

Issue
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WIND BLATT

THE ENERCON MAGAZINE



Feature: Scandinavia

Pages 6/7: Norway

Hydrogen from wind

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An E-40 on the rocks of Åland

Pages 10/11: Sweden

The northernmost project



EDITORIAL

Dear Readers,

In the past years, renewable energies have attained a good image worldwide. A lot of dedicated individuals, political groups, environmentalists, governments and even the G8 countries have all contributed to establishing this image. The G8 Task Force has compiled a study on the topic of sustainable energy supply in which it itemises the consequential costs for power generation using fossil fuels taking external costs into consideration. The consensus amongst those who are informed is that a sustainable energy supply using more renewable energy sources must be established.

In addition, there are agreements that industrial countries have to set an example in this respect. Since these countries produce approx. 80 per cent of the toxic waste, they should be made responsible for their deeds. Industrial nations shouldn't be allowed to burn coal without any forbearance on the future, emit CO₂, and at the same time expect developing countries or newly industrialized countries to use renewable energy. No, we, or rather, all the industrialised nations should take the lead in the use of regenerative energy! Years ago, Germany already achieved great respect for its use and operation of regenerative power plants and has, for many countries, become a touchstone for future renewable energy supply. I would, at this point, like to express my appreciation and thanks to all those who, through their active support, enabled us to attain this leading position. Through these efforts, we have all been able to demonstrate that regenerative energies are a sure source of energy for the future. When the sun comes up in the morning, it produces warmth. When the wind reaches its peak around midday, our wind turbines produce peak energy yields. This has been totally neglected in the calculation of wind energy prices (more detailed information in the following report).

Vast investments in the supply industry and the respective manufacturers have assisted in reaching a common achievement and it could be that this success isn't quite a welcome factor for some sectors or larger companies.

Our Minister of Economic Affairs, Mr. Wolfgang Clement, has been grossly negligent by representing interests which infringe upon our lives and the interests of many industrial firms. Mr. Clement's current political debate has led to uncertainty for numerous firms whose main business volume comes from wind energy. At the same time, countries which currently want to implement regenerative energy are also becoming unsettled. Germany is threatened to lose its leading position.

I don't know what leads people like Mr. Clement to make such comments. However, it is certain that he is infringing on moral and ethical laws. As the Minister of Economic Affairs it's his duty to represent the interests of the whole economy, the people and the environment!

Yours,



Aloys Wobben,
Managing Director of ENERCON GmbH

SUMMER IN THE CITY

Power plants are forced to cut output

**This record-breaking summer,
most nuclear energy lobbyists
were really sweating it out.**

**They had to admit that
their power plants, too, are
not always available 24 hours,
but on occasion, are forced
to cut output.**

At the beginning of August, production in most of the nuclear plants on the Elbe, Weser, Rhine and Neckar had to be reduced due to increased river water temperatures. The heated up cooling water, which normally drains off into the rivers as liquid waste, causes an additional increase in temperature in running waters. Legally bound maximum temperature levels are set for each river. And these temperatures, again, determine the maximum temperature level for coolant water being pumped out of the plant into the river. This meant, for example, that the Krümmel Nuclear Plant had to reduce

production to only 60 per cent capacity in order to avoid increasing the temperature in the Elbe River which had already reached 26 degrees Celsius. Power supply in Germany was, however, not at any time endangered because on the one hand Germany uses less energy in the summer than in the winter months and on the other hand the energy mix – including renewable energies – allows for distribution to various energy levels.

Dr. Peter Ahmels, president of Bundesverband WindEnergie (BWE), explained that the BWE doesn't see any reason, in view of the slightly lower power yields in 2003, to say that the amount of wind supply has decreased. "These types of fluctuations also occur in other sectors of power production such as hydro which is traditionally used by big power supply companies", says Ahmels. Irregularities in energy production are easily compensated by the overall group of power plants in the European Union.

Figures show that even in record breaking years, such as 2003, where wind levels were low, wind turbines still contributed to producing power. It wouldn't be realistic to say that winds are calm all over Germany. Even if the wind slacks off in some regions, in others it will still continue to blow. On top of that, on a lot of days out of the year the wind curve often corresponds well to the system load (consumption curve). This is well depicted on the picture "Feed-in capacity of supply area for EWE".

This shows the feed-in capacity for all ENERCON wind turbines in the EWE

ENERCON:

2002: Wind speed 5.24 m/s
3,449 Turbines: 687.64 GWh Power

2003: Wind speed 4.43 m/s
4,103 Turbines: 698.42 GWh Power

Source: ENERCON Scada

Total in Germany:

1. HJ 2003: 8.95 Billion kWh


1. HJ 2002: 9.96 Billion kWh

▶ only 9 % less wind energy in 2003

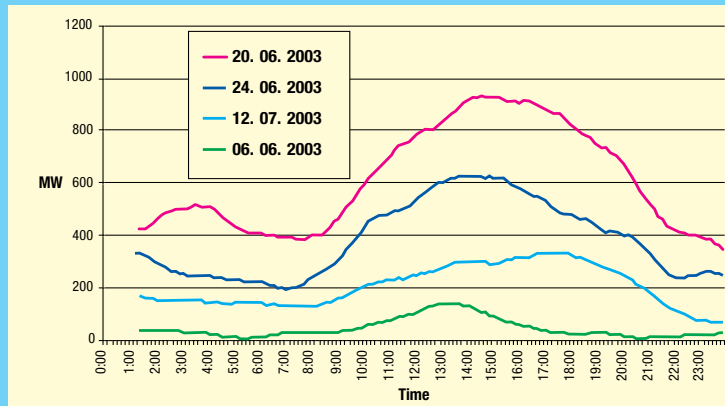
Source: Statistic from the Institut für Solare Energieversorgungstechnik (ISET) indicating the monthly energy supply from all wind turbines throughout Germany.

region on four days this summer with varying wind supply (6 June 2003: very little wind, 20 June 2003: high winds). It's easy to see that morning winds (with sunrise) increase up to midday – the main consumption period – reach their apex and then die off towards the evening. This pattern follows the typical consumption curve in Germany. This way the feeding-in of wind energy nicely supplements the energy supply during midday peak periods.

The power supply system in Germany with its apparently liberalised energy market hasn't shown any of the hoped-for advantages for consumers. According to statistics presented by the Energy Consumers Association (Bund der Energieverbraucher), private households overpay approximately four Billion Euros per year for electricity and gas. Aribert Peters, from the Bundesverband der Energieverbraucher (German Energy Consumers Association), reported to the German Press Agency that four large providers dominate the German market to the detriment of the consumers. In the last twelve months alone, energy prices have risen by six per cent for the average consumer. Thorsten Kasper, the official representative for energy at the Bundesverband der Verbraucherzentralen (National Consumers Association) comments on the increased electricity prices: "We have hardly any competition on the energy market." While the energy companies are trying to chalk the price increase up to renewable energy, it doesn't fit reality. The large power companies have managed to push competitors out of the picture by raising third party access fees. The German Federal Cartel Office is pursuing a number of cases of unfair competition. In actuality, alternative power suppliers have to pay half of what they earn to the grid operators.

As of July 2004, a regulatory office will be in charge of making sure that smaller power providers will also have an opportunity on the market. 

Feed-in capacity EWE region of supply



Energy yield of ENERCON wind turbines in the EWE region according to time of day.

Unjustified criticism regarding subsidies

Against the background of the forthcoming amendment to the German Renewable Energies Act (EEG), a debate has now begun on the future shape of Germany's energy mix. Amongst the protagonists are the two ministries headed by the Federal Minister for the Environment, Jürgen Trittin (Green Party), and the Federal Minister of Economics, Wolfgang Clement (SPD).

In contrast to Jürgen Trittin, his colleague in the cabinet responsible for the environment, Mr Clement holds the view that the diminishing support provided to wind energy must be reduced even further. In this context he speaks of a policy of subsidy that has already reached the scale of the coal subsidy. On one hand, this is factually incorrect, because the support provided to renewable energies is at a level far removed from the state subsidies provided to the coal industry. On top of this, Mr Clement fails to consider the fact that savings made in respect of wind energy would, as a result of conse-

quent EU restrictions on the Treasury, not yield any increased income to the public purse. This is because the costs incurred for electricity generated from wind are not supported by the state, but rather are financed through a levy on the price of electricity at a level directly related to the relevant costs.

The EU levy stands currently at a level of about 0.2 cent/kWh. According to calculations provided by the Federal Association for Renewable Energy (BEE) it will rise over the coming years to 0.4 cents/kWh at the maximum, but will drop rapidly after 2010. Because of the rising cost of primary energies, by the year 2020 wind energy will no longer create any extra costs in comparison with conventional sources of energy, in spite of its continuing expansion.

At present the average household pays a maximum of one Euro per month towards the so-called extra costs for electricity from renewable energy.



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SUPPLIER
SINCE 1989

Kienle + Spiess produce interleaving metal sheet

Contact was first made in 1989 at the Hanover Fair. On the Kienle + Spiess stand, ENERCON boss Aloys Wobben discovered the product that he needed to implement his plan of moving away from conventional geared equipment towards building gearless wind energy converters. Kienle + Spiess have turned out to be exactly the supplier he was looking for and with whom he could implement this project very quickly. Calculations were carried out almost overnight, and were later implemented in a project together with the tool constructors at Kienle + Spiess. Only one year later, the first segment metal sheets for the prototype E-36 were stamped. Kienle + Spiess can therefore call themselves the "suppliers in the hour of need".

Kienle + Spiess is the most important European supplier of laminated metal sheet to the electrical industry and of die-cast parts for electrical drives, generators and transformers. The company has recently become part of "Cogent Power Ltd.", 75 per cent of which is owned by the English Corus Group, while the other 25 per cent share is held by the Swedish steel manufacturer Svenskt Stal AB (SSAB). About 770 employees work at the three sites in South Germany, at Sachsenheim (where the administrative headquarters are based), Vaihingen and Enzweihingen. They supply well-known companies around the world in the motor and generator industries, the electrical industry, and manufacturers of power tools, fans, pumps, domestic appliances and other sectors.

Since then, the manufacturing procedures used for ENERCON have been further optimised, and segment sheets are supplied for all types of ENERCON ring generators, up to the E-112, the world's largest converter. Since 1990 turnover has grown continuously. "Between nine and ten per cent of our sales, in other words about twelve

Million Euros, are made thanks to ENERCON. Kienle + Spiess have long attached great importance to the wind energy sector. Numerous internal investments have been made to meet the rising demand. This includes the purchase of new equipment and the intensification of research and development in the stamping technology field", explains Peter Mockler. A business manager by profession, he is responsible at Kienle + Spiess for cooperation with ENERCON.

"As one of the largest employers in the region, ENERCON is extremely important for the economy of the North German region. The promotion of Germany as a centre of expertise and innovation is being advanced here", explains Mr Mockler. He then points out that, on top of this, ENERCON, as an environmentally conscious company, is spreading and implementing "long-term thinking" in economic and environmental fields, and is therefore helping to secure the future. "Alternative energies enable new political and economic thinking, and therefore encourage new ideas," adds the Kienle + Spiess manager.

The company stamps segment sheets for the generator's stator ring, and manufactures the pole packs. The stamping is carried out using a specially fabricated tool (a carbide multistage die) that is built into a stamping press. The applied force (up to 400 t) stamps the stator sheets from the electrical steel. The pole sheets are welded to form packs and then dispatched.

The dimensions of a generator stator are enormous, often reaching almost 10 m diameter. For this reason the stator sheets are "interleaved" as segments, and these are assembled into a complete stator at ENERCON. The staggered layering of these thin, leaf-like sheets prevents the development of eddy currents. Noise is




Above: Kienle + Spiess worker with interleafed generator sheets.

minimised by the narrow air gap and the shape of the packs.

Like other supplier companies in the Baden-Wuerttemberg region, the employees at Kienle + Spiess were angered by the criticisms of wind energy expressed by their Minister President. Mr Mockler puts it like this: "The arguments of our Minister President Erwin Teufel do not match the image that the Baden-Wuerttemberg region presents to the outside world. Baden-Wuerttemberg's position as a leading industrial region is being undermined. Companies, and their market position, are not being considered." The loss of jobs and expertise would be unavoidable if Teufel's rejection of wind energy were to become

reality, and for that reason he should inform himself more accurately about the companies based in his region and the fields in which they are active. The industrial manager is convinced that "a reversal in the sales trend would have many negative consequences".

Mr Mockler perceives yet another danger: "If Germany were to withdraw from wind energy, this would be associated with a worldwide loss of image for German industry (e.g. a lack of innovation, technology, research etc.). A country with a "green" government would be laughed at abroad if it were not itself in a position to further develop alternative energies." 

Below: Checking the sheet thickness.





HYDROGEN SOCIETY ON THE ISLAND OF UTSIRA

Two Enercon E-40 in an isolated grid pilot project

Could hydrogen combined with wind energy prove to be the best energy solution for remote communities? On Utsira – a beautiful windswept island off the western Norwegian coast – ENERCON in cooperation with Norsk Hydro ASA is setting up a pilot project to demonstrate how wind energy together with hydrogen can provide all the energy needed in a community making it totally independent of fossil fuel. This is the first full-scale project of its kind worldwide and is a barrier-breaking milestone in the development of alternative or “green” energy systems. Utsira has a population of only 250, but in 2003 it will be the showcase of a major pioneering project in the field of energy. All the concessions and plans are ready, and decisions have been taken; Hydro will be setting up a show project using wind energy along with hydrogen to demonstrate how to ensure clean energy.

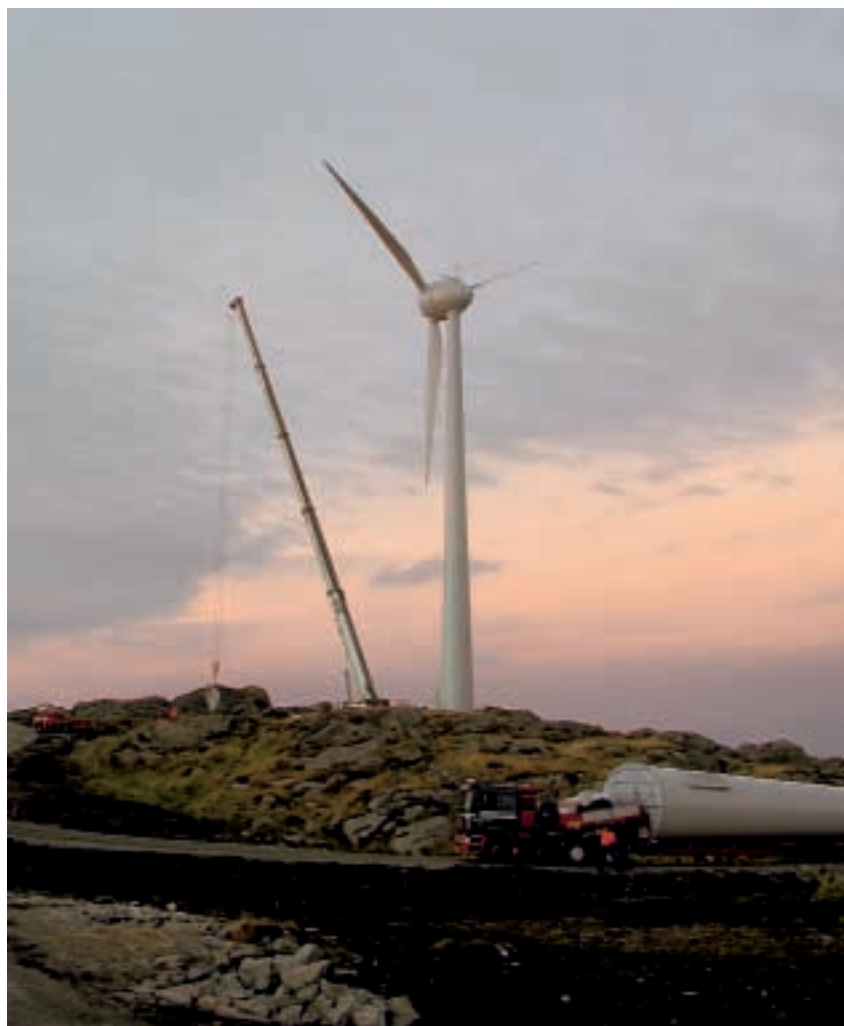
The task sounds simple: to ensure an adequate and stable supply of electricity from renewable sources to ten households on Utsira all year round. However, wind energy is not the only solution. The winds often storm across the island and at other times can be totally calm.

A number of measures have to be taken in order to compensate for the fluctuating winds. The wind fluctuations in a short-term period (seconds) is regulated by a flywheel system developed by ENERCON. By means of a sophisticated control system this guarantees a constant output depending on the amount of consumption. This way, when the winds are favourable, the wind turbine and the flywheel can supply power to the connected users. Any excess wind energy will be used to produce hydrogen which then can be stored.

Hydrogen is produced by means of an electrolyser delivered by Norsk Hydro Electrolysers AS. Hydrogen is then used to produce electricity when wind cannot be used. To begin with, a hydrogen-run generator will produce the additional electricity, but in the spring of 2004 a fuel cell will be installed which will provide electricity directly from hydrogen.

Because the wind turbines are easy to regulate, the whole system can be managed without “dump loads” in which excess energy has to be burnt. ENERCON’s sophisticated energy management system enables the different energy sources and storage systems to vary or adapt according to supply and demand. In addition to this complex task, ENERCON also manages the visualisation and the transfer of data to a control station on the mainland.






The first plant should be ready by January 2004. The groundbreaking ceremony took place this year in June, both windmills were erected at the beginning of September and the hydrogen plant should go into service this autumn.

“This is an unbelievably exciting full-scale pilot project. Utsira will be the showcase for the use of sustainable energy systems based on renewable energy,” says Jørgen Rostrup, senior vice president of Renewables and Hydrogen in Hydro.

“As this is a pilot plant, we cannot expect it to be commercially viable, but it still has great value. The Utsira project will provide us with unique experience in building and operating a future-oriented plant. We are grateful for the enthusiasm and support we have met both from the inhabitants of Utsira and from the local and national authorities, and we are looking

forward to working together with these people on realising these plans.”

The Utsira project is particularly exciting for Norsk Hydro, as the company is able to draw on experience in several areas of operation.

Hydro is already one of the world's largest hydrogen producers and has over 80 years experience in hydrogen production and storage through its agricultural activities. As Norway's largest private electricity producer, Norsk Hydro also has experience in developing and running power plants. In addition, oil operations in the North Sea have given Hydro experience in working under extreme weather conditions. The company also has a tradition of complying with stringent safety requirements, protecting nature and the environment, developing good technical solutions and ensuring long-term and profitable operations. 

Transportation and Construction

Normally, the 70 m long “Elektron” is used to transport heavy cargo around Norway and Great Britain. This time ENERCON and Norsk Hydro chartered the ship to transport two wind energy turbines.

Norway's main transportation obstacles are the numerous mountains, craggy fjords and winding roads which is why heavy loads are usually transported on ships. Brisk commuter boat traffic enables cars to cross the fjords which have the advantage of being deep and sheltered by the surrounding mountains. Ideal conditions to dock at any of the specially built or existing quays.

Utsira, Norway's western most island in the North Sea, however, is unsheltered and holds the risks of high wind and waves. A five day time period, which included the construction and the transport of the trucks and cranes to and from the island, was planned to realise the project. On the first morning, the captain had to abort the first docking attempt because the docking ramp was turned towards the wind. An hour later they were able to make a second successful attempt, because the wind had switched direction. It all had to go quickly because the ship couldn't dock for very long, but they were able to unload the crane. Another landing was made later that day and the construction team was able to get all the components for one of the turbines offloaded. The trip between the harbour in Haugesund and the island of Utsira is only 1 1/2 hours, so the next day they were able to deliver the rest of the second turbine. The ship came back again in the evening even though the waves had increased.

The next two days were unusually calm for the month of September which meant that the teams were able to erect the two turbines and finish 18 hours ahead of schedule. So the crane was loaded back onto the “Elektron” to escape an oncoming storm coming from the southern tip of Norway and safely reached the mainland.



Åland's craggy cliffy territory with almost 6,500 islands with names (and even more without names) looks like pebbles that were scattered on the map between Finland and Sweden. The Åland Islands with about 26,000 inhabitants form an autonomous, demilitarised and unilingual Swedish-speaking province of Finland. This is where Henrik Lindqvist has his home just like his father and grandfather before him. The country, however, is not the only bond between the three men; all three are wind energy enthusiasts, because Åland has the best winds in all of Finland.

Henrik Lindqvist's grandfather who lived on of Åland's tiny islands built a small wind turbine which supplied enough energy to light their house in the evening hours. At the end of the 80's Lindqvist's father started becoming actively involved with wind energy. First he planned to purchase two turbines, but the sea cables to the project were too expensive. In 1992, however, the government of Åland erected the first modern plant. And in 1994 several wind energy enthusiasts including Henrik Lindqvist's father and himself formed an association. And during the next year the tall young man started looking for other people interested in supporting him in his Wind Project. Of course, on Åland he was able to find numerous enthusiasts and together they formed the "Ålands Vindenergi Andelslag", which today has around 1,000 members. Lindqvist's company also works closely with the two other investment firms specialized in wind energy. In the meantime 14 wind turbines, which together produce 17,250 MWh power, are operating on the main islands. With an overall electricity consumption of about 250,000 MWh per year, this represents six to seven per cent.

Lindqvist had the first ENERCON turbine built in 1997. The profitable cooperation with ENERCON was a coincidence. When the Ålander contacted ENERCON Inter-



One of the two new E-40 on Åland.

6,500 ISLANDS IN THE WIND

Eight E-40s are operating on the Åland islands

national, the person understood Öland instead of Åland. And since Öland is not far from ENERCON's Swedish branch office, the sales approval was turned over to them. In the meantime, a great working relationship between the manufacturer and the customer has developed and both are happy about the initial mix-up even though the erection teams had to travel a longer distance. Since then Lindqvist knows, he can rely on ENERCON and the association now owns eight East Frisian-made turbines.

Two ENERCON E-40 turbines were erected on the rocky red grounds in the inland of the main island just this August. The vegetation here is sparse. Heather and other shrubs bloom between gnarled softwood and bleached skeletons of dead trees. Lichens colour the cliffs light green and orange. Here the foundations for the two E-40s were anchored in the rock. In order to do this, the rock was scraped to a level surface and then drilled with eleven 2.5 to 3.5 m deep holes and the foundation was then secured to the rock.




Henrik Lindqvist on his way to the future E-66 site.

The two turbines are now functioning under an average wind speed of 7.3 m/s at 30 meters height.

The good-natured man is proud to be an Ålander. Anyone who unintentionally calls him a Finn is immediately corrected. Lindqvist explains: "I like living here. The economic conditions are better than in other regions in Finland." Lindqvist also says that people in Åland are very industrious. A lot of people have two jobs. He reminisces about the time when he was a fireman and started "Ålands Vindenergi Andelslag" at the same time. "Today, I have two children and a job," he says. "That's enough". In addition, the big man not only manages the association which runs the turbines, but also takes care of the maintenance. Currently, besides himself, there are three other service technicians on the island, two of which are in their apprenticeship. And in the future Lindqvist wants to hire more staff so that he can concentrate solely on the office work. But until then, he'll

continue to climb up each of his wind turbines to service them if necessary. This means ENERCON doesn't have to send out a service team to do any repairs on the isolated group of islands. "Here, everyone has a solution for everything", says the operator, and that's particularly true for the service technicians.

Henrik Lindqvist already has another project in line. After a one-hour ride in his motor boat he reaches a small island 14 km away from Åland's main island. Next year six ENERCON E-66 (2 MW) turbines are to be built here and on two other islands which are nothing more than two rocky ridges jutting out of the sea. The project will be a great challenge for the transport and construction team. Laying 14 km of cable from here to the mainland is another investment of about two Million Euros. But the investment is worth it, because the wind speed is 9.2 m/s at a hub height of 65 m and should guarantee good yields. 



Åland's Minister of Energy Runar Karlsson.

WINDBLATT Interview with Åland's Minister of Energy Runar Karlsson on the topic of wind energy.

WINDBLATT: What is Åland's main source of energy?

Karlsson: We obtain 80 per cent of our required energy via cable from Sweden and ten per cent from the Finnish mainland. Energy obtained through wind power is around six to seven per cent. Seventy per cent of our heating energy requirements are covered by oil and 30 per cent with wood pellets and other similar fuels.

WINDBLATT: How do you see the wind as a source of energy for Åland in particular?

Karlsson: Since Åland has the best location in all of Finland and since there are no economical objections, I had a very positive view of this source of energy from the beginning. In addition, we are also committed to the Kyoto Protocol.

WINDBLATT: What measures is your government taking to promote wind energy?

Karlsson: In the past we subsidised wind energy in order to establish wind energy companies. And we lease property to enable wind projects to be realised.

WINDBLATT: What do you think the power supply in Åland will look like in the next 50 years?

Karlsson: We will have between 20 to 30 per cent wind energy and the proportion of wood pellets used for heating will increase considerably. This way we will become more independent.

WINDBLATT: Do you think that the tourists will see the wind turbines as something negative?

Karlsson: I've never thought that. The tourists see them as proof that we are concerned about nature and that we are doing something about it.

*Typical scandinavian houses.*

QUICK WORK NEAR ARCTIC CIRCLE

ENERCON erection team at the Bottna Fjord

ENERCON's construction team lands at the airport in Umeå after one hour flight time.

Here, 1,000 km north of Stockholm, it's noticeably cooler than in the capital city. The car journey takes them 150 km through the sleepy Bottna Fjord provinces further north. A road leading through endless pinewoods past the typical Scandinavian houses painted dark red. Scattered along the way, signs warn against elks crossing. The team checks into the hotel in Skellefteå. And before supper is served – cold cuts and crispbread – ENERCON's five-man team and a team from the crane company Knaack visit the construction site in Bureå, a small community near Skellefteå. Within the next few

days, three ENERCON E-40 (600 kW) wind turbines are to be erected amongst the conifers. To date this is the most northerly site close to the sea for any of ENERCON's turbines.

The construction supervisor, Rainer Kleemann is satisfied: "Great preparation work was done here! Nice solid roads, proper crane pad, and neat and clean foundations." Meanwhile the wide load drivers are waiting at the site access road with the components. One resident tried to intimidate them by asking for a 100 Euros road toll. But after a call to the Swedish operator and ENERCON's sales agent, Anders Halme, it's made certain that all these costs have already been taken care of. Next morning at eight o'clock, the first transport lorries appear on

the construction site. It's cold and the sky is hung with dark clouds. In order to catch a glimpse of the open sea one has to stalk through a small woods covered with mountain cranberry bushes and yellow boletuses between scattered boulders. On the other side of the bay, a huge dark building appears. This former paper mill was shut down in the 90's and part of Bureå's population became jobless. In this structurally weak region – Swedish Lapland – not far from the Arctic Circle, everyone is happy if they are able to find a job.

The erection team starts its work. The first steel tower segment is unloaded and Rolf Beckmann, Knaack's crane conductor, swings it over the foundation where the flange is inserted with a loud creak. By two pm the third and last section is in place.



Knaack crane conductor Rolf preparing the freshly caught pike in the kitchen tent.



The assembly team enjoying potato salad and fried fish.

Quick work! By now the tower is 63 m tall and everybody's stomach is growling. This is where the Knaack team reveals their special talents. In the waiting periods between the assembly stages Eduard Spitzer, the crane conductor, had thrown a hook and line into the water and was able to angle a few medium-sized pikes. Rolf Beckmann, who was a professional cook for many years before he became a crane conductor, is now standing in the kitchen tent armed with a frying pan: his kitchen counter is a cable drum. Beckmann serves homemade potato salad with bacon and the tasty fish with herbed butter. He even thought of the lemon for the fish. And then he treats the assembly team to apple pancakes with cinnamon.

With renewed energy they attack the afternoon works. The nacelle is pre-mounted on the ground and then hoisted to the top of the tower flange. Then the rotor blades are secured to the hub so that the assembly can be completed the following morning. While the other team members have many years of experience under their belts, this is an exciting and

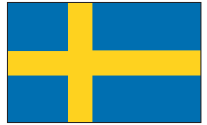
strenuous day for Markus Jönsson. The young Swede from Malmö has only been working for ENERCON for three months. He will be the four Swedish service teams supporting mechanic in the future. But before this he did training in Aurich, ENERCON's headquarters in East Frisia, and will start out by familiarising himself with the plant as an assembly technician. After a hard day's work and a good dinner they all go to bed early. Two more E-40s are waiting to be erected and connected to the grid. For the assembly team that means that they will be needing extra herring bites and Wasa crisp bread in the lunch boxes! 🇸🇪



The site in Bureå.

In short

- ENERCON's Swedish Sales Office was established in Malmö in 1999.
- To date, ENERCON has erected 87 wind turbines in Sweden.
- Sweden is highly interested in wind energy, but obtaining permits are long and drawn-out procedures. In 80 per cent of the cases the permits are not granted.
- Remuneration for wind energy is composed of a "green" certificate (2.6 Cents), the current power market price and a tax exemption, which comes to eight Cents per kW hour wind energy.
- The project permit for Bureå took three years to get approved and cost the operators 10,000 Euros.
- The wind speed on site is around 6.4 m/s at 50 m height.
- Operators are the ENERCON sales manager Anders Halme and the manager of Rejlers Engineers AB in Malmö, Sonny Andersson.



WIND ENERGY CAN BE SO QUIET

ENERCON converters do not become louder above 95 per cent of rated power

Although the noise propagated by wind energy converters has now been quite adequately researched, various claims are being repeatedly circulated by, amongst others, opponents of wind energy, and these claims unsettle planners, authorities and local residents.

When a wind energy project is being planned, detailed sound propagation calculations have to be carried out prior to approval in order to establish what increase in existing noise levels would be created by the planned wind energy converters. Depending on the location, specific levels must be adhered to in the areas immediately adjacent to a wind farm, in accordance with the statutory

specifications of the “**Technical Instructions for Protection against Noise**” (“TA Lärm”). The levels that may not be exceeded in exclusively residential areas are 35 dB at night and 50 dB during the day, whereas in areas of mixed activity the level is 45 dB at night and 60 dB in the day.

In order to carry out these calculations, it is necessary to know the noise generated by the wind energy converter itself, the sound power level. According to the current guidelines for the measurement of this SPL, the various types of wind energy converter are measured a number of times under closely defined external conditions, to ensure that the conclusions made about the generated sound are re-

liable. Interfering sound that is recorded in the course of taking these measurements is masked out at a later stage. For example, a car driving past is louder than the equipment being measured. Whereas in the past the SPL was determined for a reference wind velocity of 8 m/s at a height of 10 m (with the converter operating at medium load), converters are nowadays measured at a reference wind velocity of 10 m/s at 10 m height, or alternatively at 95 per cent of their maximum power, as it has been found that converters propagate the maximum sound under these conditions.

A major manufacturer of wind energy converters has recently caused some-

What you should know about sound

Many of the technical terms used in the study of sound appear very abstract to the layman. Very few of us can tell from the quoted values how loud a wind energy converter will really seem to our ears.

Explanation:

The sound power level (SPL) that is often quoted in the data sheets describing wind energy converters refers to the total sound power released by a source of sound, if we imagine that it has the form of a point. But not all of this energy actually reaches the hearer. The further you are from a source of sound, the larger the area over which this power is distributed. The sound power that reaches the hearer is therefore less, and the converter sounds quieter. If we know the SPL value and the distance from the source of sound, it is possible to calculate the sound pressure level, in other words what the sound level really is at this distance (see the graph of sound propagation from an E-66).

The smallest sound pressure that the human ear can detect is around about 20 µPa (micropascal), and the pain level is only reached at a sound pressure one Million times greater. The decibel unit (dB) was introduced in order to be able to define the audible range without having to work with such large numbers. On the decibel scale, the audible limit is located at 0 dB and the pain

barrier at 120 dB. On this logarithmic scale, increasing the sound pressure level by three dB means that the sound level that is perceived has twice the power. A difference in the volume of the source of sound is only perceived by humans when the sound pressure level varies by approx. one dB.

Comparison:

Up to 130 dB: the engine of a jet aircraft or on the dance floor of a disco.

Up to 120 dB: next to a pneumatic drill or to musicians of a rock band.

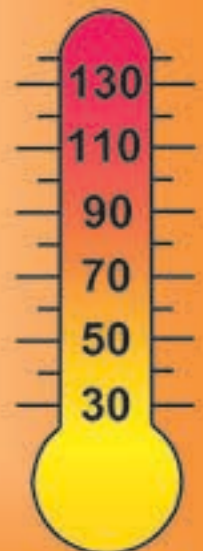
From 85 dB upwards: employers must provide ear protection.

Approx. 65 dB: normal speaking volume.

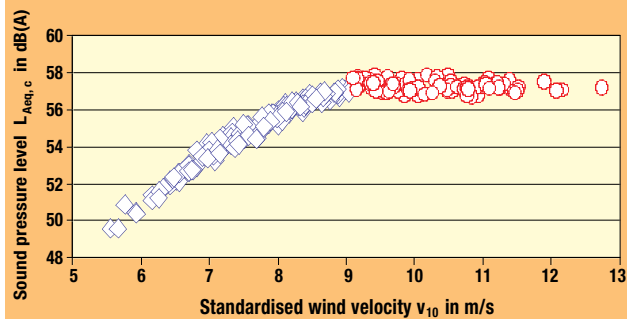
Up to 50 dB: the sound of an E-66 (98 m hub height) at a distance of 150 m.

Up to 40 dB: the sound of a E-66 (98 m hub height) at a distance of 460 m, or the noise of trees in the wind.

Up to 35 dB: the sound of an E-66 (98m hub height) at a distance of 670 m, or the ambient noise in a living room with the television switched off.



E-66 sound measurements



Sound measurement by the measurement laboratory of Kötter Consulting Engineers.

Blue diamonds: below 95 % rated power.

Red circles: above 95 % rated power.

what of a stir: in an advertising brochure, the company published a graph demonstrating that above this reference value their equipment becomes even louder. The fact that, when operating above 95 % of rated power, ENERCON converters do not similarly become louder – as was at first assumed on the basis of this information – has now been confirmed through official measurements taken by Kötter Consulting Engineers on an E-66 (1.8 MW) at Aurich-Brockzetel in East Frisia, in accordance with the current (FGW) guidelines.

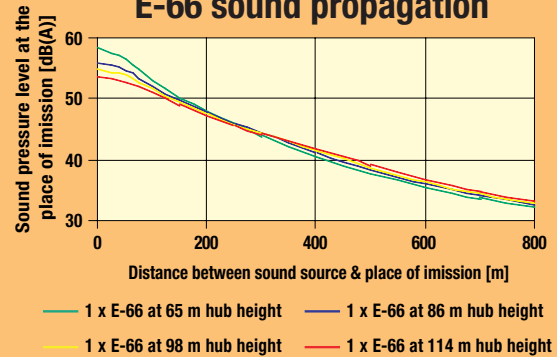
The diagram above left illustrates the measurements of sound pressure level (see box for technical terms) at three different wind velocities. Kötter's graph illustrates the result of the measurement clearly: the sound pressure level does not increase above 95 per cent rated power. In other words the level does not continue to rise as the wind velocity increases. A similar measurement taken on a converter being operated at reduced nominal power (1010 kW) shows the same curve in the measurements, and provides evidence that the sound levels are maintained in sound-optimised operation (see further below).

In the past, the engineers at ENERCON's development department have already achieved a great deal in terms of minimising the sound generated by ENERCON converters. The sound from a wind energy converter results mainly

from the noise of the wind created by the rotating blades, and thus depends greatly on the speed at which the converter is rotating. But sound propagation can also be reduced with a favourable shape and design of the rotor blade profile – although aerodynamic modifications that would negatively effect the converter's yield are always to be avoided. ENERCON have managed to find a very good compromise between low sound imission and high energy yield, as is illustrated by the consistently low measured sound values and high yields of ENERCON converters. In spite of this, development work in this area is still continuing, and initial results suggest that further improvements can be expected.

In addition to further technical development work on the converters, lessons have been learnt in Germany from planning mistakes made in the past. Today the specifications for the planning of and adherence to sound values, such as calculation safety margins and measurement of the converters following installation, have been significantly tightened. As a result, although ENERCON has installed more than 6,000 converters in recent years, no (justified) complaints about their noise have been recorded. One further comment is relevant at this point: the uncertainty in measurements of noise originating from wind energy converters is, as a rule, ± 1 dB, so that in the measurement of the E-66 values, sound pressure levels of, for instance, 102.7 dB


E-66 sound propagation



Comparison of the sound pressure levels from an E-66 at various hub heights (calculated in accordance with DIN ISO 9613-2). Ref.: sound pressure level for 95 % of the rated power; sound pressure level of an E-66; LWA = 103.0 dB(A).

and 103.5 dB were measured. This difference in the SPL cannot be heard (see box) and the large number of subsequent measurements have shown that ENERCON converters do not differ by more than the SPL uncertainty measurement for each converter type (the relevant term is "series scatter").

If these sound propagation calculations for planning a wind farm show that the statutory limit values cannot be observed, with the converters in standard operation (due to close proximity, or the existing sound levels at the selected site), then the variable-speed ENERCON converters allow the required speeds to be met by automatic reduction of the rotation speed according to the time of day. This is known as noise-optimised operation. As this usually means maintaining the stricter levels for night-time operation, the lower rated output due to the required reduction in sound level may hardly affect the overall yield from the converter. This is because it only occurs during the night (1/3 of the day), and then again only when the wind velocity is high.

The technological progress and sophisticated engineering thus make it possible for ENERCON wind energy converters to be operated, even at noise-critical locations, with the aid of careful planning and noise-optimised modes of operation in a manner that is both acceptable to the neighbourhood and still economically viable. 



E-40 and E-16 in front of

Above: workers at the Rothenhausen farm. Below: Fritz Otto in the greenhouse.



Wheat and vegetables are not all that is harvested at the Rothenhausen organic farm near Lübeck — wind energy too.

It is hot in the sunlit greenhouse. A small frog hops between the rows of tomato plants. The ripe tomatoes gleam between the green leaves. These are organic tomatoes that have had so much sunshine this summer that they taste sweet and aromatic.

Fritz Otto and his friends have been farming the land at the Rothenhausen farm near Lübeck originally since 1976. And because ecological thinking in this community reaches further than just agriculture, an energy concept has been developed for the farm, which showed that the farm would itself consume a good half of the generated energy (including heating). A wind energy converter was therefore approved immediately. The oil heaters were then replaced by heat pumps almost straight away. On a field, about 500 m from the farm, Fritz Otto and the other members of his community erected an E-40 (600 kW) with a hub height of 78 m. It is Otto's dream that hydrogen will later be generated from the

ECOLOGICAL ELECTRICITY FOR ORGANIC VEGETABLES

An E-40 on an organic farm near Lübeck

the Rothenhausen farm.

excess electricity, to be used as a fuel for the cars.


The E-40 is not the farm's first wind energy converter. The eighth E-16 (55 kW) ENERCON converter in the world was erected here on a pylon in 1987. The electricity produced by this converter passes via a cable for use directly on the farm. Otto remembers: "The reactor accident at Chernobyl opened our eyes. Suddenly, everybody wanted to buy our old crop – because of fears of

possible pollution in the new crop." They then researched the various possibilities of renewable energy, and decided on wind energy. Following a visit to Denmark, Fritz Otto came to the young company from Aurich, ENERCON. "At that time, it was not just the variable rotation speed that impressed me from the technical point of view. I also had the feeling that we could rely on Mr Wobben, the company's boss."

Not only are wind, wheat and vegetables harvested on the Rothenhausen farm, but animals are also reared. The pigs lie contentedly in their stalls. They are fed only on good organic vegetables. The cows dine in the fresh air, and let the sun warm their backs as they graze in the meadows. Their milk is used in the farm's cheese unit to manufacture all kinds of great tasting varieties – from classic Tilsiter through to delicious carrot

cheese. Six newly moulded cheeses are draining off at the moment. They will be ripe in about six weeks.

Even the home-grown grain is used on the farm itself. The smell of healthy wholemeal bread and rolls rises from the bakery almost every day. There can be no doubt that variety characterises the farm. "There are two directions in which organic operations can develop nowadays. Either they specialise, through the cultivation of particular strains, in meeting the mass market's requirements for the appearance of fruit and vegetables, perhaps using hybrid seeds to obtain vegetables of uniform size. Unfortunately this is not a natural growth process. Or alternatively, the organic farmer can take the classic route, and accept that not every cabbage is the same size. For farm sales that is good, because the customers are happy to choose between small and large cabbages. But this is not the way to find buyers for our goods on the mass market." However, the farm community must also make compromises. So the farm shop does not just offer seasonal vegetables, but also a range of imported products specially labelled so that there are also tomatoes at Christmas time.

What is certain, in any event, is that the products from the Rothenhausen farm are a bit more organic than from conventional organic farms, since its two wind energy converters generate at least as much electricity as the farm needs for its bakery, greenhouse and cheese dairy. 

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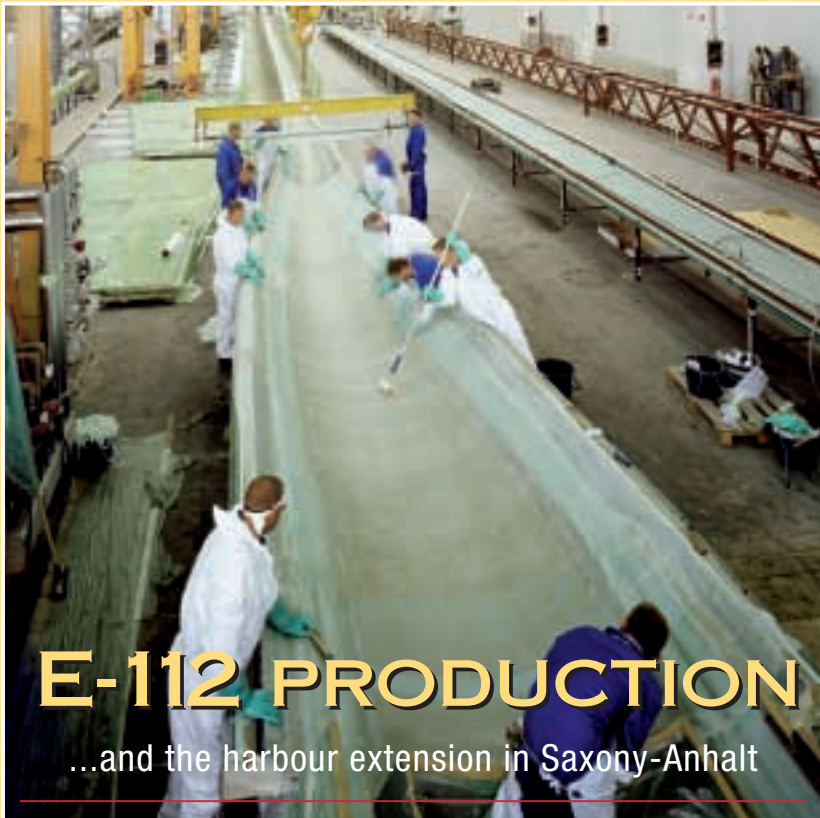
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E-112 PRODUCTION

...and the harbour extension in Saxony-Anhalt

Magdeburg-Rothensee is increasingly developing into a more important location for ENERCON. This is where the 4.5 megawatt turbine E-112 will go into serial production. The production line is already in place where the first blade has been completed. And the blades for the third E-112 prototype whose tower is already standing in the Wybelsumer Polder Wind Farm near Emden in East Frisia will be completed this year.

As of January 2004, the production will be in full swing. Graduate engineer Volker Ziem, the managing director of ENERCON Production in Magdeburg-Rothensee, estimates: "Theoretically, next year we will be able to turn out an E-112 blade every 14 days." In two years the multi-megawatt generators are to be produced in the former "Wilhelm Pieck" foundry, which, although still requiring renovation, is an ideal location for the serial production of this gigantic turbine.

From a logistics point of view, Rothensee is ideally located with a direct connection

to the water ways. A gravel road leads several meters through a bushy rolling countryside to a loading dock at a flour mill on the canal. From here several E-66 rotor blades started their journey to the Austrian Burgenland.

Saxony-Anhalt's Minister of Economic Affairs, Dr. Horst Rehberger, has already cleared the way to develop Rothensee into a modern logistics site and has handed over the official grant notification of 16.5 Million Euros for the construction of a new harbour in Magdeburg. Rehberger: "Sachsen-Anhalt's economy depends on the waterways as an important and economical means of transportation. I know that for companies such as ENERCON the location near the river and harbour is a decisive factor for the site. ENERCON, one of the principal employers in the region, sends the gigantic rotor blades for its wind turbines on their journey from Magdeburg – transporting these enormous components over land is almost impossible. A suitable loading solution which can accommodate the industry's requirements is in the works."

The "Hansehafen" which has been planned for a while should be completed in stages by 2008 for a total cost of 30 Million Euros. The site will be along 1,500 m on the west bank of Rothensee's connecting canal and thus will be exactly in the area which ENERCON is interested in to ship its components. "Of course, this isn't a coincidence," explains Karl-Heinz Ehrhardt who is the managing director of Magdeburger Hafen GmbH. "Because of ENERCON's production capacity expansion and larger and higher-powered wind turbines, there is a necessity to shift transportation from the roads to the waterways. This was a considerable stimulus, to make full strength efforts to press ahead in the development of the "Hansehafen". Ziem estimates: "Theoretically, ENERCON could send around 200 ships per year on their journey from the Hansehafen loaded with wind turbine components."

With the realisation of the Hansehafen, ENERCON will not only have access to canals and the Elbe, but also to the harbour railway and to the main rail networks, as well as the A2 and A14 highways. Dr. Klaus Puchta, Councillor for the Economy, Tourism and Regional Cooperation in Magdeburg, also sees the planned civil works as an important investment for the future: "The extension of the harbour and the construction of a waterways junction on the Elbe ensures Magdeburg's link to Europe's waterways and thus creates exceptional conditions for Magdeburg's locality."

ENERCON will be able to make use of the logistical advantages even before the Hansehafen's final completion. Karl-Heinz Ehrhardt promises: "The construction of the planned heavy cargo area and the connected trans-shipment centre to the north will be started on time and we anticipate completion in the second half of 2005." 