START OF EP4 PRE-SERIES

ENERCON commissions E-126 EP4 prototype

EPK+B  ENERCON expands service portfolio to include wind farm operation control
SUPPORT WITH INVITATIONS TO TENDER  ENERCON a strong partner to medium-sized business customers
1,000 MW INSTALLED  ENERCON reaches important milestone in the Netherlands
### TABLE OF CONTENTS

**TITLE**  
10  | START OF EP4 PRE-SERIES  

**TECHNICAL LEXICON**  
16  | EP4 blade connection unit  
New adapters for rotor blade connection combine benefits for manufacturing, transport, operation, and maintenance.

**INTERNAL**  
17  | Graduation of apprentices  
ENERCON hosted a ceremony in Aurich for 36 young people who successfully completed their apprenticeships.

**POLITICS**  
18  | Priority for community-owned energy?  
Plans to make the tendering process easier for community-owned projects are still in need of improvement.

**PRACTICE**  
22  | EPK+P  
ENERCON expands its service portfolio for medium-sized operators/owners to include wind farm operation control.

30  | Five E-70 for energy-self-sufficient El Hierro  
Hybrid ENERCON WEC and hydropower plant connected to the grid without a backup for the first time.

**INTERNATIONAL**  
28  | 1,000 MW installed  
ENERCON has reached an important milestone in the Netherlands.

24  | Wind power from Lake Starnberg  
ENERCON installed 4 × E-115/3 MW for the community-owned Berg wind farm.

**EDITORIAL**

Politicians must not put wind industry in jeopardy

Dear clients, business partners, and employees,

...the energy transition is moving ahead! In the past year, the wind sector was able to install 3,685 MW in Germany. While this is still not quite enough to reach the Paris climate goals, it is another step in the right direction. If we want to achieve the Paris goals, renewable energies must contribute 60% of gross power consumption in Germany by 2025.

However, the German government is just now getting ready to step on the brakes and could put the onshore wind energy sector in serious jeopardy. Suddenly, the success of renewable energies in recent years is declared a problem and onshore wind energy – one of the most cost-effective power generator there is – is asked to pay the price. The government plans to introduce a formula to ensure that renewable energies will not exceed the 45% share of power consumption stipulated by the coalition agreement for 2025. We can certainly argue about their reasons. But one thing is for sure: This government dogma means that a lot of innovation, new market developments and business ideas with many positive developments will not come out of Germany.

The current plan proposes to allot to onshore wind projects only the tendering volume that is left over by other renewable energies; if the government adheres to this plan, in extreme cases there may be years without any allotment at all. The formula used for these calculations is particularly questionable: Efficiency increases and wind-rich years will penalise the wind energy sector by re-allocating its call-for-tender allotment – after all, total power consumption in recent years is declared a problem and onshore wind energy – one of the most cost-effective power generator there is – is asked to pay the price. The government plans to introduce a formula to ensure that renewable energies will not exceed the 45% share of power consumption stipulated by the coalition agreement for 2025. We can certainly argue about their reasons. But one thing is for sure: This government dogma means that a lot of innovation, new market developments and business ideas with many positive developments will not come out of Germany.

The attempt to protect community-owned energy projects by allowing them to participate early in the call for tender does not help much. If the market were to shrink for example to one eighth of the previous year’s volume, there would not be much left for any projects, community-owned or not. We want to alert politicians to these risks one more time; they must not put the onshore wind energy industry in jeopardy in order to stifle the inevitable revolution of the energy sector. This would not help anybody. Too many would be affected by the negative consequences, both in the old and the new energy sector: Sustainable policy also means surpassing goals and not putting limits on good things.

Hans-Dieter Kettwig  
ENERCON Managing Director
The states of Southern Germany have been strengthening their commitment to the construction of wind energy converters. According to data from Deutsche WindGuard, in all of Germany it was the Southern state of Baden-Württemberg that saw the most significant power increase from new construction compared to 2015 (gross new construction): A total of 52 WECs with a power of 144.05 MW were installed in 2015, whereas new construction during the previous year was only 8 WECs with 18.65 MW. This means that gross new construction in Baden-Württemberg was nearly eight times as much as before.

North Rhine-Westphalia, too, was able to significantly increase its gross new construction in 2015 to 167 WECs and 421.65 MW (compared to 124 WECs and 307.2 MW in the preceding year). The analysts found significant growth also in Saarland (23 WECs/63.85 MW compared to 15 WECs/37.30 MW) and Saxony (30 WECs/69.05 MW compared to 13 WECs/32.70 MW).

Photo: Transport of an E-70 rotor blade using special equipment for the installation of a wind energy project in Hornsgrinde/Baden-Württemberg (see also report on p. 24).
GZO casts first components for E-115

For the first time, foundry Gusszentrum Ostfriesland (GZO) has cast components for ENERCON’s E-115 series. They were for the so-called zero series of the E-115 hub. The 27.5-ton component made of spheroidal graphite cast iron will be series-manufactured by ENERCON’s foundry in Georshiel. GZO will take up series production in Q2 of this year. Once production has reached full scale, GZO will produce six E-115 hubs per week.

The first casting for an E-115 hub was done in early January. It was “spot-on”, says GZO Production Manager Reemt Geiken proudly: “The entire production process and quality assurance worked perfectly from the get-go.” The results of the subsequent machining of the components were also very satisfactory, he adds.

Reemt Geiken is confident when talking about the start of series production – and is already looking further ahead to more changes: “Once E-115 hub production is fully under way, GZO wants to take on the production of more E-115 cast components.”

GZO has all the necessary production infrastructure. Just recently, they put a new foundry crane into service. This new double-girder bridge crane can lift up to 70 tons of molten material, considerably more than the previous foundry crane. This means that GZO has the perfect set-up for manufacturing components for the larger ENERCON wind energy converter series including the new EP4 platform.

At its production site in Haren, ENERCON’s new winding centre for the manufacture of rotor blade components for wind energy converters of the EP4 platform took up operation. These modern manufacturing facilities use an automated winding process to produce the inner rotor blades of E-126 EP4 and E-141 EP4 wind turbines.

These wind energy converter models have split rotor blades to allow for easier transport. Inner blades and outer blades are then joined at the construction site during the assembly process. While the outer blades are manufactured using the conventional half-shell technique, the inner blades are made using a winding technique where glass-fibre non-woven fabric is soaked with a resin-hardener mixture and then wrapped around a revolving positive core. In the next production step, the aerodynamic casing that gives the blade segment its distinct profile is glued onto the hardened tubular structure.

The winding centre in Haren took up production late last year. Since then, a number of different test series have been conducted successfully. Right now, the facility in Haren is preparing for the series production of EP4 inner blades, scheduled to start in the summer.

ENERCON lowers power prices for employees

At the start of this year, ENERCON lowered the consumption charge of its employee power price. The 100% green energy from ENERCON wind energy converters and German hydropower will now be offered at 2.33 cents per kilowatt-hour less than in the previous year. That means the lowest consumption charge is now 21.96 ct/kWh with prices varying by region. The monthly base charge is 7.50 euros.

With this latest price drop, employees pay less for their power than they would with most utilities and comparable green power providers; at the same time, they can make their contribution to the energy transition in their own homes. The employee power price is available to all employees of the ENERCON Group in Germany. Anyone interested can sign up easily at www.enercon-energie.de.
ENECON and EWE start cooperation on Smart Grid technologies

ENECON and EWE AG will work together to develop new business ideas around renewable energies and smart grids. The two companies announced their cooperation in late December in Aurich. The Minister for the Economy of Lower Saxony, Olaf Lies, was present for the occasion. To start with, the cooperation will focus on the district of Aurich. The goal is to provide this region with locally produced renewable energy as completely and reliably as possible. The partners then want to take the technical solutions developed for this purpose and in a second step, convert them into standardised, transferable elements for an “energy transition kit” that can be used to assemble individualised system solutions for other projects.

“EWE and ENECON share the vision of a decentralised energy system based largely on renewable energies. We want to make a joint effort in the district of Aurich to realise this vision and create innovative network solutions that can later be offered successfully in other parts of Germany and selected foreign markets,” says Matthias Brückmann, Chairman of the Board of EWE AG.

“ENECON is proud of its home region and is looking forward to creating a 100% renewable and decentralised energy supply here in the power and gas network of the district of Aurich that can serve as model for other regions. This innovative cooperation model with an experienced grid operator such as EWE provides ENECON with the opportunity to demonstrate the ‘energy transition building blocks’ within a real-life energy network and test them in day-to-day grid operation,” says ENECON Managing Director Hans-Dieter Kettwig. As the German market leader in the field of wind energy converters, ENECON brings to the table its vast competence regarding the electrical characteristics of wind energy converters, power electronics and project management. EWE is the fifth-largest energy provider in Germany and contributes extensive expertise in grid structure, grid operation and control, smart grids, and telecommunications.

Presenting the cooperation in Aurich (left to right): Matthias Brückmann, Chairman of the Board of EWE AG; Olaf Lies, Minister for the Economy in Lower Saxony; Hans-Dieter Kettwig, ENECON Managing Director and Chairman of the Board of the Aloys Wobben Foundation; Nicole Fritsch-Nehring, ENECON Managing Director and Vice-Chairperson of the Board of the Aloys Wobben Foundation; Simon-Hermann Wobben, Member of the Board of the Aloys Wobben Foundation; and Hermann Weber, District Counsellor of the District of Aurich.

ENECON employees donate to children’s hospice

ENECON staff and management donated 6,000 euros to Angelika Reichelt Kinder- und Jugendhospiz Joshua’s Engelreich, a children’s hospice in Wilhelmshaven. As part of the Christmas celebrations in Aurich, employees collected donations for this purpose. Management then added its own contribution.

“Our employees had the idea for this fund-raiser because they wanted to support a charitable organisation for children in the region,” said ENECON Managing Director Hans-Dieter Kettwig about the donation. He presented the check to Kim Gesine Friedrichs and Bianca Heins of the children’s hospice.

The children’s hospices takes in terminally ill children and adolescents with their parents in order to provide them with some respite from their difficult day-to-day life. While the professional nursing staff takes care of the children around the clock, the parents can take some time to regain their strength for their day-to-day life. The long-term care insurance and health insurance providers cover 95 percent of the care-related costs. To finance the remaining five percent as well as any extras for children and parents – such as field trips, music therapy and art therapy – the hospice relies on donations alone. Such activities in particular are very important when caring for terminally ill children, emphasises Bianca Heins, deputy care services manager of the hospice: “We want to make sure the children enjoy their time with us as much as possible.”

ENECON Managing Director Hans-Dieter Kettwig (from left), Kim Gesine Friedrichs, Bianca Heins and ENECON’s Claudia Holling at the check presentation.

ENECON remains German market leader

With a market share of 36.9 percent, ENECON remains in the lead in Germany. During the 2015 installation year, the company installed 1,376 MW throughout the whole country. The total gross new construction of turbines power class 3,535 MW according to data from Deutsche WindGuard. ENECON’s worldwide installed power now amounts to around 3,121 MW.

ENECON’s goal for 2016 is to maintain the level of installed MW in Germany. The expected construction volume in the German onshore wind energy sector is approx. 3,500 MW.

HannoverMesse
[Hanover/Germany]
25 - 29 April 2016
www.hannovermesse.de/

ICCI
[Istanbul/Turkey]
27 - 29 April 2016
www.icci.com/tr/en

AllEnergy UK
[Glascow/UK]
4 - 5 May 2016
www.all-energy.co.uk/

WindEnergy
[Hamburg/Germany]
27 - 30 September 2016
www.windenergyhamburg.com/

Renewables Marketplace
[Liverpool/UK]
12 - 13 October 2016
www.renewablesuk.com

CanWaC
[Calgary/Canada]
1 - 3 November 2016
windenergycanada.com/canwa-c-2016/

EurTier
[Hanover/Germany]
15 - 18 November 2016
www.eurtier.com

EuroTier
[Hannover/Germany]
25 -29 April 2016
www.eur-tier.com

EuroTier UK
[Herne/France]
1 - 3 November 2016
www.eur-tier.com

EuropaWind
[Berlin/Germany]
27 - 29 April 2016
www.europawind.com

WindEurope
[Brussels/Belgium]
12 - 15 October 2016
www.windEurope.org
Launch of new EP4 platform pre-series at ENERCON

Any one travelling along the shore of the Dutch Ijsselmeer from Emmeloord to Lelystad gets a spectacular view of ENERCON’s current wind energy technology. Near Emmeloord, Europe’s largest onshore wind farm is located right next to the dyke. It includes 38 × ENERCON E-126/7.5 MW, one of the world’s most powerful onshore wind energy converters. This impressive large-scale green power plant showcases the dimensions that onshore wind energy has reached by now. And only a few kilometers down the road, near Lelystad, the prototype of the E-126 EP4/4.2 MW is spinning in the brisk northwesterly wind. It was successfully commissioned in early April.

The EP4 combines innovative technology with intelligent modular design, making increased use of carry-over parts and standardised components and offering customers the highest quality standards in combination with maximum efficiency and reliability for a wide variety of sites. The E-126 EP4 can generate an annual energy output of 14.8 million kilowatt-hours at inland sites with an average wind speed of 7.5 meters per second at 135 meters hub height. On top of this, the E-126 EP4 has a low sound emission level. Both trailing edge serrations on the rotor blades installed as standard and the next step in the evolution of ENERCON’s direct-drive annular generator substantially contribute to reducing aero-acoustic and machine noise and ensure an overall sound power level of a mere 105.0 dB(A) in power-optimised mode.
New strategy for logistics and installation

A main focus during EP4 development was on optimising the manufacturing, logistics and installation processes in order to cut down on project turn-around times. The “design to manufacture and assembly” principle held true for the first prototype. “Aside from weather-related interruptions, which we really can’t do anything about, the construction work including transport, pre-assembly, and installation went off without a hitch,” says Arno Hildebrand, E-126 EP4 project manager with WRD, ENERCON’s research & development organisation.

The transport-optimised modular design of the EP4, for example, really proved its worth. The rotor blades and the generator are split into two parts for easier transport. The individual segments are smaller and weigh less, which makes the abnormal load transports easier to handle. The machine house, too, ships from the factory as modules that are more manageable in transport. The entire nacelle casing can be placed inside standard shipping containers that can be taken to the installation site by ordinary lorries without any special permits.

At the construction site, an installation strategy is used that has been specially designed for EP4 assembly. “We intensely looked at the entire construction site process during the EP4 design stage and heavily optimised it, which will contribute substantially to shortening installation time,” explains Benjamin Seifert, Head of Project & Logistics Management at ENERCON.

Assembly test at WRD in Aurich

Installation teams underwent intensive training on technical developments and optimised assembly processes in the setting of an assembly test in the new WRD factory buildings. “In addition, the assembly test helps the Equipment and Plant Engineering team with their final check of the design details before starting shipments to the field,” says Arno Hildebrand.

At the same time, the knowledge gained from the assembly test was incorporated into the documentation and the assembly instructions that are used to train the regular installation teams in preparation for the EP4 series production start, explains Wolfgang Meyer, EP4 project coordinator at the Prototype Construction and Equipment Engineering department of ENERCON Production GmbH.

Cutting-edge platform technology

“We are perfectly on schedule for the introduction of the new series,” says Joachim Stilla, EP4 programme manager at WRD. This is important not least because the E-126 EP4/4.2 MW is already the most popular WEC for many customer projects. The pre-series stage will be complete by the end of the year and will be followed by the launch of series production.

Following completion of the E-126 EP4 pre-series the prototypes of the E-141 EP4/4.2 MW for wind class III will be installed by the end of the year. The E-141 EP4/4.2 MW has a rotor diameter of 141 metres, making it the world’s largest onshore rotor on the market. At sites where wind speeds average 6.5 metres per second it will generate annual energy yields of more than 13 million kilowatt-hours. The new ENERCON platform technology has been designed to include many carry-over parts. Aside from the outer blade, the rotor blade, generator, mechanical equipment, nacelle and E-module stay the same compared to the E-126 EP4.

“We intensely looked at the entire construction site process during the EP4 design stage and heavily optimised it, which will contribute substantially to shortening installation time.”

Benjamin Seifert, Head of Project & Logistics Management at ENERCON
ENERCON has designed a new blade connection unit for joining the rotor blades to the hub in EP4 wind energy converters. It consists of a pitch system to which hub adapter and blade adapter are fastened, and combines a range of benefits with regard to design, manufacturing, transport and maintenance.

The hub adapter, made from spheroidal graphite cast iron, provides for the connection of the blade flange bearing and optimises the distribution of forces in this area. At the same time, this design allows for a more compact hub which in turn provides benefits with regard to manufacturing, machining and transport of this main component. The hub, made from the same type of cast iron, weighs significantly less and is easier to transport thanks to its smaller size.

EP4 blade connection unit
NEWLY DESIGNED FOR ENERCON’S 4 MW PLATFORM, THESE ADAPTERS FOR ROTOR BLADE CONNECTION COMBINE BENEFITS FOR MANUFACTURING, TRANSPORT, OPERATION AND MAINTENANCE.

In honour of its former apprentices, ENERCON hosted an internal graduation ceremony at the EEZ (Energy, Education and Discovery Centre) in Aurich. A total of 36 young people successfully completed their apprenticeships with ENERCON companies in East Frisia in the winter of 2015/2016. ENERCON Production Director Simon-Hermann Wobben and ENERCON Chief Production Manager Klaus Peters presented the graduates with certificates and gift vouchers during the ceremony at the EEZ.

“Offering apprenticeships that produce skilled workers is important for the future of our company, in particular considering the national shortage of skilled workers and the demographic development,” added Simon-Hermann Wobben. “We are pleased that you chose this path, and that ENERCON had the opportunity to walk with you.”

The following apprentices passed their exams before the local chamber of industry and commerce:
Priority for community-owned energy?

THE FEDERAL MINISTRY FOR THE ECONOMY INTENDS TO MAKE THE TENDERING PROCESS EASIER FOR COMMUNITY-OWNED PROJECTS. THE INDUSTRY WELCOMES THIS INITIATIVE BUT SEES ROOM FOR IMPROVEMENT.

The paradigm shift in the promotion of renewable energies with its switch to a call-for-tender system has a lot of knock-on effects. One of them – especially troublesome for the domestic wind energy sector – is the existential pressure on the smaller actors in the industry. The Federal Government is aware of this issue – but in the past, did not propose any acceptable solutions. In February, the Federal Ministry for the Economy published a proposal on how to protect at least community-owned projects from being pushed out of the market.

These projects that add a lot of value to the local economy create the acceptance that is essential for the success of the energy transition. Where local residents have the opportunity to become investors, they already much more with the clean energy in their backyards. The positive experiences in Schleswig-Holstein, where for example almost all wind turbines running in the Nordfriesland district are located in community-owned wind farms, make this point emphatically. And it is also noticeable in Lower Saxony, Mecklenburg-Western Pomerania and Thuringia, where a certain portion of community investment will even become mandatory in order to obtain building permits. According to the Ministry, the community-owned wind farms should also face the competition with other bidders in the tendering process; but they will receive some compensation for their structural disadvantages with regard to risk spreading.

For community co-ops, their own local project is typically their whole portfolio. If such co-ops need to shoulder the planning costs prior to approval without any certainty of the actual success of their tender, they will disappear from the market once the call-for-tender system is in place. After all: How would such projects be able to raise several hundred thousand euros of venture capital locally? For this reason, the Ministry proposes that community-owned projects will be allowed to submit their tender at an earlier point in the project life cycle. They only need to have secured a site for the construction and present a wind analysis. If their bid is successful, they can start planning the rest of the project.

This idea makes sense. However, an early decision in the tendering process alone will not help the community-owned projects much. Project planners frequently do not know prior to receiving the permit what types of shut-down features will be imposed for noise mitigation, shadow flickering, bat protection etc.; hence, an early tender comes with significant yield risks, not to mention the uncertainty of interest rate trends until the project financing is in place. All this means that the early bidders need to factor in safety mark-ups to ensure they will be able to supply their wind power at the offered “tariff”.

Safety mark-ups reduce chances

In view of the limited new construction allotment – too small in our estimation – a fierce bidding war must be expected. Having to add safety mark-ups will therefore distinctly reduce a bidder’s chances of success. If the Legislatures grants the community-owned projects in the region tangible advantages – for example guaranteed acceptance, price mark-up or similar security models – even states like Saxony-Anhalt, Hesse, Saxony or North Rhine-Westphalia, where community-owned wind farms are not currently the norm, could see a dynamic that creates a bigger boost for the regional economy. The Staats- and Federal Governments have been demanding this for a long time – now the opportunity has arrived.

The prerequisites that allow a project to use the simplified procedure appear well thought-out. The requirement that at least ten shareholders must be residents of the rural district where the project is located, and the limitation of each individual’s share to a maximum of ten percent of the entire project make it at least difficult to abuse the rule. The rule that all shareholders may plan at most one project per year limits this segment to those true regional projects that are desirable in order to ensure acceptance.

In particular in rural regions, the link to the rural district ought to be revised: For example, the major cities of Halle and Magdeburg in Saxony-Anhalt do not belong to any rural district and barely have any suitable wind energy sites within their city limits; but the residents of the surrounding rural districts will probably have difficulty raising the necessary equity. As an alternative to using the rural district as frame of reference, one could define a “business” with a certain number of residents, for example 200,000. Regardless of the population density and the rural district boundaries, this would create uniform access for residents in the entire country. If the Federal Government thus uses the remaining months until the end of the tendering debate to make some amendments to the special regulations, it could save at least some of the at-risk regional actors from being pushed out of the market.

Amending of suggestions

These issues sound bureaucratic, hard to verify and therefore hard to implement, but this is what we all need to prepare ourselves for: No longer will there be a sustainable and robust growth of onshore wind energy according to the wishes of the Federal Ministry for the Economy. However, we do hope that these suggestions supported by the industry will still be incorporated. We will continue to advocate for them. Our customers can absolutely rely on our support. We all need to keep in mind: A successful energy transition requires sustainable action, and stability takes priority. For our decentralised vision, this is the only way forward. //
A project financing perspective on the call-for-tender system

THE SWITCH OF THE FEED-IN TARIFF SYSTEM TO A CALL-FOR-TENDER SYSTEM WILL AFFECT PROJECT FINANCING, TOO.

AN ARTICLE BY GUEST WRITER HARTMUT KLUGE OF BREMER LANDESBAEK.

The proposals to grant community-owned wind farms early access to the call for tender do not really address their needs. At such an earlystage, project calculations are necessarily uncertain, not least with a view to interest rate developments. Even though the EU Directives expressly allows minimum rules that protect the small actors in the market, politicians have been thinking they could do without such a rule because of the simplicity and transparency of the tendering system. However, in view of the volume restrictions, such a rule is urgently needed. Otherwise, legislators will knowingly abandon the express goal of stakeholder diversity.

Reference yield model / one-stage or two-stage subsidies

The switch of the subsidy system from a two-stage model to a one-stage model comes with benefits and drawbacks. A disadvantage is the high administrative effort, in particular the initial assessment based on expert reports, and the reassessment of the subsidy level with re-funds or back payments every five years. And this does not even answer the question of the ‘correct’ energy yield assessment at the beginning of the project’s life-time, a key marker for the quality of the projects, the banks will create suitable regulations that anticipate the resulting money flows in the project financing model. An advantage of the one-stage model is the longer financing periods that take into account the service lives of the WECs. This affects projects with a site quality of more than 80% whose entitlement to the initial remuneration is done in one go, whereas the capital commitment of borrowed funds has been shortened significantly by the EEG-2004.

Maximum pricing and other efficiency measures

The stipulated maximum price of 7.0 cents/kWh (including depression) for 100% sites allows profitable project financing under the current framework conditions, as confirmed by various current cost studies. However, this does not take into account the economic effects of the yield losses caused by Art. 24 EEG-2004, which currently not be reliably estimated, or a normalization of the capital market interest rates that are currently distorted by ECB policies. In this respect, there is a clearly asymmetrical opportunity-risk ratio regarding the future energy production costs.

What is more, a different formula would be used for calculating the reference yield. This change will mean that WECs with hub heights below 135 metres will be assigned a lower reference yield, all other conditions being equal, conversely, this will mean that the projects are assigned a better calculatory site quality and therefore less subsidies.

Permanent operational restrictions required by the operating permit and non-wind-related WEC downtimes > 24 hours will be factored into the assessment of the site quality and reduce the subsidy entitlement. In our opinion, this proposal would create a disproportionate administrative effort and for this reason alone should be reconsidered. If the fixing of a maximum price is indispensable, it would be at least desirable for the Federal Network Agency to use its 10% adjustment latitude primarily with regard to costs, and if crucial financing parameters, such as a long financing period to a one-stage model comes with benefits and drawbacks. A disadvantage is the high administrative effort, in particular the initial assessment based on expert reports, and the reassessment of the subsidy level with re-funds or back payments every five years. And this does not even answer the question of the ‘correct’ energy yield assessment at the beginning of the project’s life-time, a key marker for the quality of the projects, the banks will create suitable regulations that anticipate the resulting money flows in the project financing model. An advantage of the one-stage model is the longer financing periods that take into account the service lives of the WECs. This affects projects with a site quality of more than 80% whose entitlement to the initial remuneration is done in one go, whereas the capital commitment of borrowed funds has been shortened significantly by the EEG-2004.

Maximum pricing and other efficiency measures

The stipulated maximum price of 7.0 cents/kWh (including depression) for 100% sites allows profitable project financing under the current framework conditions, as confirmed by various current cost studies. However, this does not take into account the economic effects of the yield losses caused by Art. 24 EEG-2004, which currently not be reliably estimated, or a normalization of the capital market interest rates that are currently distorted by ECB policies. In this respect, there is a clearly asymmetrical opportunity-risk ratio regarding the future energy production costs.

What is more, a different formula would be used for calculating the reference yield. This change will mean that WECs with hub heights below 135 metres will be assigned a lower reference yield, all other conditions being equal, conversely, this will mean that the projects are assigned a better calculatory site quality and therefore less subsidies.

Permanent operational restrictions required by the operating permit and non-wind-related WEC downtimes > 24 hours will be factored into the assessment of the site quality and reduce the subsidy entitlement. In our opinion, this proposal would create a disproportionate administrative effort and for this reason alone should be reconsidered. If the fixing of a maximum price is indispensable, it would be at least desirable for the Federal Network Agency to use its 10% adjustment latitude primarily with regard to costs, and if crucial financing parameters, such as a long financing period to a one-stage model comes with benefits and drawbacks. A disadvantage is the high administrative effort, in particular the initial assessment based on expert reports, and the reassessment of the subsidy level with re-funds or back payments every five years. And this does not even answer the question of the ‘correct’ energy yield assessment at the beginning of the project’s life-time, a key marker for the quality of the projects, the banks will create suitable regulations that anticipate the resulting money flows in the project financing model. An advantage of the one-stage model is the longer financing periods that take into account the service lives of the WECs. This affects projects with a site quality of more than 80% whose entitlement to the initial remuneration is done in one go, whereas the capital commitment of borrowed funds has been shortened significantly by the EEG-2004.
that operators will not receive any remuneration if power prices are
reporting obligations, the so-called six-hour rule based on Article 24
stage, ENERCON's Project Financing & Investments Manager
it difficult to handle the increasingly complex framework conditions.
new rules and regulations to be observed regarding the operation
of wind farms that require adjustments from businesses active
within the market. In particular small and medium-sized businesses find
it difficult to handle the increasingly complex framework conditions.
In addition to its well-established EPK programme [ENERCON
PartnerKonzept], ENERCON has therefore developed new service
offerings that help with operation control tailored specifically
for this customer group.

Greater challenges during operation stage
As an example of the ever-greater challenges during the operation
stage, ENERCON's Project Financing & Investments Manager
Dieter Aden points to the direct marketing mandate; the extensive
reporting obligations, the so-called six-hour rule based on Article 24
of the EEG [German Renewable Energy Sources Act] that stipulates
that operators will not receive any remuneration if power prices are
negative for six consecutive hours, and other bureaucratic hurdles.
"The framework conditions are becoming more and more complex
and challenging. Community-owned wind farms in particular are
reaching the limits of what they can handle," says Aden.
For this reason, ENERCON now offers operation control as a new EPK
option especially to small and medium-sized customers. This new
EPK+ service offering is an add-on to the regular EPK contract and
covers the commercial and technical operation of the installed wind
energy converters.
It includes day-to-day bookkeeping and annual accounts, an annual
target/actual comparison with the business plan, and handling all
commercial correspondence, payments, and contracts. In addition,
ENERCON will verify on behalf of the customer the feed-in remu-
eration statements created by the grid operator and direct marketer.
This need to take into account any power limitations of the WEC due
to feed-in management and the six-hour rule according to Article 24
of the EEG.
As part of technical operation control, ENERCON is the point of
contact for technical issues vis-a-vis grid operators, direct marketers
and the authorities, notifies these parties of malfunctions and
downtimes, handles the technical adjustment of insurance claims, and
contracts service providers for repairs and damage not covered by the
EPK contract. ENERCON also monitors the inspection intervals for
safety equipment as well as recurring inspections required by the
operating permit, type testing, and applicable technical regulations.
This includes the mandatory reporting required by REMIT as well as the
System Stability Ordinance (Stabilitätsordnung), the System Service Ordinance
(Systemdienstordnung) and the Energy Efficiency Directive. The contract also covers
the hiring of expert inspectors as well as overseeing the repair of any
defects. The EPK+ service also includes regular checks of the wind
farm, its access roads and crane platforms as well as the monitoring of
operating parameters.

ENERCON offers solid support during tendering process
ON THEIR OWN, SMALL AND MEDIUM-SIZED INVESTORS BARELY HAVE A CHANCE OF PARTICIPATING
IN THE NEW CALL-FOR-TENDER SYSTEM BECAUSE OF THE GREATER RISKS INVOLVED.
ENERCON IS READY TO BE A SOLID PARTNER AND OFFER ITS SUPPORT.

The German Federal Government plans to switch the energy
feed-in tariff system to a call-for-tender system. This will have
far-reaching effects on who can participate in the onshore wind
industry if these plans are realised in their current form. Many
small and medium-sized investors and operators – who have
so far been the pioneers and "movers" of the energy transition –
would hardly stand a chance of participating in the market
because of the greater financial risks. The result would be a
concentration on large enterprises and institutional investors
with deep pockets. Small investors, which include most com-
community-owned projects as well as city utilities, farmers and
medium-sized planning companies, would be pushed out of
the market. For this reason, ENERCON offers support during
the tendering process especially to these groups and stands by
their side as a strong partner.

The biggest obstacle for this group of customers regarding
the planned call for tender system is that the government will
require a valid permit under the German Federal Immission
Control Act (BImSchG) as precondition for submitting a tender.
This means that anyone who wishes to submit their project in
a call for tender must spend a significant amount of money up
front: They must bear the planning costs and pay for a large
number of expert reports. Given the uncertainty about whether
their project will actually be accepted and they will be able
to build it, it will be difficult for small investors to raise this
venture capital. Many prospective investors will hesitate because
if the project is not accepted, the lost project costs cannot be
absorbed by a larger portfolio.
However, ENERCON strongly believes that the expansion of
onshore wind energy must continue to involve community-
owned energy companies, city utilities, farmers, energy co-ops
and regional planners – in other words, people who come
directly from the project regions. "Now as ever, ENERCON is
an advocate for the decentralised energy supply with as much
regional business involvement as possible," declares ENERCON
Managing Director Hans-Dieter Kettwig. "For us, stakeholder
diversity is a key for the acceptance of wind energy projects
and the energy transition as a whole. The restructuring of the
energy system will be successful only if as many individuals
as possible have an opportunity to be involved. This is another
reason why the energy transition must not become the
playing field of large enterprises and big investors!"
For this reason, ENERCON offers its support particularly to
small and medium-sized investors in the early stages of their
projects in order to develop project-specific solutions and
mitigate the financial risks. The goal is to work together to
develop strategies for planned projects and create suitable
financial models.
If desired, ENERCON will accompany customers at financial
meetings, establish contact with potential financing partners
and create a financing recommendation. In addition, ENERCON
will create a strategy for participating in the call for tender,
support customers during the tendering process, and broker
the required securities if necessary. During this process,
customers can rely on ENERCON's excellent creditworthiness
and financial soundness repeatedly confirmed by independent
ratings.
This new offer includes extensive support during the project
planning stage; creation of the BImSchG plan; and designing
grid connection, substations, access roads and crane hardstands.
It also includes the creation of risk evaluation reports; turbi-
nele analysis; stability analysis; progress of yield, noise
and shadowcasting; and wind analyses. In order to provide additional
capacities for this enhanced customer care, ENERCON will
expand its workforce in the relevant departments.
Contact: E-Mail: Vertrieb@enercon.de Tel. +49 4941/927-0

PRACTICE_ Support for operation control

ENERCON NOW OFFERS EXTENDED SUPPORT FOR WIND FARM OPERATION, ESPECIALLY
TO SMALL AND MEDIUM-SIZED OWNERS. THESE CUSTOMERS IN PARTICULAR FACE SPECIAL
CHALLENGES BECAUSE OF THE CHANGED FRAMEWORK CONDITIONS.

This new EPK+ option rounds out the complete care of the wind
farm during its operational life. It is the ideal add-on to the existing
EPK contract and the direct marketing option EPK-E for small and
medium-sized customers," says Dieter Aden. ENERCON views its
support for small and medium-sized actors in the market, which
include most community-owned wind projects, as a contribution
towards ensuring stakeholder diversity in the onshore wind industry
in Germany. "We consider stakeholder diversity a key instrument for
the high acceptance and the success of the energy transition. For this
reason, we want to help the small players in the market as much as
possible when facing the upcoming challenges," affirms ENERCON
Managing Director Hans-Dieter Kettwig.
T he Hornisgrinde in the Northern Black Forest is remarkable in more than one respect. At 1,163 metres, this mountain ridge in the Ortenaukreis district of Baden-Württemberg, near the well-known wine village of Sasbachwalden, is the highest elevation in the region. Its bleak plateau includes a bog that is at least 6,000 years old; it is among the places with the highest precipitation in Germany. In addition, Hornisgrinde is the highest elevation in Germany to host a wind energy converter – now featuring ENERCON technology. In late October, an E-70/2.3 MW turbine took up operation at the site.

ENERCON installed the E-70 with a hub height of 85 metres in the course of a repowering project. The customer is the Windpark Hornisgrinde GmbH & Co. KG, which is backed by the Griebl investor family from Achern. The E-70 turbine replaced three antiquated geared wind turbines by former manufacturer Seewind that were installed on the mountain plateau in the 1990s; at the time, this was the first wind farm in Baden-Württemberg.

"Hornisgrinde is a very wind-rich inland site," says ENERCON project manager Robert Rampp. The forecast for the E-70 expects an annual energy yield of 5.3 million kilowatt-hours. This means the ENERCON wind turbine produces about seven times as much energy as the three dismantled old turbines combined. "In December alone, it produced 708,000 kWh, reaching about one seventh of its annual energy yield," says Rampp.

Obstacles in planning stage overcome

Whereas power generation has been smooth sailing, the procedure for obtaining the permits was much less so. Initial plans for repowering the old wind farm were made as early as 2010, says Matthias Griebl. Objections were raised by the German military and broad-caster Südwestfunk, both of whom operate transmitters near the site and were worried about signal interference. The German Federal Network Agency, the Ministry of the Interior of the state of Baden-Württemberg, and some mobile phone operators also voiced concerns. They feared that the larger wind energy converter would interfere with DAB transmitters, police radio traffic and mobile phone signals.

Obstacles in planning stage overcome

“Variety of expert reports was able to prove that the new wind turbine would not create interference with the various radio signals,” explains Matthias Griebl. With the State Ministry of the Environment as mediator, solutions could be worked out with the wireless operators. However, the proximity of a nature reserve and other concerns regarding environmental protection caused more problems in the planning stage. Many individual case examinations and exemptions were needed until finally in February 2015, the BImSchG permit was issued subject to certain conditions.

The installation of the wind turbine then presented new challenges. “Because of environmental protection restrictions, we could work on the construction only from August to November," says ENERCON project manager Robert Rampp. Because they were not allowed to fell any trees to make room for access roads, all major components had to be re-loaded onto special vehicles in the valley. The concrete tower segments were transported by semi trailers, the steel tower section and the rotor blades by a self-propelled vehicle. For moving the rotor blades, the alpine transport frame was used that is able to raise the rotor blades to a near-vertical position in narrow bends. "Due to gradients of up to 18 percent, we also had to put down an asphalt layer in some parts to ensure the stability of the self-propelled vehicle," says Rampp. Strong winds forced frequent interruptions of the installation work.

On October 3rd, Germany’s National Day of Unity, the hub was hoisted – just in time before the strong winter winds pick up that prevail on Hornisgrinde from October onwards and would have made any more crane-assisted operations impossible. The official commissioning of the fully installed E-70 wind turbine was celebrated on October 30th in the presence of Baden-Württemberg’s Minister for the Environment, Franz Untersteller. //
The architects of the community-owned wind project Berg in Upper Bavaria have created a landmark in support of the energy transition. They had four ENERCON E-115/3 MW wind energy converters installed for this project on Lake Starnberg. The site is on the Eastern shore of the lake in the municipality of Berg in the district of Starnberg. With their hub height of 149 metres, the wind turbines can be seen from afar in the region - if the weather is clear even from the Bavarian capital of Munich, about 30 kilometres away.

The wind farm is a landmark also in the metaphorical sense – standing against wind power critics, against the “10-H rule” introduced by Prime Minister Horst Seehofer (CSU) that is controversial even within Bavaria (the rule stipulates that the distance from residential buildings must be at least ten times the WEC height and is intended to thwart the progress of wind energy in Bavaria) and against the few entrenched opponents of the community-owned project in the district which is among the regions with the highest per-capita income in Germany. They tried to prevent the realisation of the project because they disliked having to look at wind energy converters.

“But now the wind turbines are up and running,” Robert Sing says happily; he is the planner and managing director of Bürgerwind Berg GmbH & Co. KG, the company that operates the wind farm. “With this project, we have created a model for the decentralised expansion of wind energy at inland sites in many regions of Bavaria.” Sing says he received numerous inquiries from mayors of other Bavarian towns, from energy co-ops and interested citizens who want to know how the project was realised and whether the same thing could be done in their region. “This includes many CSU supporters,” says Sing. “At the grassroots, many people in Bavaria are in favour of wind energy projects. This contradicts Mr. Seehöfer’s misguided 10-H policy.”

Even more so because the communities reap double benefits from projects like the community-owned project in Berg: Firstly, through the eco-friendly local production of renewable energy; and secondly, through direct shares in the project. “The Berg community-owned wind farm has 169 shareholders,” explains Robert Sing. “In addition to the municipality of Berg, this includes residents of the region, the local bank, the neighbouring municipality of Münsing, the municipality of Gaissach, the Bad Tölz city utilities, and the energy co-op Fünfseenland eG. We are 100 percent local.”

ENERCON, too, considers the project in Berg an excellent model. “It shows how to boost the regional economy and create many opportunities for rural areas,” says Joachim Keuerleber, ENERCON’s Regional Sales Manager for Southern Germany. “However, at this point in time, there are unfortunately many who fail to understand this. So we must not waver in our commitment. We need to make sure that regional community co-ops with their great stakeholder diversity continue to play an important role in the energy transition.”
ENERCON’s installed power in the Netherlands now tops 1,000 MW. The 1,000th megawatt was installed last December in the form of an E-101 wind turbine in the Battenoert community-owned wind farm. ENERCON built a total of 4 x E-101/3 MW on the North Sea island of Goeree-Overflakkee for the shareholder project operated by the Deltawind co-op.

The Battenoert wind farm is located on the southern shore of Goeree-Overflakkee next to lake Geverlingmeer, about 50 kilometres south-west of Rotterdam. The four E-101 wind turbines were installed on hybrid towers and have a hub height of 99 metres. All of the project shareholders come from the surrounding area. The Deltawind co-op that operates the wind farm is equally local – 1,900 residents from the region, mostly individuals, hold shares.

Community-owned shareholder companies make up an important customer group for ENERCON in the Netherlands. They initiate many of the onshore wind energy projects in the country and make a crucial contribution to local economies and the acceptance of wind energy among the population. This includes the largest wind energy project realised by ENERCON in Europe to date – the Noordoost-energy among the population. This includes the largest wind energy project realised by ENERCON in Europe to date – the Noordoost-energy among the population.

ENERCON’s first project outside of Germany ENERCON entered the Dutch market in 1992. At that time, ENERCON built the Roggeplaat wind farm (12 x E-33/400 kW) for ENERCON’s first project outside of Germany.

In the early years, it was just a handful of staff who represented ENERCON in the Netherlands and laid the foundation for a nationwide sales and service organisation. After 1998, most projects were smaller wind farms using the revolutionary E-40/500 kW wind turbines – the first gearless, direct-drive ENERCON WECs. In 2003, ENERCON opened a Dutch sales and service subsidiary in Zwolle. Ever since, the company has been intensifying its activities in the Netherlands. After investments in the service infrastructure and hiring in all areas, 2014 saw the inauguration of a state-of-the-art service and training base in Emmeloord. Today, ENERCON employs almost 300 people in the Netherlands and is among the largest employers in the onshore wind industry.

ENERCON’s most important project milestones in the Netherlands include the Dafteijl wind farm in Groningen province. It was installed in 2005 and consists of 35 x E-70/2.3 MW. Dafteijl was also ENERCON’s first large-scale project in the Netherlands.

In 2006/2007, the Eemshaven wind farm with 66 x E-82/3 MW and a total wind farm power of 192 MW was installed, again in Groningen province.

In early 2012, the Roggpleaat wind farm was repowered, again using ENERCON technology: The 12 x E-33 were replaced with 4 x E-82/3 2.3 MW.

In 2014, ENERCON installed its first export turbine of the highly efficient E-115/3 MW series in Lelystad in Flevoland province.

In 2014, ENERCON also built its first transmission substation in the Netherlands as part of the NOP project.

In early 2016, the prototype of the E-126 EP4 was installed in Lelystad (see report on page 10).

ENERCON still has big plans for the future in the Netherlands. The Dutch Government has set a goal of achieving a total installed wind power of 6,000 MW by the year 2020. “We have done half of that so far,” says Bram van Noort. “And even for the time after 2020, the Netherlands will be well advised to reduce their dependence on finite fossil fuels such as natural gas. We are 100% committed to realising these renewable energy goals together with our customers and to pushing ahead with the expansion of onshore wind energy in the Netherlands.”
Five E-70 energy-self-sufficient El Hierro

ENERCON WIND TURBINES WORK IN COMBINATION WITH A PUMPED STORAGE SYSTEM. THE PROJECT MAKES POWER GENERATION ON EL HIERRO COMPLETELY INDEPENDENT OF FOSSIL FUELS.

El Hierro has set itself ambitious goals for power production. The smallest of the Canary Islands soon wants to meet its electricity demand using one hundred percent renewable energies. The electrical energy will be produced directly on the island to make El Hierro independent of imported fossil fuels. Up until now, the island has been using diesel generators, which they would like to phase out for environmental reasons. El Hierro is a UNESCO biosphere reserve. The island puts a heavy emphasis on environmental protection and takes pride in offering sustainable tourism.

To reach these goals, a renewable energy project combining wind energy and a pumped storage system was planned with backing from the Spanish Government and the European Union. The project was realised on the west coast near the island’s main settlement of Valverde. ENERCON supplied the wind energy converters and the wind farm control unit (FCU). Five E-70/2.3 MW wind turbines were installed for the project. After the WECs were commissioned about two years ago, the hybrid power plant has been put into service step by step through extensive testing and the temporary connection of pumps and water turbines. The diesel generators serve as back-up during this test stage. In January of this year, they were taken off the grid for more than 24 hours for the first time, and El Hierro received its power wholly from regenerative sources around the clock.

This cutting-edge hybrid power plant is a model for regenerative power supply in other regions, too. El Hierro has a peak energy consumption of approximately 7.5 MW. The wind farm capacity of 11.5 MW has been designed such that the island can obtain part of its power from the wind turbines even in those months when winds are low, explains Eric Breckwoldt, ENERCON Sales Director for Spain & Portugal. The excess power produced during strong wind periods is passed to the pumped storage system, where it is used to pump water from a low-lying reservoir to another reservoir higher up.

When needed, the water is released from the upper reservoir and drives four Pelton turbines with a total power of 11.32 MW. The upper reservoir is a natural volcanic caldera that can hold up to 500,000 cubic metres of water. The lower reservoir is a man-made basin that can hold roughly 150,000 cubic metres.

For this system to work, the proper coordination between the control systems for WEC power generation, pumping power and water turbine power of the hydropower plant is essential – this is the job of the FCU supplied by ENERCON. “The WECs run permanently only in harmony with the whole system,” explains Eric Breckwoldt. “At full-load operation, the wind farm would be able to inject the entire generated power – not only into the grid but also into the pumping capacity.” In day-to-day operation, however, the WECs run at limited capacity because the variable power output triggers fluctuations of frequency and voltage in the grid that need to be compensated constantly. “The fact that we are able to perform this compensation and that the grid parameters do not go haywire, that is what makes this project so unique,” says Breckwoldt.

Wind power is highly cost-effective

In addition to the benefits for the environment, the project stakeholders also point to cost-effectiveness. The power produced by the wind turbines costs little more than half as much as the power produced by the diesel power station. On the Canary Islands, a kilowatt-hour of wind electricity costs about 8 cents whereas a kilowatt-hour of diesel electricity costs about 17 cents, with fuel and transportation costs constantly on the rise.

The island location presented some special logistical challenges – all components had to be shipped to the island harbour – and the wind conditions at the site also created problems for the project planners. In summer, the winds along the west coast of El Hierro are extremely strong, often with heavy turbulence. So the planners opted for the E-70 wind turbine on a 64-metre tubular steel tower. “This sturdy wind turbine is the ideal solution for this type of site,” says Breckwoldt. In addition, the E-70 wind turbines were equipped with a blade load control system that has been used successfully in the E-82 model.
E-141 EP4 / 4,200 kW

Intelligent Advancement of the Enercon Platform Strategy

- High efficient low wind turbine
- New generator design for maximum quietness
- Largest onshore rotor blade for maximum yield
- Expedient hub heights

Enercon
Energy for the World