a construction site?
Maximum turbine availability is crucial for the economic operation of wind turbines. This is why it is essential to avoid potential cable damage. Infrest is your partner for obtaining and issuing information about buried infrastructure throughout Germany.

With around 11,300 registered infrastructure operators and other public authorities, the infrest Leitungsauskunftsportal provides the widest coverage in Germany. In a single step, all affected network and infrastructure operators are identified, and a central infrastructure request is sent to them. The bundled participation of public authorities saves a significant amount of time and cost compared to having to send out individual letters. The audit-compliant storage of all processes and documents within the portal also reduces administrative effort and increases legal clarity.

To receive enquiries, operators can upload data about their wind turbines and buried infrastructure to the portal free of charge. An automated check then ensures that only relevant requests need to be processed.

Infrest also offers an online solution for processing incoming buried infrastructure enquiries in the form of an enquiries database. It enables simple and cost-effective responses to enquiries thus making it the perfect complement to the infrest buried infrastructure information portal.

Thanks to standardised processes and preconfigured response letters, online enquiries received via the infrest Leitungsauskunftsportal can be processed with no media discontinuity. A direct connection to GIS solutions facilitates the provision of information without the need to install any software. The infrest information database can also be used to manage and process any enquiries received by the operator directly by email or post.



01 | The infrest Leitungsauskunftsportal
02 | Use the infrest information database to process incoming buried infrastructure enquiries
03 | Four steps to obtaining information about buried infrastructure anywhere in Germany
04 | The area of responsibility uploaded for a specific wind farm

If required, infrest can manage the entire process of providing information about buried infrastructure for wind farms and wind turbine operators as a service.

infreSt INFRASTRUKTUR eSTRASSE

infrest – Infrastruktur eStrasse GmbH

Address	Torgauer Straße 12–15 10829 Berlin
Phone	+49 (0)30 22 44 52 58-43
E-Mail	vertrieb@infrest.de
Web	www.infrest.de
Category	Planning
Profile	Grids & grid connection
Employees	approx. 20
Founding year	2010

Isoblock Schaltanlagen GmbH & Co. KG

Planning, execution and implementation – all from a single source!
Our system-oriented full service package guarantees a consistently smooth process flow with a direct contact person. Experienced engineers and our qualified assembly team ensure the highest quality products “made by ISOBLOCK” in terms of technology and craftsmanship.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01 | Photovoltaic park with Isoblock transformer and transfer substations
02 | Air-insulated measuring transformer panel for metering and control
03 | Customized transformer and transfer substations in various appearances
04 | The Isoblock mobile plant visualization
05 | Transport and implementation of a transfer substation for a wind farm
06 | Isoblock all-in-one solutions for fast charging systems

Transfer and transformer substations:
Our services in the field of renewable energies include project planning, delivery, installation and maintenance of medium-voltage switchgear, transfer and transformer substations up to 36 kV according to the “plug & play” principle. Isoblock systems offer maximum personal protection and operational safety through reliable electrical and building services engineering. On request, we can also take care of transport and installation on site – including implementation and instruction of our customers.

We have the right solution for your individual application. Well-known customers throughout Europe rely on transfer and transformer substations from Isoblock! Together, we have successfully implemented the grid connection of more than 3,000 wind turbines with a total output of over 7,000 MW and more than 1,000 MWp of solar energy.

Grid protection and telecontrol technology:
We plan, manufacture, and parameterize innovative grid protection technology and implement it on site, if necessary together with the customer and the grid operator or energy supplier. Of course, in accordance with the current Technical Connection Guidelines.

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Gas-insulated & air-insulated medium-voltage switchgear:
Gas-insulated or air-insulated medium-voltage switchgears and measuring transformers, type-tested according to IEC 62271-200, EEG-compliant and in accordance with guidelines of the network operators are also part of our transfer and transformer substations, as are the standardized energy billing systems.

Mobile Isoblock system visualization:
Everything in view at all times: [mIA], with the mobile Isoblock plant visualization. Our monitoring technology informs you 24/7 about the status and productivity of your medium-voltage, industrial and EEG plants. Without much effort, both new and existing plants can communicate on a state-of-the-art level thanks to [mIA] – individually adapted to your requirements!

Our system transmits the switching states of your plants as well as the current, voltage and power values from your plant control system and current messages from the protective relay directly to your smartphone. Even before the service personnel arrive, you can find out whether your plant has been disconnected from the grid due to a short circuit, voltage or frequency fluctuation. The necessary measures can be planned directly and downtimes can thus be optimized.

E-mobility:
Our service starts with planning the right system for you and your needs. We support you in applying for subsidies and coordinate the details with the local energy supplier or grid operator. The provision of the transformer substation including battery storage, remote monitoring and connection to back-end systems complete the coherent concept. Modern payment systems can also be easily integrated.

Isoblock's intelligent all-in-one system includes all the components you need for optimal operation of your private or commercial system.

Maintenance and service:
Even after implementation, we remain a partner for our customers – we offer individual maintenance concepts, service as well as all services related to your transfer substation. If problems should still arise, our competent 24/7 emergency service is there to help – 365 days a year!

06

Isoblock Schaltanlagen

Isoblock Schaltanlagen GmbH & Co. KG

Address	Anton-Storch-Straße 17 49080 Osnabrück
Phone	+49 (0)541 9590 90
Fax	+49 (0)541 95909 50
E-Mail	peter.schriewer@isoblock.de
Web	www.isoblock.de
Category	Planning
Profile	Grids & grid connection
Employees	100+
Founding year	1966

juwi AG

The energy is there

Project development with competence, experience, and passion. juwi has been implementing cost-effective and reliable renewable energy projects for the past 25 years. We lease sites, manage approvals planning, source components and construct wind farms, and also assume project rights.

01 | The juwi Group – the onshore wind energy experts
02 | Wind power in harmony with nature

Competent, experienced and in a spirit of partnership

juwi is one of the leading wind and solar energy project specialists. During the course of many projects, we have proven ourselves as a collaboration partner for regional project developers, energy suppliers and energy cooperatives. Our reliability is guaranteed through our long-term collaborations with all important wind turbine and component suppliers.

juwi was founded in 1996 in Rhineland-Palatinate, Germany. The Group employs about 1000 people around the world and has a presence in every continent. Over 1000 wind turbines and more than 1750 PV systems attest to the company's 25 years of expertise in renewable energies.

Complex sites & repowering

Throughout Germany, juwi has already installed some 820 wind turbines with an output capacity in excess of 2100 megawatts, in many cases with the participation of citizens and local authorities. juwi can demonstrate its expertise even on extremely complex hilly or wooded sites. Having repowered over 100 wind turbines, we can also provide numerous references for this service.

Pioneering partnership

The juwi Group and MVV Energie AG have been collaborating since 2014 to create an efficient, secure, and climate-friendly energy system. We are able to cover the entire energy industry value chain thanks to our partnership with one of Germany's largest energy suppliers. Together, we offer wind turbine operator solutions, such as our MVV20plus product for continuing operations after 20 years, which will continue to be attractive even when subsidies end ("post-EEG"). We also combine wind turbines with battery storage facilities in innovative projects and, in addition to fixed market premiums, also offer operators the option of a multi-year power purchase agreement (PPA).

juwi AG

Address	Energie-Allee 1 55286 Wörrstadt
Phone	+49 (0)6732 9657-0
Fax	+49 (0)6732 9657-7001
E-Mail	info@juwi.de
Web	www.juwi.de
Category	Planning
Profile	Planers & project developers
Employees	approx. 1,000 (juwi-group)
Founding year	1996

juwi Operations & Maintenance GmbH

The energy is there!
We provide the full range of technical and commercial management services as well as wind and PV system maintenance. Our 25 years of experience and proprietary control room enable us to optimize yields. We also have attractive offers for continued operations following 20 years of EEG support.

Technical management
We provide support with legal, insurance and regulatory compliance requirements. Malfunctions are analysed and rectified immediately, and you receive comprehensive reports. You will also benefit from the personal support of a qualified technical customer advisor, who will assert your claims quickly and effectively. We fulfil all occupational health and safety requirements on your behalf using our occupational health and safety management system (which is BG ETEM, OHSAS certified).

Maintenance
Rely on our many years of experience in everything from recurring to condition-based inspections as well as maintenance and site care. We will take on the maintenance of all components according to manufacturer's specifications and will provide well-founded action recommendations. Fast and effective repairs complement our range of services to ensure maximum yields.

Commercial business management
We will manage your entire financial affairs, from commercial bookkeeping and dunning to payment transaction processing. We can also manage your communications with your business partners. Build on our experience in budget and liquidity management: our services include shareholder meeting support, contract management and advice on legal and regulatory optimisation.

Remote monitoring from our control room
We guarantee the smooth flow of maintenance and repairs based on our professional 24/7 monitoring system, which enables us to optimise the technical availability of your systems and forms the basis for the best possible electricity yields.

Continued operation after 20 years
Together with our parent company, MVV Energie, we can offer you attractive conditions through our MVV20plus product.


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01 | The control room at the juwi headquarters in Wörrstadt
02 | Continued operations or repowering? We will help you to take the right decision.

juwi Energy is here

juwi Operations & Maintenance GmbH

Address	Energie-Allee 1 55286 Wörrstadt
Phone	+49 (0)6732 9657 5090
Fax	+49 (0)6732 9657 7001
E-Mail	info@juwi-om.de
Web	www.juwi-om.de
Category	Operation & Service
Profile	Technical & commercial operational management
Employees	120 (only O&M)
Founding year	1996

KOOPMANN Gruppe

Professional service in the field of electrical power engineering
The KOOPMANN Group is one of Germany's leading energy and electrical engineering specialists. Wind industry services: cable measurement, power plant installation, circuit breaker servicing, testing & diagnostics, transformer servicing, power stations, safety engineering and operational management.

01 | High-performance measuring system in a sea container, Cable measuring van "The Beast", Locations, Business sectors
02 | 260 kV resonance testing system

Our wind energy services include comprehensive planning and project support, assembly, maintenance, repairs/overhauls, and the provision of turnkey distribution and switching substations. Our activities cover the installation of new switching substations, cable routes, and transformers up to 110 kV. The installation service is supplemented by commissioning, as well as requalification and safety testing. We also perform standards-compliant earth measurement and network analyses. We have invested in transformer servicing, both in terms of technology and personnel, and own an oil laboratory where we perform and evaluate all VDE oil analyses. We are able to carry out extensive on-site services on transformers of any size using our mobile oil treatment facilities.

Our core competencies include cable testing and diagnostics.
The respective equipment consists of 14 medium voltage cable measuring and diagnostic vehicles and a test facility with an output voltage of 260kV AC for high voltage cables. In addition, the KOOPMANN Group owns mobile measuring equipment for testing and diagnosing switchgear, as well as for measuring insulation, transformation ratios, winding resistance and dielectric frequency response for transformer tests.

Our cable test van "The Beast" is currently equipped with **the most powerful VLF test system in the world** for the standards-compliant testing of cables with an operating voltage of up to 33kV and a length of up to 100 km.

We also have a high-performance fault location system, installed in a seaworthy container for the precise location of cable faults both on- and offshore. In addition, we provide an operational management service for energy and electrical infrastructure systems.

Our team is available 24/7 and is well equipped both professionally and technically to ensure the safe and long-term operation of your energy supply facilities.

KOOPMANN
ENERGIE- UND ELEKTROTECHNIK

KOOPMANN Gruppe

Address	Zum Brook 19–21 49661 Cloppenburg
Phone	+49 (0)4471 9494 0
Fax	+49 (0)4471 84895
E-Mail	info@hk-c.de
Web	www.hk-c.de
Category	Operation & Service
Profile	Service, maintenance & repair
Employees	360
Founding year	1982

KWS Energy Knowledge eG

Knowledge – Workmanship – Safety
In the area of wind power, we assist you with standard training courses from our comprehensive basic and advanced training program as well as with client-specific courses and workshops. Get in touch with us and benefit from our strong, well-established community!

With basic and advanced training offerings generated each year in its function as a vocational training institution for the power industry, KWS has earned a highly respected reputation worldwide for itself. The instruction lineup encompasses preset and modularized training systems with specialized solutions and customized courses. Thanks to an ever-growing advanced training program, KWS always keeps up with the latest trends in power generation and thereby ascertains a uniformly high training standard in power industry businesses. Its across-the-board training lineup contributes to greater safety, environmental protection, and economy–a priceless investment in the future.

Energy providers worldwide entrust us with the basic and advanced training of their skilled personnel. Make use of our know-how and get a strong and dependable partner by your side. Go with KWS and let us train your operating, service, and maintenance personnel to make them highly competent specialists.

With our WPI (wind power installation) training tower, we are able to offer matchless safety, operations, maintenance and repairs instruction.

Our program encompasses courses, seminars, workshops, and trainings covering the following topics:

1. Advanced training for service technician for wind power installation technology (CIC)
2. Retraining for electrically qualified person (wind power)
3. Teaching fundamentals in the field of wind power installations and their technology
4. Operations and maintenance
5. Occupational safety, health and environmental protection, fire protection
6. Identification and documentation
7. Electrotechnology
8. Interdepartmental skills

Our claim is to be – and to remain – a top service provider in basic and advanced training of the power industry's expert staff.


01

01 | Training Center of KWS Energy Knowledge eG
02 | WPI Training Tower


02

KWS ENERGY KNOWLEDGE FOR YOU

KWS Energy Knowledge eG

Address	Deilbachtal 199 45257 Essen
Phone	+49 (0)201 8489-0
Fax	+49 (0)201 8489-102
E-Mail	info@kws-eg.com
Web	www.kws-eg.com
Category	Education & training
Profile	Education & training
Employees	55
Founding year	1957

The Liebherr Group

A Strong Partner for the Wind Industry

For more than 70 years, the Liebherr name has stood for excellent, benefit-oriented products and services. The Liebherr Group is not only one of the world's leading manufacturers of construction machinery; it is also a major supplier in many other fields of engineering like the wind industry.

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Liebherr is a powerful partner for the wind industry and offers convincing solutions for a wide range of requirements: On the one hand, components manufactured by Liebherr are installed directly into wind turbines. On the other hand, the company's mobile, crawler, offshore and tower cranes, for example, are used for erecting wind turbines and constructing wind farms.

Offering slewing bearings, slewing drives, electric machines, frequency converters and hydraulic cylinders, Liebherr is the only manufacturer worldwide that provides not only single components, but also entire systems for electromechanical and hydraulic pitch and yaw adjustment in wind turbines. For rotor blade adjustment, Liebherr offers moment bearings in two main designs: as double-row tapered roller bearings or triple-row roller bearing slewing rings. The portfolio also includes compact full-scale converter solutions for wind turbines with a capacity from 2 to 5 MW.

One of the major elements of cooperation with customers from all over the world is application-specific engineering to perfectly adapt each of the components. In the wind industry, Liebherr collaborates with nearly all leading turbine manufacturers, having equipped numerous wind turbines with its own components. The product portfolio comprises components for turbines from 800 kW up to solutions for multi-megawatt offshore turbines.

With their innovative technology, high quality, profitability and longevity, mobile and crawler cranes from Liebherr own a leading position in the world market. For decades, they have also been proving their value in the construction of wind farms. As well as telescopic mobile cranes, Liebherr also provides lattice boom mobile cranes and crawler cranes to erect wind power systems, in a

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01 | From single components to final assembly, Liebherr offers the matching solution for different demands of the wind industry.
02 | Liebherr LTM 1750-9.1 mobile crane installs the rotor star at a hub height of 80 m.
03 | Heavy duty CAL 64000-1500 Litronic® offshore crane during the installation of rotor stars in the North Sea.
04 | Liebherr tower cranes of the type 1000 EC-B are specially designed to erect wind turbines and work extremely precise with a space-saving design.

03

variety of performance classes, specifically matched to meet the needs of the wind power industry. The Liebherr Group keeps pace with the development of larger and more efficient turbines as well as the increasing hub heights by offering cranes with optimized performance and new jib systems, reaching higher lifting capacities.

Cranes on narrow crawler travel gears especially developed for the construction of wind farms can move on the narrow tracks from one unit to the next in full setup condition, that is including jib and full ballast. This is especially economical, because machine and equipment have to be mounted only once.

For erecting wind turbines with a hub height of 110 m or more in low-wind areas, Liebherr also offers specially developed tower cranes with lifting capacities of up to 125 t. They are mounted on the wind turbine and are configured in a way that the necessary lifting height can be reached by guying the crane to the mast at one point only. Advantages are reduced space required by the crane, the ability to work despite high wind speeds and sensitive lifting of loads using Micromove.

04

The Liebherr Group also offers innovative solutions for the loading and erection of wind turbines at offshore locations. Liebherr mobile harbor cranes handle rotor blades, generators, nacelles and monopiles for the erection of wind farms onshore and offshore. The tandem lift-assist system Sycratronic is often used for this purpose. In tandem lift mode, two LHM 800 mobile harbour cranes can lift up to 616 t. Heavy duty cranes for offshore applications are able to lift up to 5,000 t and reach a lifting height of 180 m above deck. Thereby the Group's offshore portfolio meets challenging requirements, such as the provision of diesel or electrical drive units, explosion protected cranes and cranes for ambient temperatures between +40 °C and -50 °C. Liebherr cranes are not only used successfully for the construction of offshore wind turbines, but also on oil and gas platforms, for offshore construction, pipe-laying or subsea operations down to 3,600 m below sea level.

LIEBHERR

The Liebherr Group

Address	Hans-Liebherr-Straße 45 88400 Biberach an der Riss
Phone	+49 (0)7351 41-0
Fax	+49 (0)7351 41-265
E-Mail	info.lho@liebherr.com
Web	www.liebherr.com
Category	Transport & Logistics
Profile	Crane companies, crane hire & special transport
Turnover	€ 10,341 million (2020)
Employees	47,925 (2020)
Founding year	1949

M.O.S.S. Computer Grafik Systeme GmbH

Digital planning: GIS-based, optimised and integrated wind farm planning
GIS-based wind farm planning, with no format breaks, including CAD integration, embedded in your own processes, highly flexible, partially automated, and server-based.

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01 | Virtual project support for wind farm planning through the use of 2D/3D technology up to and including augmented reality
02 | Efficient planning processes through consistent and comprehensive information management

Web service for buffering official building footprints for white area analyses
We have acquired the complete ALKIS database of building footprints and their attributes for the whole of Germany and have placed it online as a password-protected web service. Wind farm planners can use the information to analyse the buffering requirements of residential areas close to the area where a wind farm is being planned, taking into account the particular specifications of the responsible regional planning authorities and depending on whether the building project is located in an urban or rural zone. The results can then be downloaded in a shapefile, after which they can easily be integrated with other baseline data in a local GIS in which they can be further combined with other data and analyses.

Wind farm planning & IT infrastructure (Wind-PIA)
Rather than proceeding in chronological order, wind farm planning processes tend to be iterative and seemingly reliable results can change again and again throughout the process. This makes it all the more important for project developers to work on the basis of structured, standardised, and coordinated planning processes. Wind-PIA provides the means to make wind farm planning processes more efficient by using a standardised geodata and information exchange system. To optimise the process, technical, structural, and organisational hurdles that arise during the planning process are identified and removed, e.g., by reducing task duplication, avoiding data conversions and projection changes or local and redundant data storage. In this way, wind farm planning processes can become significantly more efficient and integrated.

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M.O.S.S.
Computer Grafik Systeme
Geoinformationssysteme

M.O.S.S. Computer Grafik Systeme GmbH

Address	Hohenbrunner Weg 13 82024 Taufkirchen
Phone	+49 (0)89 66675-100
Fax	+49 (0)89 66675-180
E-Mail	info@moss.de
Web	www.moss.de
Category	Other services
Profile	Software solutions
Employees	65
Founding year	1987

Messe Husum & Congress GmbH & Co. KG

We think wind further!
From September 12–15, 2023, everything in the North Sea town of Husum will revolve around wind energy and its importance. Exhibitors from Germany & other countries will present product innovations, cutting-edge technologies & innovative onshore & offshore solutions for a successful energy transition at HUSUM Wind.

Since over 30 years HUSUM Wind is the most important trade fair in the wind industry. In Husum, the complete value chain of the onshore and offshore industry is represented in the areas of plant construction, service, planning, financing and operation, plant components and raw materials. Between the North Sea and the Baltic Sea, the trade fair in Germany's largest wind farm network offers a unique contact platform for the wind industry, characterized by practical relevance, networks that have grown over decades and a personal atmosphere – the legendary "Husum Spirit". OEMs and market leaders, start-ups and tech companies, research institutions, clusters, politics and trade associations meet here to engage in personal discussions at the exhibition and afterwards. The exhibition in the exhibition halls is flanked by an exciting program of forums, panels, cooperation exchanges and matchmaking formats.

Wind energy is essential for a successful energy transition and decarbonization of industry. This opens up new development potential for industry and the regional economy. The trade fair location of Husum, Germany's leading model region for wind and hydrogen, offers optimal conditions for presenting the industry's forward-looking technology status in an innovation environment. Outside the gates of the trade fair, a new, integrated energy system is already becoming reality with wind power, green hydrogen and alternative utilization concepts. In the end, the future of the German industry will be decided here in the market. The latest developments will then be presented at HUSUM Wind and discussed in the context of pressing future issues.


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01 | HUSUM Wind – showcase of the wind industry.
02 | HUSUM-Spirit: Personal atmosphere and close networks characterize the trade fair.
03 | The industry will meet at HUSUM Wind from 12–15th September 2023.
04 | Established forum for the industry: HUSUM Wind attracts experts from all sectors.


02

Transformation, Innovation
and Wind Power:
HUSUM Wind September 12–15, 2023.

We will meet in Husum!

HUSUM Wind
The German Wind Trade Fair and Congress
12–15 Sept. 2023
Husum, Germany

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Messe Husum & Congress GmbH & Co. KG

Address	Am Messeplatz 12–18 25813 Husum
Phone	+49 (0)4841 902-0
Fax	+49 (0)4841 902 246
E-Mail	info@husumwind.com
Web	www.husumwind.com/en/home-en/
Category	Other services
Profile	Trade fairs & conferences for the wind energy industry
Founding year	1986

MLK-Gruppe

Family business

The MLK Group has planned and constructed numerous wind farms, biomass power plants, and PV systems since its foundation. Our focus is on broad citizen participation, the fair treatment of business partners, supporting our employees, and close collaboration with municipal authorities.

Heinrich Lohmann, founder of MLK, has been working in the field of renewable energies since the early 1990s and has been involved in the development of around 570 wind turbines with a total installed capacity of 800 MW. MLK itself has installed 50 turbines with an output of about 150 MW since 2008 and has participated in another 100 via collaboration agreements. Many more are currently being approved.

The company has already installed three biomass power plants in East Brandenburg, which are fed with agricultural substrate from the surrounding area. MLK is now also planning to expand its portfolio through the addition of several PV power generation systems. The first projects are already being implemented.

A special feature of nearly all projects is that MLK operates the vast majority of installed facilities in-house. MLK continues its involvement in new systems which creates trust among communities and residents: The company involved at the planning stage remains on site throughout the operational period and assumes responsibility.

Participation – even without assets and risks

The MLK Group has a particular commitment to citizen participation: local people, even the less wealthy, should benefit from MLK facilities. The company has developed several measures aimed at all social groups ranging from subsidised electricity tariffs for residents to direct participation opportunities. The neighbourhood electricity tariff, for example, provides green electricity to people living next to wind farms at a lower tariff than those offered by other low-cost suppliers. The MLK Citizen Savings scheme yields three percent interest per annum – in an era of low interest rates. Crowd funding campaigns and sponsorships for day-care groups complete this raft of measures.


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01 | Transport at night
02 | A tidy construction site
03 | Progress with construction
04 | Bird protection

MLK-Gruppe

Address	Lichtenberger Weg 4 15236 Jacobsdorf OT Sieversdorf
Phone	+49 (0)336 081 799 97
Fax	+49 (0)336 081 799 98
E-Mail	info@mlk-consult.de
Web	www.mlk-windparks.de
Category	Planning
Profile	Planers & project developers
Employees	40 (Wind energy: 30)
Founding year	2005

Monsson Operation GmbH

Your global service partner in the renewable energy market
As part of a selected group of companies which are all acting in the renewable energy market within well-defined fields, Monsson Operation GmbH is able to provide added value for a wide range of services either with own or group resources.

Installation for onshore wind turbines
The installation service may consider the supply of installation teams or the supply of both installation teams and crane services. In some cases, special transport can also be considered for taking over a turnkey project.

Operation and maintenance for onshore wind turbines
As the core service of Monsson, the O&M category includes the delivery of full or limited service agreements, as well as of selected stand-alone services. Such services include preventive and corrective maintenance, service and troubleshooting, blades and other rope access works, gearbox video-endoscopy and gearbox oil exchange, condition monitoring through vibration analysis, and inspection of wind turbine equipment.

EPC and operation and maintenance for solar power plants
The solar PV is a strong developed division within Monsson which is able to provide a wide range of services. It all starts with EPC contracts and continues with O&M and various other analysis, inspection and calibration services aimed to ensure a smooth operation of the solar power plant.

Remote monitoring for renewable assets
With two privately-owned remote monitoring and dispatch centers, Monsson is able to actively monitor 24/7 renewable power plants and transformer stations, and provide remote control, data analysis, as well as on-site teams coordination and support.

GWO and other industry trainings
Monsson's Renewable Energy School of Skills is the largest privately-owned training facility in South-Eastern Europe, fully certified and supported by BZEE and GWO. Currently, the facility provides various and complex training modules for both onshore and offshore technicians, with new trainings being periodically developed and implemented.

Photos: Monsson Operation

monsson operation

Monsson Operation GmbH

Address	Ballindamm 3 20095 Hamburg
Phone	+49 (0)403 010 4470
Fax	+49 (0)403 010 4299
E-Mail	germany@monsson.eu
Web	www.monsson.eu
Category	Operation & Service
Profile	Service, maintenance & repair

N.T.E.S. GmbH

Maintenance • Repair • Inspection • Optimisation
Service for wind turbines since 2000. Manufacturer-independent maintenance and repair across Germany using the latest technology.

N.T.E.S. GmbH Windkraftservice is a service provider in the wind energy sector.

What drives us: to provide top-level maintenance and repair – manufacturer-independent and across Germany.

Our competencies include MAINTENANCE, OPTIMISATION, INSPECTION, REPAIR, THERMOGRAPHY and MEASUREMENT. We are specialists for AN Bonus and Siemens turbines in the range of 150 kW to 2.3 MW.

01

Nearly 20 years of experience in the wind energy sector are an ideal foundation for achieving the best results both in repair and preventatively in maintenance or inspection. Our well-trained teams work across Germany. Flexibility and fast response times are our key qualities.

Our services in brief:

- **Maintenance**
- **24/7 trouble-shooting**
- **Repair**
- **Recurring inspections** (DGUV V3, crane, arrester and ladder inspections)
- **Inspections** (blade and transmission inspections, blade assessment and damage analysis)

N.T.E.S. GmbH

Address	Handelshof 8 27432 Bremervörde
Phone	+49 (0)4761 92612-0
Fax	+49 (0)4761 92612-99
E-Mail	wkas@ntes-service.de
Web	www.ntes-service.de
Category	Operation & Service
Profile	Service, maintenance & repair
Employees	25
Founding year	2000

01 | On the road for you...

Netze BW GmbH – Division of services

wind power outlet

From engineering and approval planning to the construction of a turnkey transformer station, Netze BW division of services ensures wind farms feed into the 110kV grid efficiently.


01


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01–04 | Transformer substation

Netze BW's "wind power outlet" is a standardized 110/30 or 110/20kV supply substation, which can be tailored precisely to the requirements of the respective renewable energy project by means of modular and performance-dependent components. It enables technically mature, cost-effective, direct supply to the high-voltage grid. The transformer station is constructed on a turn-key basis in just 12-14 months, including approval planning. Netze BW takes care of all the tasks involved, from planning and project development to construction and commissioning.

The services of Netze BW division of services at a glance:

- Planning, project development and construction of 110/30 or 110/20kV feeder substations or the entire wind farm infrastructure
- Planning, project development and construction of medium-voltage installations
- Construction of internal wind farm cabling
- Integration of the wind farm into the grid of the regional grid operator
- Management of all medium- and high-voltage plants with assumption of plant responsibility
- 24/7 on-call service and fault clearance for the wind turbines and wind farm infrastructure
- Certification of transformer station and wind farm

Netze BW
Sparte Dienstleistungen

Netze BW GmbH – Division of services

Address	Schelmenwasenstraße 15 70567 Stuttgart
Phone	+49 (0)711 289-46000
Fax	+49 (0)721 914-20111
E-Mail	dienstleistungen-hs@netze-bw.de
Web	www.netze-bw.de/windsteckdose
Category	Planning
Profile	Grids & grid connection
Employees	about 4,700
Founding year	2014

NORD/LB

International presence with North German focus
With total assets of € 120 billion, NORD/LB Norddeutsche Landesbank is one of Germany's leading merchant banks.


01


02

01 | Breathtaking view: This wind turbine has a hub height of 149 meters.
02 | Spectacular: the NORD/LB building in Hanover.

Our ideas are extremely innovative – like the energy we invest in.

NORD/LB has been involved as a financier for projects in the renewable energy sector since the mid-1990s and has pioneered wind energy financing.

Having successfully advised and financed many on- and offshore wind as well as solar projects, we are one of the top arrangers for renewable energy project finance in the national and international markets. We support our customers in achieving their targets with our expertise, know-how and commitment. Based on this, we are able to provide a thorough assessment of each projects' opportunities and risks and offer each of our customers' tailor-made solutions for their individual financing needs.

Our services range from optimising financing structures and funding sources (including multi-lateral and Export Cover structures) to providing advice and support during any potential project sale. Having financed one of the largest renewable energy portfolios provides an indispensable added value when consulting and structuring future projects.

We provide these services by international teams in Hanover, Oldenburg and London as well as specialists in New York and Singapore.

NORD/LB

Address	Friedrichswall 10 30159 Hannover
Phone	+49 (0)441 237 1667
E-Mail	gerrit.schmidt@nordlb.de
Web	www.nordlb.de
Category	Finance & Law
Profile	Banks, financial institutions & financial service providers
Founding year	1970

NOTUS energy

Power on your side.
As an independent energy producer and project initiator, we plan, construct and operate wind farms and solar parks from conceptualization to the final grid connection.

Over the last 20 years, NOTUS energy has installed wind farms and solar parks with an output of over 1,400 MW. Today we operate 260 megawatts of wind power in-house. Most of the plants we construct in Germany today remain in our ownership.

As an **Independent Power Producer (IPP),** we are continuously expanding our wind and solar portfolio. This provides us with the **financial independence** we require to be able to invest in new projects and continue to grow the company.

Our ambition is to bring together the best professionals in the field. NOTUS energy is a flexible and financially strong partner for **municipalities, planners, and investors.** We are convinced that renewable energies result in win-win situations: **sustainable investment,** regional value generation and a future for our children.

02

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Wind Power:
1,420 MW installed
4,200 MW in development
260 MW as managing owners
450 MW in operational management

Solar Power:
3,400 MWp in development

200 employees, active in 15 countries

GENERAL CONTRACTOR: EVERYTHING FROM A SINGLE SOURCE
As one of Germany's leading general contractors for wind and solar energy we construct turnkey wind farms and solar parks around the world. Fast, flexible and on time: ISO 9001 certified.

ARTIFICIAL INTELLIGENCE: IMPROVED WIND FORECASTS AND POWER LOAD CALCULATIONS
Together with our partners, we are developing intelligent software solutions: for optimised wind forecasts, power load calculations and automated wind or solar power plant inspection using drones.

03 | NOTUS Headquarters in Potsdam
04 | Solar Park Baraize, France

04

01

01 | Wind Farm Beesenberg, Germany
02 | Alexandra Trigo Villarreal, NOTUS Project Manager for International Projects

ASSET-MANAGEMENT: A MODERN TAKE ON OPERATIONAL MANAGEMENT
As asset managers, we not only take on technical and commercial management roles but fully represent the owners in every way by continuously optimising the technology as well as sales operations.

NOTUS ENERGY

NOTUS energy

Address	Parkstraße 1 14469 Potsdam
Phone	+49 (0)331 62043-40
Fax	+49 (0)331 62043-44
E-Mail	windkraft@notus.de
Web	www.notus.de
Category	Planning
Profile	Planers & project developers
Employees	200
Founding year	2001

PNE AG

Solutions for clean energy

Development, realisation, operation and management of wind farms – international, onshore and offshore.

Overview

The PNE Group is one of the pioneers in developing wind farms at sea and on land. Based on this success, we have developed into a “Clean Energy Solutions Provider.”

From initial site assessment and the implementation of approval procedures, financing and turnkey construction to operation and repowering at the end of the system’s useful life: Our range of services covers all phases of project planning and operation of wind farms.

The entire portfolio of renewable energies

Wind energy is our core business. But we are doing all we can to achieve a sustainable energy supply and we offer an even broader value-added chain of renewable energies as well as the supply and delivery of power (PPA) from renewable energy sources. Beyond that, we strongly expand our own operation of wind farms.

In addition to wind energy, the company’s portfolio includes photovoltaics, electricity storage and power-to-X technologies with a focus on hydrogen.

The development of our different business segments is also accompanied by a regional expansion of our business activities: In addition to western industrialised countries, we are focusing our commercial activities on developing countries in Latin America, Africa and in both the Middle and Far East.

The more than 450 employees of the PNE Group dedicate themselves every day to moving one step closer to realising the vision of a world where energy demand is met solely from renewable energy sources. For clean, sustainable energy production – now and in the future.

Our references at a glance:
www.pne-ag.com

01 | Altenbruch wind farm, Lower Saxony
02 | Gode Wind offshore wind farm, North Sea
03 | Chransdorf wind farm, Brandenburg
04 | Headquarters of PNE AG, Cuxhaven

PNE AG

Address	Peter-Henlein-Straße 2-4 27472 Cuxhaven
Phone	+49 (0)4721 718 06
Fax	+49 (0)4721 718 200
E-Mail	info@pne-ag.com
Web	www.pne-ag.com
Category	Planning
Profile	Planers & project developers
Employees	approx. 450
Founding year	1995

R+V Allgemeine Versicherung AG

R+V offers comprehensive insurance cover for wind turbines.
From planning and installation through to the operational phase, wind turbines require comprehensive insurance cover. This is now available all under one roof with R+V's wind insurance concept.

R+V is part of the German cooperative banking group Volksbanken Raiffeisenbanken (VR), making it part of a strong alliance. What we offer our customers, in addition to the latest products and extensive knowledge, is our local presence. Across the 800 VR banks and their 8,500 branches, our customers find a named contact for all their insurance matters. You can be sure that we are always there for you.

First-hand knowledge all under one roof – AgrarKompetenzCenter

As one of the largest insurers for renewable energy plants, R+V has over 30 years experience in this field. To strengthen our position in the rapidly growing renewables market, we have bundled our knowledge and expertise in the Competence Centre for Renewable Energies. Our team of experts implements new product ideas across all areas and continuously develops the existing product offer.

Our staff are always identifying the latest trends in the fields of wind power, solar energy and biogas in cooperation with leading companies and associations. Helping you make sustainable use of our solutions well into the future.

Agrar KompetenzCenter

02

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01 | R+V consultant Jan Kehnappel with the customer Mr Petersen
02 | First-hand knowledge all under one roof – AgrarKompetenzCenter

R+V insurance solutions for your wind turbines
Wind turbine operators are making an important contribution to the success of the energy transition. This way of generating power is especially climate-friendly and particularly lucrative – provided you are sufficiently well insured.

From planning and installation to the operational phase, R+V offers comprehensive cover all under one roof with its new insurance concept especially for wind energy.

Let us join forces at the early stages of your project so we can offer you the very best support and advice.

R+V

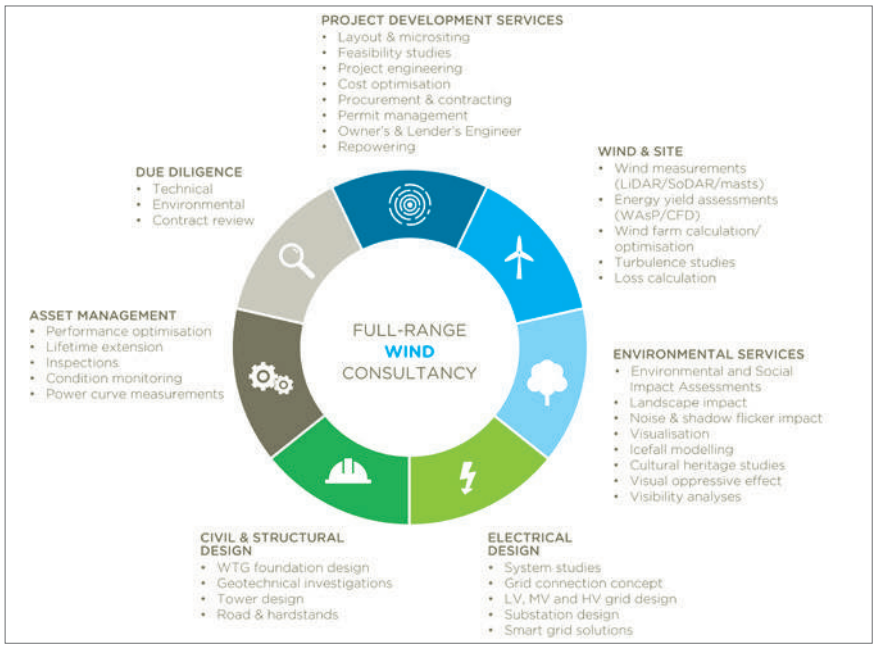
R+V Allgemeine Versicherung AG

Address	Raiffeisenplatz 1 65189 Wiesbaden
Phone	+49 (0)611 533 98751
E-Mail	AgrarKompetenzCenter@ruv.de
Web	www.ruv.de/firmenkunden/erneuerbare-energien/windenergie
Category	Finance & Law
Profile	Insurance companies
Employees	15,000
Founding year	1922

Ramboll

World-leading wind consultancy

With our multidisciplinary capabilities and international expertise, we offer a full range of services that cover the entire life cycle of on- and offshore wind energy projects: from project development, strategic advice and pre-studies to design, operation and decommissioning/ repowering.



RAMBOLL Bright ideas. Sustainable change

Ramboll	
Address	Jürgen-Töpfer-Straße 48 22763 Hamburg
Phone	+49 (0)40 302020-0
E-Mail	info@ramboll.de
Web	www.ramboll.de/wind
Category	Planning
Profile	Offshore
Turnover	€ 1.8 billion
Employees	16,000 (Wind energy: approx 350)
Founding year	1945

Ramboll is one of the top-ranking engineering consultants in Europe. We provide individualised services, supporting our clients in wind energy project development and implementation processes. Ramboll has a strong focus on understanding our clients' needs, and we strive to provide sustainable and long-term technical and commercial solutions to our clients.

In-depth knowledge and experience

With more than 30 years of consultancy experience from onshore and offshore wind projects, Ramboll has built up comprehensive knowledge and competencies within wind energy. We have performed designs for more than 65 offshore wind farms around the world, totaling more than 50 % of all installations.

Within the field of onshore wind, we have provided expert services to wind farms with a nominal output of +60,000 MW in more than 60 countries. Ramboll has the expertise to support our clients from due diligence and environmental studies over planning and construction to commissioning and operation of the wind farm and can provide assistance at every step of the project.

Access to global knowledge

With 300 offices in 35 countries, we strive to combine our local presence with our global resources and expertise. This means that our clients worldwide can get globally leading consultancy with an in-depth knowledge of local conditions.

RECASE Regenerative Energien GmbH

RECASE – Engineering services for the renewable energy sector
RECASE has long been operating in the national and international sector markets. A team with decades of experience, technical expertise and methodological competence is ready to develop the optimal solution for our customers, both from a technical and economic perspective.

The company's core competencies in the on- and offshore WIND ENERGY sector include:

- Engineering solutions for offshore wind turbines, foundations, substations, and operations
- Technical due diligence
- Follow-up on technical obligations arising from service and warranty contracts
- Technical solutions to meet grid connection requirements
- Technical assessments on the continued operation of wind turbines after 20 years
- Wind turbine and component development
- Bespoke solutions for the professional integration of third-party systems in wind turbines, e.g., ADLS, fire detection devices, and advanced data collection systems

Beyond the wind energy sector, RECASE has additional core competencies in REGENERATIVE ENERGY SYSTEMS, ENERGY MARKETING CONCEPTS, and ENERGY MONITORING TECHNOLOGIES.

Extract from our wind energy references:

- Development, marketable integration and installation of the first commercially applicable ADLS in collaboration with the "Lanthan Safe Sky GmbH" consortium
- Continuation audits (20+) in collaboration with "Auctoritec GmbH" and "morewind GmbH"
- Adapting 3.4MW wind turbines originally intended for the North American market to the current technical state of the art for the German market, including validation on a nacelle test stand, up to customer handover
- Developing an HSE compliant, innovative concept for single blade assembly and on- and offshore rotor installation
- Offshore transport logistics
- Electrical engineering developments, testing and operation of modern floating offshore wind turbine concepts


01

Our clients and customers include wind farm operators, wind turbine manufacturers, energy suppliers, and investors. We collaborate constructively with authorities, municipalities, and landowners.


02

01 | Service in the Wind Farm
02 | Lorenz-H. Carstensen and Maurice Graber

RECASE®
REGENERATIVE ENERGIEN

RECASE Regenerative Energien GmbH

Address	Alte Landstraße 1 24866 Busdorf
Phone	+49 (0)4621 4216640
Fax	+49 (0)4621 4216 648
E-Mail	info@recase.de
Web	www.recase.de/home/
Category	Other services
Profile	Development & construction

Regenerative Energien Zernsee GmbH & Co. KG

Commitment that pays off

Operational management concepts are only as good as their ability to adapt to customer wishes and new circumstances, because the wind energy sector is changing continually. We emphasise close support, industry dialogue and a clear position vis-à-vis politicians, network operators and authorities.

REZ delivers exactly what customers ought to be able to expect, i.e., technical and commercial management services for their wind farms. This can include specific tasks or taking on the entire management including site management with a dedicated on-site service, direct marketing or – as the system lifespan draws to an end – repowering measures, always with the objective of maintaining the highest possible availability and thereby maximising returns for our customers.

REZ is currently pursuing this objective for around 120 wind turbines with a total rated output of about 300 megawatts, primarily in Brandenburg, Rhineland-Palatinate, Hesse, and Saxony-Anhalt. REZ is now also providing a full management service for three transformer stations.

But we also do more by acting as a permanent negotiating partner for service providers, or as a powerful voice in matters relating to energy policy, electricity taxation, reporting obligations or negative electricity prices, always in the interests of our customers, which is ultimately reflected in their profitability.

To remain flexible, such issues as Aircraft Detection Lighting Systems (ADLS) or bird and bat protection are tackled as early as possible. To this end REZ is a recognised member of the BWE's Operations Managers Advisory Board and seeks dialogue with industry colleagues, as well as regularly sharing its own expertise in BWE seminars.

And by the way, our ISO 9001:2015 certified quality management system is regularly audited and confirmed.

Regenerative Energien Zernsee GmbH & Co. KG

Address	Bergstraße 1 12169 Berlin
Phone	+49 (0)30 22 44 598 30
Fax	+49 (0)30 22 44 598 31
E-Mail	info@rez-windparks.de
Web	www.rez-windparks.de
Category	Operation & Service
Profile	Technical & commercial operational management
Employees	23
Founding year	2004

01 | Site management included: REZ staff are quickly on site.
02 | Jacobsdorf wind farm
03 | Collaborative management: Klaus Wolters (right), Walter Delabar (left)
04 | REZ Headquarters at Alte Post, Berlin Steglitz

Rosendahl & Frank Windtechnik GmbH

Experts for wind energy | Quality assurance for wind turbines
As an independent, accredited inspection body for wind turbines, we use our many years of expertise, experience and impartial knowledge to ensure the longest possible, safe and economical operating life for each and every wind turbine.

Every year, our inspectors inspect more than 800 wind turbines of various manufacturers and power classes throughout Europe according to individually developed inspection plans. In particular, numerous operators rely on our expertise for inspections of Enercon WTGs. We are a member of the expert advisory board of the BWE and an inspection body accredited by the German Accreditation Body (DAkkS) according to DIN EN ISO/IEC 17020 for the scope specified in the certificate D-IS-21476-01-00.

Keep the overview
With our manufacturer-independent expert reports and with our experience as experts, you can keep track of the condition of your wind turbine or wind farm. These inspections form the basis for the longest possible trouble-free operation and high plant availability.


01

Accredited inspections
- Lifetime extension assessment (BPW)
- Periodic inspection (WKP)
- Rotor blade inspection (RBK) incl. lightning protection measurement by rope access technique
- Condition-oriented inspection (ZOP)
- Commissioning report
- Out of contract/warranty inspections
- Damage reports
- Technical due diligence

Supplementary analyses
- Vibration analyses (offline and online)
- Video endoscopies
- Thermographies
- Oil and grease analyses

Continued operation
The continued operation of wind turbines beyond 20 years is close to our heart. Therefore, it is our goal to provide our customers with services that enable them to keep their wind turbines in operation for as long as possible.
As an accredited inspection body, we carry out the assessment and testing for continued operation of wind turbines (BPW) and are available as an independent contact for all questions.

01 | The RFW team
02 | Rotor blade inspection via rope access
03 | Enercon E-92


02


03

Rosendahl & Frank Windtechnik GmbH

Rosendahl & Frank Windtechnik GmbH

Address	Hermann-Scheer-Str. 1 26736 Krummhörn
Phone	+49 (0)4923 805 977 1
Fax	+49 (0)4923 805 977 2
E-Mail	info@rfw-gmbh.de
Web	https://rfw-gmbh.de
Category	Experts
Profile	Technical consultants
Employees	18
Founding year	2006

SCADA International A/S

Empowering a renewable future

SCADA International supports customers around the world to execute projects at any point in the SCADA value chain. With more than 6000 SCADA solutions installed, the customer range encompasses manufacturers, utilities, asset owners and independent power producers, among others.

Removing barriers among data and technology

Businesses depend on data to optimize performance and operations, and since SCADA International's foundation, we have been developing solutions to enable data access. We believe that anticipating tomorrow's problems will solve today's difficulties. Therefore, our intelligent software solutions make data reliable from various sources available in real time to customers worldwide. We strive to reduce complexity and provide our customers with solutions that optimize performance and competitiveness, and facilitate information exchange among databases and technologies.

Covering the full SCADA value chain

Data is at the core of any machine – it is a key ally to secure and extend its lifespan. Thus, at SCADA International, we cover the full SCADA value chain – from SCADA hardware and software, installation, and commissioning into consulting. Our highly skilled specialists support the value chain at any point, ensuring efficient and cost-saving solutions for our customers.

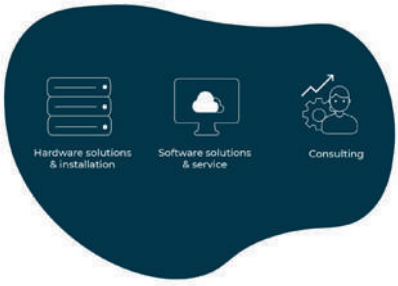
Committed with the wind industry

SCADA International stands for building an open-source architecture and technology environment to ensure interoperability for the wind industry systems. We are committed to facilitating energy transition through data and find tomorrow's problems, identifying new opportunities, and developing innovative solutions to support our customers' business growth.

SCADA International at a glance

Headquartered in Denmark, SCADA International employs more than 100 SCADA specialists at offices in Germany, Poland, Ukraine, United Kingdom and the USA. The company is certified according to ISO 9001, ISO 14001 and ISO 45001.

SCADA International accounts for more than 6.000 SCADA solutions installed across 29 different countries. The organization specializes in renewables, and focuses on developing intelligent data solutions to streamline operations and reduce the Levelized Cost of Energy (LCoE).



SCADA international

SCADA International A/S

Address	A. C. Illums Vej 4A DK-8600 Silkeborg
Phone	+45 (0)9641 9200
E-Mail	scada@scada-international.com
Web	www.scada-international.com
Category	Other services
Profile	Software solutions

Statkraft Markets GmbH

A secure future for your renewable energy asset

As the market leader in direct marketing, Statkraft is a powerful partner who will support you in the market in the long term – even after the EEG subsidy has expired.

Over 125 years of experience with our own power plants, in project development and in trading create the best conditions for reliable direct marketing. We purchase your electricity volumes at fixed conditions, assume commercial risks and thus enable the operation of your plants. In addition to standard services such as generation forecasts, marketing of electricity on the spot market and balancing, we support you at all times as partners and make your everyday energy life easier.

Redispatch 2.0 – Your new obligations, our service

We take over all services related to Redispatch 2.0 for you – in particular the role of the deployment manager (EIV) and the BRT (operator of a technical resource).

Continued operation after expiry of EEG subsidies

The continued operation of wind turbines beyond the expiry of the EEG subsidy remains one of the key topics in the coming years – not only for their operators and owners. Statkraft already offers viable, long-term power purchase agreements that ensure the continued profitable operation of existing plants.

Our team is your reliable partner with sound know-how. Statkraft makes all this possible not only for your wind farms that run out of subsidy. With our long-standing expertise, we also enable you to generate additional income from marketing the flexibility of your wind turbines as well as storage and e-mobility solutions.

01

Feel free to contact us if you have any questions about direct marketing or specifically about the continued operation of your plants. You can also meet us in person at wind industry days and trade fairs. Just check the calendar on our website.

01 | The Statkraft direct marketing team: we make it possible!
02 | Redispatch 2.0: we take over for you!

02

Statkraft Markets GmbH

Address	Derendorfer Allee 2a 40476 Düsseldorf
Phone	+49 (0)211 60 244-4404
Fax	+49 (0)211 60 244-199
E-Mail	direktvermarktung@statkraft.de
Web	www.statkraftdirektvermarktung.de
Category	Direct marketing
Profile	Direct marketers
Turnover	€ 25.4 billion
Employees	500
Founding year	1999

STEIL KRANARBEITEN GMBH & CO. KG

Heavy things – moved easily!
We tackle difficult tasks with many years of experience, trained employees, and a highly specialised fleet of more than 100 cranes. We serve our customers throughout Germany and around the world from our 6 bases distributed throughout the Saar-Lor-Lux region.

01


02

With our highly specialised vehicle fleet, we are well equipped to face the technical challenges of the future. We collaborate with a large number of subcontractors throughout Western Europe, that partly can be reached quickly from other regions, always with the goal of finding the best possible, most cost-effective solution.


03

Safety and quality is always the focus in everything we do. We can look back on many years of experience both in our home country and abroad, especially in the construction of wind power turbines. The skills of our crane operators as well as our office-based and field staff play a crucial role in this. Wherever heavy loads need to be moved safely and precisely, the designers and project engineers involved have to rely on our expertise.


04

We also provide our customers with a complete service range and take care of all necessary details from feasibility studies, crane engineering, and the selection of suitable resources trough to approvals and CAD planning.

01 | Precision work
02 | Wind energy
03 | Blade lifter
04 | Wind energy

STEIL KRANARBEITEN GMBH & CO. KG

Address	Auf dem Adler 3 54293 Trier
Phone	+49 (0)651 14656-0
Fax	+49 (0)651 14656-50
E-Mail	info@steil-kranarbeiten.de
Web	www.steil-kranarbeiten.de
Category	Transport & Logistics
Profile	Crane companies, crane hire & special transport
Employees	250
Founding year	1924

TOPseven

TOPseven – MAKING DRONES SMARTER.
TOPseven offers customers automated, drone-based visual inspection and contactless lightning protection measurement of onshore & offshore wind turbines. The patented process is validated and verified by TÜV SÜD. The user is enabled to use the technology independently.

The inspection of wind turbines reaches a new level with the patented TOPseven technology: automated, drone-based visual inspection including contactless lightning protection measurement for rotor blades and tower of onshore and offshore wind turbines. In the process, specialized personnel enable the user to apply the technology independently.

The TOPseven technology is unique on the market worldwide: validated and verified by TÜV SÜD and thus applicable as an alternative inspection method (according to BWE guideline).

Qualification
The users are enabled by our experts in a short training to use the technology independently. After a short calibration flight, the exact flight route is calculated and the drone flies autonomously.

Efficiency
For visual inspection and contactless lightning protection measurement, the turbine only needs to be stopped once. This saves time and costs.


01

Analysis
The drone provides gapless, high-resolution and reproducible images with consistent minimal overlap. Automated reporting according to the industry standards is performed with the TOPseven software.


02

Lightning protection measurement
Special in-house developed sensors can detect the functionality of the lightning protection system contactless.
In addition, this measurement method allows the exact localization of a damage area.


03

01 | TOPseven – drone
02 | TOPseven – lightning protection measurement
03 | TOPseven – headquarters

MAKING DRONES SMARTER.

TOPseven

Address	Schiffbauerweg 1 82319 Starnberg
Phone	+49 (0)8151 95966-0
Fax	+49 (0)8151 95966-99
E-Mail	info@TOPseven.com
Web	www.TOPseven.com
Category	Operation & Service
Profile	Service, maintenance & repair
Founding year	2020

TÜV NORD EnSys GmbH & Co. KG

Full-Service Provider with over 35 years of Experience in the Wind Industry
TÜV NORD certifies on- and offshore wind turbines to all international standards and regulations, evaluates specific site conditions and supports operation of wind turbines over their entire lifecycle. With more than 35 years of experience, TÜV NORD is your competent partner in the wind industry.

TÜV NORD GROUP is with more than 14.000 employees active in over 70 countries. In the area of wind energy, TÜV NORD offers site and technical assessment as well as inspection services and is one of the leading certification bodies for on- and offshore wind turbines and projects.

We support your wind project from the planning and approval process, while operation up to lifetime extension. As an experienced partner, we provide comprehensive services throughout the entire lifecycle of your project.

Our services include amongst others:

- Wind measurements using LiDAR technology
- Site assessment services such as site-specific wind potential and energy yield prognosis, site quality assessment, site-suitability assessments, noise immission and shadow flicker prognosis, risk assessments and assessment of minimum distance to overhead lines
- Geotechnical site investigation and foundation assessment
- Litetime extension expertise of wind turbines beyond 20 years/design life
- Technical inspections of wind turbines, e.g. end of warranty inspections, periodic inspections and condition-based inspections of wind turbines and components
- Commissioning inspections
- Inspection of approval-related additional subsystems, e.g. ice detection, blade monitoring and obstruction marking/ aviation lights
- Inspection of cranes and services lifts on- and offshore

We are accredited according to DIN EN ISO/IEC 17025 by the DAkkS for energy yield assessments (TR6) as well as site quality assessment (EEG 2021). Our inspection body wind, type A, is accredited according to DIN EN ISO/IEC 17020:2012 for technical inspections of WTG. Furthermore, we offer inspections, e.g. of lifts and elevators as “Zugelassene Überwachungsstelle (ZÜS)”.

TÜV NORD EnSys GmbH & Co. KG

Address	Große Bahnstraße 31 22525 Hamburg
Phone	+49 (0)40 8557 0
Fax	+49 (0)40 8557 2552
E-Mail	windenergy@tuev-nord.de
Web	www.tuev-nord.de
Category	Experts
Profile	Wind resource evaluators
Employees	14,182
Founding year	1869

BWE
German Wind Energy Association

The Who's Who of the German wind industry

Your company is not listed in the publication?
You'd like to be included again next year?
Then don't hesitate!

Print & Online

Specification:

Company profile and/or **Address entry**
- in the print publication
- as pdf
- and in the online database

Free distribution around the world at trade fairs and conferences

Free copies for your own marketing

We'll be glad to advise you:
Klaus Barkeling:
k.barkeling@wind-energie.de
Nikos Fucicis:
n.fucicis@wind-energie.de

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Windindustry in Germany
www.windindustry-in-germany.com

Next release date: September 2022

UKA – Umweltgerechte Kraftanlagen GmbH & Co. KG

The wind and solar park developer
UKA has been planning, building, supporting and operating wind and solar parks, as well as the related infrastructure, for more than 20 years. With some 50 grid-connected wind power plants and a project pipeline of 4 GW, UKA is one of Germany's leading onshore project developers, which also implements solar energy projects.


01


02

Complete solutions for decentralized power production
As a full-service provider, the UKA Group provides all services up to the handover of operationally-ready renewable energy parks. At the point of commissioning, our energy park operations subsidiary, UKB Umweltgerechte Kraftanlagen Betriebsführung GmbH, ensures that the turbines operate for decades with optimal technical and economic performance.

Our project management subsidiary, which is based in Lohmen (Mecklenburg), UKA Projektträger GmbH & Co. KG is responsible for the implementation of all of the UKA Group's construction projects. Due to our large purchasing volume, UKA is able to work in a particularly cost-efficient manner and also offers its services to other customers – a win-win situation for all parties.

All projects are accompanied by our expert team, every step of the way, up to the point of permit-compliant implementation. This involves providing support for everything from the construction of pathways and foundations to grid connection, turnkey construction and commissioning as well as following up on all official requirements and acceptance tests in compliance with the German Federal Immission Control Act.

Complex projects and exemplary solutions
As an expert in wind energy in forested locations, UKA has already commissioned several wind power installations in commercial forests. A specialist agency – Fachagentur Windenergie an Land – has identified the "Göllnitz-Lieskau-Rehain" project as a good-practice example of sustainable wind projects in forest locations. It exemplifies project development in close coordination with local communities and people.

The Group successfully executes repowering projects. For this purpose, UKA examines whether local conditions such as height or distance regulations, planning law and turbine firing of potentially suitable wind power plants, allow for repowering. In 2021, for example, twelve turbines were modernized and optimized at the wind park Warnsdorf in Brandenburg. The new wind turbines produce even more green electricity with an increase of the rated output of 3.6 times more than that of the old turbines and they can now supply energy to more than 40,000 households.

UKA effectively leads conservation compensation and replacement measures in the context of wind energy projects. The project "Schäferwiese" in Mecklenburg-Western Pomerania compensates exemplary the wind turbines of the wind farm Parchim, which were projected and built by UKA.

03

04

05

Local partnership and global presence
The energy park developer supports all phases of a project as a financially strong and implementation-oriented partner – regardless of the plant type. Flexible and situation-specific cooperation models enable mutual collaboration and the shaping of the energy transition with joint forces.

At present, The UKA Group employs around 700 people in various locations across Germany such as in Meißen, Cottbus, Rostock, Lohmen in Mecklenburg as well as in Bielefeld, Erfurt, Grebenstein (near Kassel), Hanover, Heilbronn, Magdeburg and Oldenburg. It is also currently expanding its business activities in other European markets including UKA Iberia which operates from Madrid. In addition, UKA North America from Stuart (Florida) and UKA Chile from Santiago de Chile are driving promising renewable energy projects in North, Central and South America.

06

01 | Renewable energies in harmony with nature
02 | UKA wind energy park in Parchim
03 | Galloway cattle grazing “Schäferwiese”
04 | Planning – construction – management – operation: Full service from a single source
05 | UKA offices
06 | Compensation and replacement measures “Schäferwiese” in Mecklenburg-Western Pomerania

Der Energieparkentwickler

UKA – Umweltgerechte Kraftanlagen GmbH & Co. KG

Address	Dr.-Eberle-Platz 1 01662 Meißen
Phone	+49 (0)3521 72 80 60
Fax	+49 (0)3521 72 80 6410
E-Mail	info@uka-group.com
Web	www.uka-group.com
Category	Planning
Profile	Planers & project developers
Employees	700
Founding year	1999

VERBUND

VERBUND – an ideal partner for marketing your old and new wind turbines.
Integrating renewable energy from subsidised or unsubsidised facilities is currently presenting a major challenge. We can provide you with a flexible power generation marketing service, photovoltaic, battery & pool solutions as well as additional revenues through attractive service concepts.

01

01 | We are energising the future with clean electricity and innovative solutions.
02 | Let's drive the energy transition forward together!
03 | VERBUND – your dependable green electricity marketing partner.

Maximum planning certainty and fixed revenues

Pursuant to the EEG, direct marketing is a mandatory requirement for new electrical power generation facilities with an output of one hundred kilowatts and above. VERBUND Energy4Business Germany, which is a subsidiary of Austria's largest electricity group, offers a direct marketing service for green electricity plant operators throughout Germany.

As an experienced stakeholder in the European electricity market, we have the requisite expertise to master the challenges within this dynamic environment in partnership with plant operators.

02

The service:

- Optimised green electricity marketing on intraday, spot & futures markets
- Long-term marketing concepts for your old Ü20 facilities
- Regional certificates as an additional source of income for plant operators and municipal utilities
- Long-term forecasting experience
- Incorporation in the VERBUND virtual power plant
- System registration and re-registration
- Participation in the German Electricity Balancing Market
- Bespoke contract terms

The benefits:

- Favourable prices thanks to optimised electricity marketing and a flexible power plant facility
- Greater profits compared to the EEG feed-in tariff
- Default compensation in the event of a drop in feed-in power
- Financial security thanks to excellent creditworthiness
- Personal contacts in Munich & Düsseldorf

VERBUND – Europe's green battery

With its flexible power station facility, which has a power output 8200 MW, VERBUND is the largest hydroelectric power producer in Austria and Bavaria. This is augmented by VERBUND's own solar and wind power facilities and those marketed on behalf of third parties.

Products for flexibility

Our power generation portfolio, which includes photovoltaic, hydroelectric and wind power facilities, forms the basis of our flexible product range, which is fully geared to the needs of the market. Companies receive electricity, energy-related products, and services on demand, in addition to innovative solutions for the efficient use of energy.

03

Verbund

Am Strom der Zukunft

VERBUND

Address	Sonnenstraße 17 80331 München
Phone	+49 (0)89 890 56 21933
Fax	+49 (0)89 890 56 21950
E-Mail	direktvermarktung@verbund.de
Web	www.verbund.de
Category	Direct marketing
Profile	Direct marketers
Turnover	€ 3.2 billion (2020, VERBUND AG)
Employees	approx. 3,150
Founding year	1947

VSB Group

Project development |Planning| Construction| Operational Management| Repowering
Trust in more than 25 years of experience and more than 1,000 megawatt installed capacity. We provide profitable solutions throughout the entire value chain of wind energy projects.


01


02

01 | Wipperdorf wind farm (Thuringia, 14.4 MW)
02 | Regional Value Added: Wölkisch wind farm (Saxony, 20.5 MW)

Wind is our passion and project development is our core competence. As a full-service provider, we accompany every step of the process, from securing land through approval planning to the implementation of wind farms, for which we are also your contact when it comes to operational management. We are also your strong partner in the field of energy services. We develop individual energy concepts for your company, taking into account all consumption sectors, and work out solutions so that you can produce, store and consume energy that is environmentally friendly and conserves resources.

Empathy and Acceptance
The energy transition can only succeed if all stakeholders act in concert. Therefore, our projects are put into practice in close cooperation with residents, municipalities, and local representatives. This results in highly individual solutions regarding turbine locations, windfarm layouts and compensation measures. Above that, scheduled receipts and financial rewards for citizens add to making renewable energies a long-term benefit for local communities.

Tested Quality
VSB has received certification according to the DIN EN ISO 9001:2015. What does this mean for our everyday business? It ensures that responsibilities are clearly assigned, processes are bindingly defined, and knowledge is documented in a systematic manner. Hence, you can put your trust in legal compliance, reliable yield projections and a strict monitoring of project costs.

In Your Vicinity
Climate action does not stop at regional borders. Consequently, our experts work internationally on implementing a sustainable energy supply. With our headquarters in Dresden and four regional German offices as well as numerous locations abroad we are always in reach when accompanying your project from the beginning to the end.

VSB Gruppe

Address	Schweizer Straße 3a 01069 Dresden
Phone	+49 (0)351 21183-400
Fax	+49 (0)351 21183-44
E-Mail	info@vsb.energy
Web	www.vsb.energy
Category	Planning
Profile	Planers & project developers
Employees	more than 300
Founding year	1996

windcomp GmbH

Optimize and protect your wind turbine with the ROMEG measuring system
windcomp GmbH is specialized in the optimization of wind turbines. We have developed the ROMEG measuring system, with which we can quickly detect both aerodynamic and mass imbalances. It is a dynamic measuring process during normal plant operation.

windcomp develops and produces laser measuring systems for wind turbines and offers as service the measurement of the turbines through our experts.
ROMEG is a laser-based measuring system for the dynamic measurement of wind turbines. ROMEG can detect and measure aerodynamic imbalances, caused by blade angle deviations, as well as mass imbalances.

FUNCTIONS OF THE ROMEG SYSTEM
The following parameters and functions are measured by the ROMEG System:

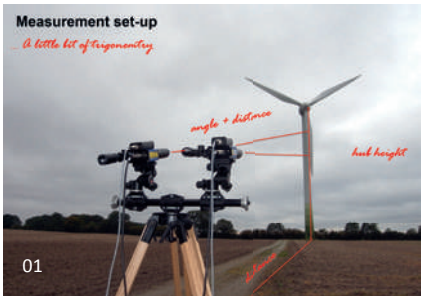
- Relative Blade angle – The main function of the ROMEG system is to measure relative blade angle deviations.
- Mass-excited unbalance. Detection of unbalance-generating mass differences in the rotor blades
- Tower vibrations - The oscillation pattern of the axial tower movement is a good indicator for the evaluation of the detected blade angle deviations.
- Vibration analysis of the tower movement (FFT Analysis).
- Measurement of the tower clearance of the blade tips.

ADVANTAGES OF ROMEG SYSTEM

- The laser measurement takes place on a running turbine under real operating conditions.
- No loss of yield due to downtime while measurement.
- Fast measuring process – entire wind farms within a short time. Results are quickly available on site and can be used immediately to optimize the turbine.
- By comparing the vibration pattern before and after the correction, the success of the optimization is immediately visible and provable.

WHY MEASURE?
In contrast to an imbalanced turbine, a turbine with well-balanced rotor shows the following attributes:

- Better performance/higher yield
- Higher availability.
- Longer service-life of turbine.
- Less tower stress
- Reduced maintenance costs
- Lower noise emission



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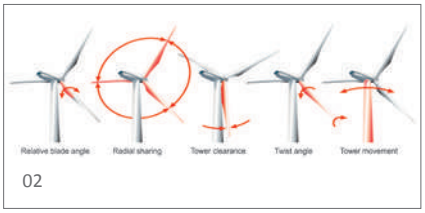
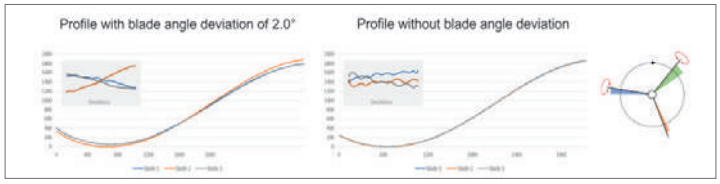


02

The ROMEG system is available as ground- and nacelle based measurement system and can therefore also be used for offshore turbines.



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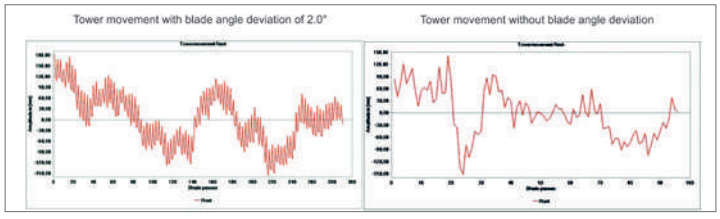


04

01 | Romeg setup
02 | Measurement parameters
03 | Profiles with blade angle deviations and without blade angle deviations
04 | Tower vibrations with a blade angle deviation and without blade angle deviation

windcomp

windcomp GmbH

Address	Glogauer Str. 21 10999 Berlin
Phone	+49 (0)30 319 85 54 75
Fax	+49 (0)30 319 85 54 99
E-Mail	info@windcomp.de
Web	www.windcomp.de
Category	peration & Service
Profile	Service, maintenance & repair
Founding year	2008

wind-turbine.com GmbH

Get wind projects digitally off the ground and realise them efficiently with experts!
Increase your international influence and gain visibility in the internet! Use wind-turbine.com as a marketing, procurement or sales platform for wind turbines, spare parts or services. You benefit from our global reach and the network effects thanks to more than 11,000 registered users from over 150 countries.

01 | Global Marketplace

The story of wind-turbine.com began in 2011. The two minds behind the portal are Bernd Weidmann, founder and managing director, and Heiko Werner, co-partner and technical developer. Each of the entrepreneurs brings over 25 years of experience in the digital platform economy, i.e. sales, marketing and development of online platforms, to the wind-turbine.com project.

Our vision:
We bring supply and demand of the global wind industry together, directly on a central platform, accelerate projects and thus the global energy transition.

Over 11.000 registered market participants from more than 150 countries, including investors, manufacturers, operators, project developers, service companies, etc., are already benefiting from the network effects of our B2B platform.

Access to international business:
As is already the case with B2C platforms, B2B value chains will be mapped on platforms in the future. Many German companies also lack visibility in the online sector. However, visibility on the internet is essential for the future of business.

The visibility and reach of wind-turbine.com gives German companies both: international visibility and access to new business opportunities and new customers, which can secure their existence. Those companies that use platforms as a sales channel will also be able to profit from the growth market of wind energy in the long term.

Therefore: Position your company on wind-turbine.com in good time, get your sales going digitally and shape the energy transition actively together with us!

wind-turbine.com – Made & operated in Germany!

wind-turbine.com

wind-turbine.com GmbH

Address	Barbarossastraße 61 63571 Gelnhausen
Phone	+49 (0)6051 971116
E-Mail	weidmann@wind-turbine.com
Web	https://wind-turbine.com
Category	Finance & Law
Profile	Consulting & business consulting
Employees	11 (Wind energy: 4)
Founding year	2016

WKN GmbH

From Husum to the whole world - Onshore wind farm project development with WKN
As a part of the PNE Group the WKN operates internationally and has been making a significant contribution to the energy revolution for 30 years. In all, wind farms with more than 2,000 MW and more than 960 wind turbines have been realised.

After its founding in 1990, WKN continuously expanded into foreign markets and is now represented with branches and joint ventures in various countries in Europe and South Africa. Around 130 employees at nine locations work together every day to implement global wind projects.

Your partner along the life cycle of a project
Our service spectrum ranges from site development to planning and financing and from construction and operation to technical and commercial management. Within our strong network we can thus offer our customers all services along the life cycle of a wind farm – professionally from a single source. In addition, the PNE Group's portfolio includes photovoltaics and power-to-X technology with a focus on hydrogen.

Long-standing expertise
We consistently rely on long-term strategies and partnerships with local service providers and suppliers while attaching great importance to cooperative relationships. We draw on many years of expertise and set ourselves high standards when working with partners to realise high-quality projects. The positive cooperation between our experts and the various stakeholders is an important basis for advancing clean energy projects. Our ultimate goal is to find optimum solutions that serve the interests of all parties involved, e.g. landowners, municipalities, investors and service providers.

WKN GmbH is a wholly owned subsidiary of PNE AG. The PNE Group is a globally active pioneer in the field of onshore and offshore wind farms that has developed into an international provider of clean energy solutions.


01

01 | The WKN team: your partner for development of wind farms
02 | Laperrière wind farm, France


02

WKN
PNE GROUP

WKN GmbH

Address	Otto-Hahn-Straße 12–16 25813 Husum
Phone	+49 (0)4841 8944-100
Fax	+49 (0)4841 8944-225
E-Mail	info@wkn-group.com
Web	www.wkn-group.com
Category	Planning
Profile	Planers & project developers
Employees	about 130
Founding year	1990

wpd windmanager GmbH & Co. KG

5870 megawatts under operational management
Steady growth – wpd windmanager looks back on a successful year which saw the introduction of new wind farms, new sites, new target markets, and new services.

The company is growing: six more offices have been added around the world since 2020, two in Germany in Erkelenz and Bremerhaven, and four further afield in Nantes (France), Valladolid (Spain), Los Ángeles (Chile), and Piteå (Sweden).

"We are currently responsible for 529 wind farms comprising 2711 wind turbines in total as well as for 108 solar farms", says Nils Brümmer, Managing Director at wpd windmanager: "We now manage a total output of 5870 MW globally, which not only makes us the market leader in Germany, but also ranks us among the major operations management companies anywhere in the world".

01 | The Bremen-based company has been providing all services related to wind farm management since 1998.
02 | wpd windmanager experts monitor the turbines around the clock in their 24/7 control room.
03 | Currently, wpd windmanager has a total output of 5849 megawatts under operational management.


01


02

In addition to our core market in Germany, wpd windmanager also has an active presence in various other European countries, South America, and Asia.

International growth: around 2.4 gigawatts under operational management
In recent years, we have been driving forward our international business. As Henning Rüpke, Head of Business Development International, explains: "We accessed three new markets in Sweden, Spain, and Chile, but have also seen continuous growth in wind power markets that have remained stable for many years, such as France, Finland, Croatia, and Poland".

To achieve this, wpd windmanager is opening new offices and expanding local teams. Key account management is an important component. Key account manager are already working in France, Poland, Finland, Spain, and Chile. "Our objective", as Ulrike Wickfeld, Head of International Key Account Management explains, "is to provide our customers with the best possible service right where their wind farms are located. This proximity is a very important factor for our management service".


03

The total output volume produced by sites within our operational management portfolio has risen to 2392 megawatts. We are planning to access further markets and launch additional projects, both via the wpd AG pipeline and through external customer projects. wpd windmanager has already acquired some 580 megawatts in new business via third-party projects since 2020 and the trend is growing.

An expanding service portfolio

In addition to wind farm management, we are also putting more resources into the management of solar parks. As Ian-Paul Grimble, Managing Director of the Solar Competence Centre, explains, “we see enormous potential in the PV sector. Our aim is to offer our customers an operational management service for both wind farms and solar parks from a single source”.

For investors involved in different projects, wpd windmanager can also provide an asset and portfolio management service. “Many of our clients operate their wind farms or solar parks in several countries and want to have their entire portfolio managed by a single provider”, as Sales Director Till Schorer explains, “which is why we are an interesting partner for many operators and investors”. We currently manage over 500 megawatts under our asset and portfolio management service and also provide management personnel for project management companies in the overseas markets.

wpd windmanager has been offering a complete range of technical and commercial services for the management of wind farms and solar parks since 1998. In addition to our key account management with specific contact persons for our customers, these services include our 24/7 central control room, our in-house field service team, and specialist technicians who can deal with system-specific issues.

We are continuously developing our service portfolio to be able to provide even more individual support for wind and solar parks. wpd windmanager is also supporting the further development of renewables and pushing new industry standards through various research and development collaborations.

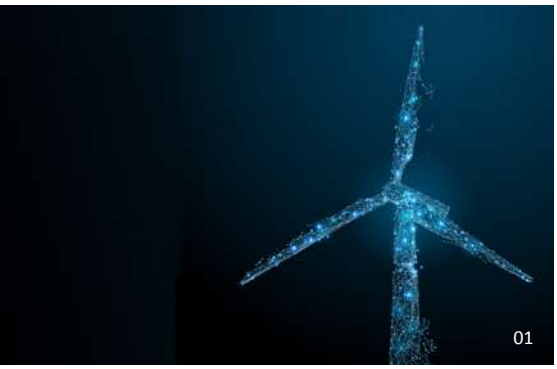
04 | Our in-house field service ensures the smooth operations of the turbines we manage.
05 | The Key Account Management team takes care of all issues.
06 | In addition to wind farm management, wpd windmanager is also expanding its solar farm management operations.

wpd windmanager GmbH & Co. KG

Address	Stephanitorsbollwerk 3 28217 Bremen
Phone	+49 (0)421 8976 600
E-Mail	windmanager@wpd.de
Web	www.windmanager.de
Category	Operation & Service
Profile	Technical & commercial operational management
Employees	470
Founding year	1998

Wölfel Wind Systems GmbH

How do you make profits with knowledge?
We are experts in vibration and signal analysis, provide information on structural damage, lifetime consumption and the associated potential continued operation, monitor material fatigue and help you meet legal requirements in the field of noise emissions.



High vibration levels, varying wind speeds or noise emissions – onshore and offshore, a wide variety of areas require professional engineering in order to make the operation of wind turbines (WTG) safe and efficient and to comply with licensing requirements.

By reliably detecting ice build-up, our IDD.Blade ® ice detection system impressively reduces the downtime of your WTG. With SHM.Tower ® and SHM.Foundation ® you are best prepared for the topic “continued operation”. With exact information about the structural condition of foundation and tower, you can achieve a precise asset evaluation and an optimized lifetime extension. The use of AI enables a new dimension of damage detection at the foundation. With SHM.Foundation individual, we are the market leader in the German offshore sector and offer customized solutions for foundation monitoring that enable condition-based inspections.

Low-frequency vibrations of the entire WTG can cause high stresses on the tower and thus significantly reduce the lifetime of the tower structure. Furthermore, if the vibrations are too high in the assembly state, e.g. the installation of the rotor blades may become impossible or may only be carried out in weather conditions that are very limited in time. Especially resonant vibrations can be reduced (cost-) effectively by our TMD.Tower dampers.

Noise-reduced operation can massively reduce the yields of your wind farm. With ADD.Sound ® you minimize tonalities and return to normal operation mode. With more than 1000 systems on the market, we can justifiably call ourselves a technology leader in active solutions for reducing gearbox tonalities.

01 | How do our blades give you a cutting-edge?
02 | How can you hear ice grow?

Wölfel Wind Systems GmbH

Address	Max-Planck-Straße 15 97204 Höchberg
Phone	+49 (0)931 49708-0
Fax	+49 (0)931 49708-150
E-Mail	info@woelfel.de
Web	www.woelfel.de
Category	Experts
Profile	Technical consultants
Employees	110
Founding year	1971

BWE
German Wind Energy Association

The Who's Who of the German wind industry

Your company is not listed in the publication?
You'd like to be included again next year?
Then don't hesitate!

Print & Online

Specification:

Company profile and/or **Address entry**
- in the print publication
- as pdf
- and in the online database

Free distribution around the world at trade fairs and conferences

Free copies for your own marketing

We'll be glad to advise you:
Klaus Barkeling:
k.barkeling@wind-energie.de
Nikos Fucicis:
n.fucicis@wind-energie.de

Published in German and English.

Windindustry in Germany
www.windindustry-in-germany.com

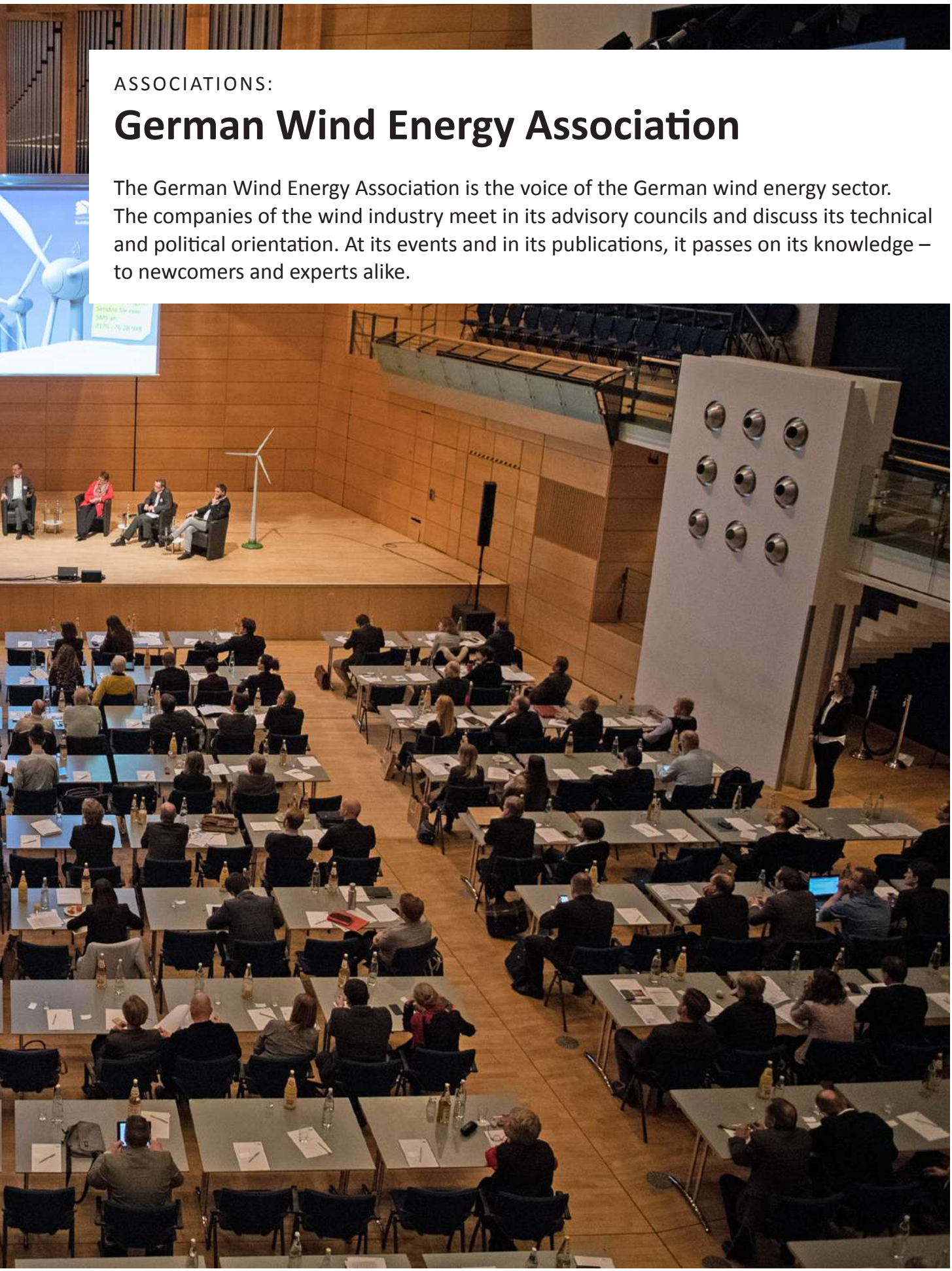
Next release date: September 2022

2nd Central German Wind Industry Day; Photo: Stefanie Loos

ASSOCIATIONS:

German Wind Energy Association

The German Wind Energy Association is the voice of the German wind energy sector. The companies of the wind industry meet in its advisory councils and discuss its technical and political orientation. At its events and in its publications, it passes on its knowledge – to newcomers and experts alike.



The expert committees at the German Wind Energy Association (BWE)

Advisory boards – Forums – Working groups
At the BWE, operators, manufacturers, suppliers and service providers are organised into expert committees such as advisory boards, working groups and forums.

01

At the advisory board meetings, companies in the wind energy sector meet to discuss and resolve current issues and to develop long-term strategies concerning the most important issues in the industry.

Within their specialist areas, they therefore function as an important platform for exchange.

The work carried out by these expert leads to position papers and statements; the standards developed then act as a guideline for the entire wind industry. The advisory boards are represented on the federal executive board of the BWE by four representatives, giving them a strong say in the association's policies.

01 | Citizen's wind energy advisory board (Photo: Tim Riediger / nordpool)
02 | Communication advisory board (Photo: Tim Riediger / nordpool)

Advisory board of operational managers

The advisory board of operational managers deals with all commercial and technical aspects related to wind turbine operation. Its members are also active in other associations to work towards guidelines.

Citizen's wind energy advisory board

The citizen's wind energy advisory board brings together operators of citizen's wind farms. Concerned with implementing the energy transition through citizen's and community-owned energy projects, it represents the interests of citizen's wind farm operators within the BWE.

Communication advisory board

Communication experts from the wind energy sector come together here to discuss how to communicate wind energy topics to the public in press and PR work. Member companies jointly plan campaigns, brochures and social media activities.

Expert advisory board

The expert advisory board discusses and develops policies and procedural guidelines for the technical examination of wind energy systems.

02

Legal advisory board

The legal advisory board comprises over 100 lawyers and in-house legal counsels who together discuss current legal questions relating to wind energy. This involves the exchange of valuable information on current court cases. The latest legal proceedings are also discussed by the legal advisory board. Written opinions are submitted jointly with the BWE's Expert Committees Division.

Manufacturer and supplier board

Through the companies represented in it, the committee brings together representatives of the German wind industry in the BWE. The Board works closely with the BWE on industry-related topics.

Operators' advisory board

On the six operator forums at the BWE, members exchange knowledge about each manufacturers' wind turbines. Operators of both individual and multiple wind turbines are organised in such forums. The speakers of the forums meet regularly to discuss their experiences in the operators' advisory board.

Planning advisory board

The planning advisory board is an important platform for the exchange of information by planning companies. Expert presentations accompany the discussion of major topics such as local and national planning laws, the future shape of the EEG, and European energy policy. Together with the Expert Committees Division, members support the positioning of the BWE regarding planning questions.

Scientific advisory board

As a forum for BWE members active in research and science, the scientific advisory board deepens current scientific discourses and establishes future research needs.

Wind consultant advisory board

The focus of the wind consultant advisory board is on improving onshore wind forecasts in Germany. Constant exchange of experiences and regular presentations on the topic are a foundation of its work, which particularly results in the definition of minimum standards for expert reports.

Working groups are established at short notice to deal with current issues and problems. They are organised across different boards, are able to act quickly, and can also hire external experts if necessary. Representatives from around 131 member companies are currently involved in working groups for networks, aviation and radar, obstruction lighting, nature conservation and wind energy, foundations, participation, energy policy and continued operation.

All 2,200 operator companies who are members of the BWE are organised in the operators' advisory board via operator forums. Of the 1,100 manufacturers, suppliers and service providers who are members, 220 companies are members of the boards of the BWE. Each board meets between 2 and 4 times a year. The work of the boards is supported by the Expert Committees Division of the BWE both thematically and organisationally. Close collaboration results in information and background papers for BWE members, positions on bills, or BWE positions.
For further information on the work of the boards and working groups and to view the lists of members, go to:
www.wind-energie.de/verband/fachgremien

BWE
German Wind Energy Association

The expert committees at the German Wind Energy Association (BWE)

Address	EUREF-Campus – Haus 16 10829 Berlin
Phone	+49 (0)30 212341-210
Fax	+49 (0)30 212341-410
E-Mail	info@wind-energie.de
Web	www.wind-energie.de
Category	Organisations & Public institutions
Founding year	1996

German Wind Energy Association (BWE)
EVENTS

KNOWLEDGE ABOUT WIND – NETWORKING – QUALIFICATION

The German Wind Energy Association – a strong partner

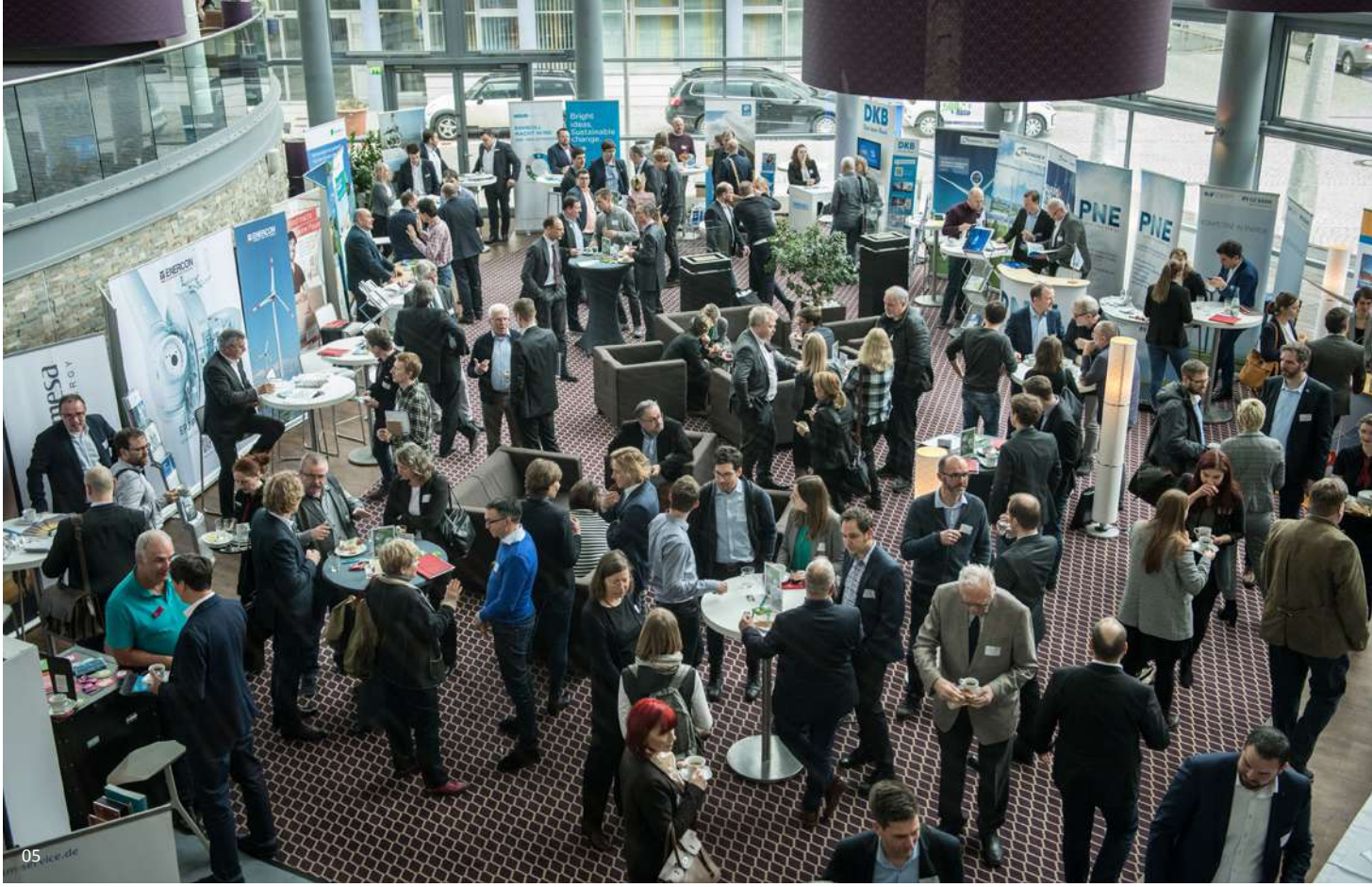
With around 20,000 members it is the world's largest association for renewable energies. The BWE has been campaigning for a sustainable and efficient expansion of wind energy in Germany for many years.

With its ambitious expansion targets, the wind energy sector is the main driver of the energy transition. Together with its members, the BWE is fully committed to continuing the success story of German wind energy and to ensuring that the vision of "100 percent electricity from renewable energy" in Germany becomes a reality soon.

The German Wind Energy Association – knowledge & networking

In addition to political work, knowledge & networking is a central impetus for the German Wind Energy Association.
BWE has accompanied the economic and technical progress of the industry for many years with its education events and publications from which everyone, novice and expert alike, can obtain the latest facts about the growing wind industry and beyond.

01 | BWE Enercon Forum;
Photo: Martin Ziemer / nordpool
02 | BWE (federal) State Chamber;
Photo: Silke Reents
03 | Wind Industry Day in Bremen, Germany;
Photo: Stefanie Loos
04 | New seminar room on the premises of the BWE;
Photo: Susanne Kafemann
05 | 3rd Central German Wind Industry Day;
Photo: Stefanie Loos



05

BWE events

With around 20,000 participants across nearly 200 events per year the BWE is the market leader in education in the wind energy sector. Other topics related to renewable energies are also covered. A wide variety of formats enable experts and leading figures from the renewable energy sector to stay abreast of current developments and expand their networks.

The “Wind Industry Days” (Windbranchentage) have become an established platform for dialogue and a forum for exchange with political circles in various federal states. With up to 800 participants they are the largest BWE events. Every year they host numerous politicians representing all levels.

At the conferences, practice days, information days and seminars selected experts pass on their practical knowledge, enabling participants to learn about the latest developments in their respective fields. Frequently, new business leads are also established there.

BWE WebAcademy

From 90-minute webinars to three-day web seminars, the BWE WebAcademy provides you with the very latest information and knowledge. As usual, you can ask our experts questions, but from the comfort of your home or office. More than 150 offers are available every year, allowing you to tap into a wide range of topics and stay abreast of developments surrounding the wind energy sector, PV and other renewables without much effort.

An overview of all events can be found here: **www.bwe-seminare.de**

BWE PolicyBriefing

Several times a year the BWE uses its video stream to inform its members on political developments in the wind energy sector. Questions arising within the sector are answered live, allowing legislative processes and challenges to be closely observed and assessed as they develop. The BWE PolicyBriefing is an interactive and transparent way of communicating with BWE members with huge reach.

BWE
German Wind Energy Association

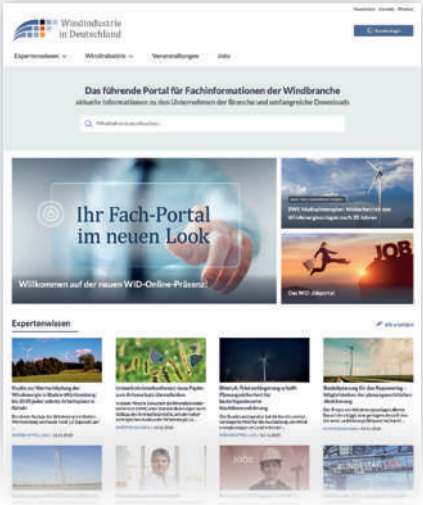
German Wind Energy Association (BWE) Events

Address	EUREF-Campus – Haus 16 10829 Berlin
Phone	+49 (0)30 20164-222
Fax	+49 (0)30 212341-362
E-Mail	seminare@wind-energie.de
Web	www.bwe-seminare.de
Category	Organisations & Public institutions
Profile	Education & Training
Founding year	1996

German Wind Energy Association (BWE)
CORPORATE PUBLISHING

From ONLINE to PRINT: expert knowledge for the sector, attractively delivered
Under the brand name Wind Industry in Germany, the BWE publishes various products for a specialist audience within the wind energy sector. With these products the BWE provides its readers with comprehensive information on current developments within the sector.

ONLINE FORMATS



windindustry-in-germany.com

The website is the leading portal for specialist information within the wind energy sector. It offers current information on companies, a comprehensive collection of expert interviews and a broad range of further education and job opportunities, while the online company directory presents the who is who in the wind energy sector.

In short: This site invites you to explore its content and to make the most of its information and educational opportunities!

Sector newsletter

The sector newsletter provides a weekly update of the most important news from the wind energy sector. Reaching about 12,000 recipients it is a press review that draws on the online presence of the sector.

German Wind Power Magazine

The idea of this new online format is to help German companies access international markets. Published in English, the German Wind Power Magazine offers a stage to present German companies to an international audience.

www.windindustry-in-germany.com/german-wind-power-magazine

PRINT FORMATS

Wind Industry in Germany

The central aim of the present directory is to build connections within the German wind industry. It is the flagship of the wind energy sector where companies can present their services and products to a broad audience. The comprehensive address section makes it a real reference book for anyone looking for partners in the wind industry. The publication also presents innovative projects and start-ups.

BWE Wind Energy Yearbook

For the last 30 years the BWE has published the wind energy yearbook which offers an excellent overview of facts, figures and data and the development of both the market and technology in Germany, Europe and the world. The results of the BWE service survey and an overview of the German service market give insights into developments within this special segment of the industry.

BWE operators' newsletter

The operators' newsletter is a print format that is mailed to around 2,200 operators. It provides this important group with relevant information, covering current issues and forthcoming changes and offering tips for efficient operation.

BWE posters

The posters always reflect current issues, such as the development of wind power in Germany, repowering, continued operation, or nature conservation and species protection. The high print run of 20,000 to 30,000 ensures that the posters are widely distributed within the sector and beyond.

Customised marketing options

The **Wind Industry in Germany** brand is a market leader when it comes to offering a wind energy sector-specific advertising platform for those engaged in marketing. Our range of marketing options includes:

- Online company listings
- Banners
- Newsletter announcements
- Stand-alone newsletters
- Company presentations
- Advertisements
- Event sponsoring
- And much more

Our well-established publications give you direct access to every **sector-relevant target group**. Contact us, we'll be happy to advise you!

Interested in realising your own corporate publishing project?
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BWE
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Windindustry in Germany

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Corporate Publishing

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Category	Other services
Profile	Media & Communication
Founding year	1996

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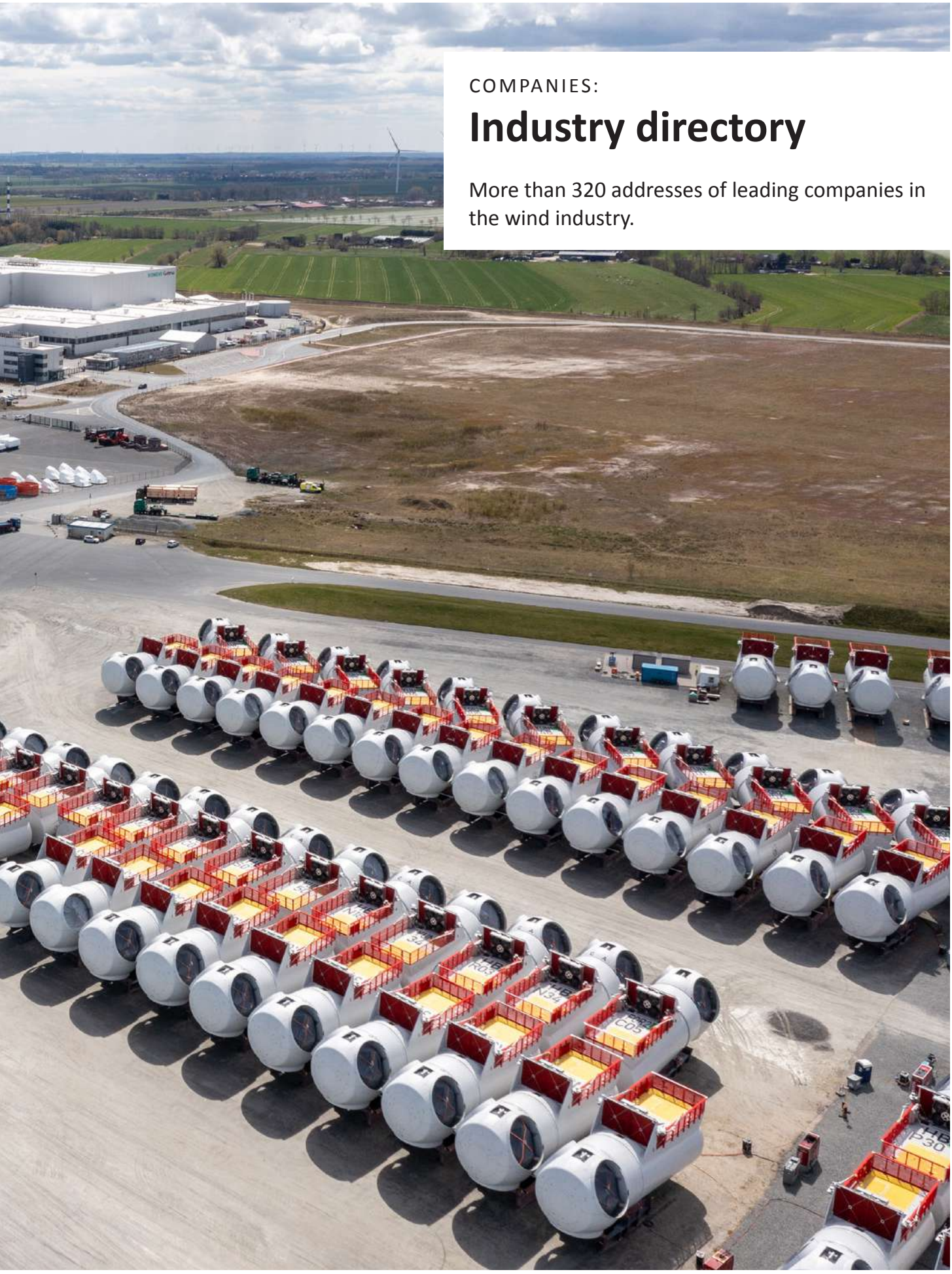

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Fax: +49 (0)30 275 81 70 20
E-Mail: info@bee-ev.de
www.bee-ev.de
As the umbrella organisation of the German renewables sector, BEE brings together the interests of 55 associations, organisations and enterprises. It has 30,000 members, more than 5,000 of which are companies.

German Wind Energy Association (BWE)
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is inside the back cover page. ▸

U

W

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Order address:
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Klaus Barkeling (k.barkeling@wind-energie.de; Tel: -177)
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Julia und Sonja Multhaupt GbR
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Here we list all companies by the services and products they offer.
An alphabetical list of companies is on page 240.

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