Germanischer Lloyd
beaufort 6
The GL Wind Newsletter for Customers and Business Partners

EDITION 2 · 2006

AGREEMENT Successful cooperation with Vestas **SPECIAL** Rope access: engineers on a thread

WindEnergy · Hamburg · 16-19 May · Hall 2 · Both 200

Dear Readers,

Energy policy in the United States of America is undergoing a process of change. Away from oil, onward to renewable energies – this is the motto which best describes the latest statements made by the President in his State of the Union address.
It is more than likely that the growing international competition for fossil fuels has prompted this change of heart. The expansion of wind energy is being encouraged by tax incentives. With great success! Over the past year, more wind turbines were set up in the USA than anywhere else in the world. The wind forecasts promise a rich harvest and the demand for load measurements, yield forecasts and periodic monitoring is mushrooming. Reason enough for GL Wind to push forward in establishing a branch office in the USA this year. May we invite you to the official opening?

Yours sincerely,

Bodo Helm
Managing Director, GL Wind

GL Wind Presentations and Events at the WindEnergy

Tuesday, 16.5.	**Wednesday, 17.5.**	**Thursday, 18.5.**	**Friday , 19.5.**
10:30–11:00 am, Hall A2, Conference Room A2.1	**11:30–12:00 am + 4:00–4:30 pm,** Hall A2, Conference Room A2.1	**10:30–11:00 am,** Hall A2, Conference Room A2.1	**10:30–11:00 am,** Hall A2, Conference Room A2.1
Mathias Steck: *"Limits of Conventional Reinforced-Concrete Foundations for Multi-Megawatt Turbines"*	Axel Dombrowski: *"Quality Assurance in the Production of Wind Energy"*	Dr.-Ing. Torsten Faber: *"The Wind Turbine Structure and Its Technical Assessment"*	Dr. Michael Hauschildt: *"Ground Fatigue at Monopile Offshore Structures"*
11:30–12:00 am + 4:00–4:30 pm, Hall A2, Conference Room A2.1	**4:00–4:30 pm,** Hall A2, Booth 200	**11:30–12:00 am + 4:00–4.30 pm,** Hall A2, Conference Room A2.1	**11:30–12:00 am,** Hall A2, Conference Room A2.1
Axel Dombrowski: *"Quality Assurance in the Production of Wind Energy"*	Dr.-Ing. Torsten Faber: *"The New Hamburg Building Regulations and the Significance of the 'Stamping Rights' for GL Wind"*	Axel Dombrowski: *"Quality Assurance in the Production of Wind Energy"*	Axel Dombrowski: *"Quality Assurance in the Production of Wind Energy"*
4:30 pm, Hall A2, Booth 200	**4:30 pm,** Hall A2, Booth 200	**2:30–3:00 pm,** Hall A2, Exhibitors' Forum	
GL Happy Hour. International meeting-place for discussions and shop talk	GL Happy Hour. International meeting-place for discussions and shop talk	Dr. Kai Freudenreich: *„The New Standard IEC 61400-1 Ed.3 Wind Turbines"*	
		4:30 pm, Hall A2, Booth 200	
		GL Happy Hour. International meeting-place for discussions and shop talk	

PHOTO: JAN OELKER

TOUGH CONDITIONS

Guide for Certification at Extreme Temperatures

More and more wind turbines are being erected at so-called "cold climate" sites. These are characterized by temperatures that drop to less than minus 20 °C on more than nine days a year.

However, wind turbines are usually designed for productive operation within a temperature range of -10 to +40 °C only. In the past few years, GL Wind has gained considerable experience with turbines in subarctic regions, most recently certifying plants at Rushlake Creek (Canada) and at Chanarambie, Viking and Stoneray (Minnesota, USA). The experience obtained with this work has resulted in a new Technical Note concerning the "Certification of Wind Turbines for Extreme Temperatures". For the customers, this useful guide points out what additional load calculations are needed for the turbines to ensure that they can face the tough climate, and to permit reliable operation even at such gruelling temperatures.

On principle, the load calculation must be adapted to the modified temperature ranges. Since the loads are primarily influenced by the change in air density, these must be adjusted to reflect the prevailing temperature and the altitude of the site. The corrected air density, then again, must be taken into account for the load calculation and when determining the power curve.

Furthermore, an increased degree of ice accretion will also affect the aerodynamics of the rotor blades and the tubular steel or lattice tower. Consequently, the guide defines the requirements applying to devices installed for the automatic detection of ice formation: the sensor must be able to detect icing or an ice-forming atmosphere at least on the level of the hub height; moreover, the sensor and its evaluation processor unit must have a suitable monitoring arrangement to report any malfunctions. The corresponding signals, such as "icing" or "interference ice sensor" must be made available to the turbine controller on a permanent basis. The turbine must be switched off when the ambient temperature falls below +5 °C and a signal such as "icing" is applied, or if the communication to the ice sensor has been interrupted. The guide defines all the additional requirements for the safety system and the protective and monitoring devices. Above all, it contains exact details on the lubricants and oils to be used at low temperatures. It must be guaranteed that the viscosity/temperature behaviour of the lubricants is considered both in determining the component loading and in relation to the system response of the turbine. GL Wind's new Technical Note 067 in German and English on the "Certification of Wind Turbines for Extreme Temperatures (here: Cold Climate)" may be ordered from:

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Cooperation with Vestas

As part of the revision of a cooperation agreement between GL Wind and the turbine manufacturer Vestas, the video endoscopy process has now been integrated into the surveys for condition-oriented maintenance. With this technology, it is for example possible to perform an inspection of the inaccessible gears and bearings inside the gearbox of a wind turbine.

Vestas is offering turbine operators a special GL Wind service package, which amongst other aspects includes vibration measurements at the drive train, lightning protection measurements, separate rotor blade surveys, damage expertises as well as subsequent surveys to meet any requirements resulting from an expert appraisal. A substantial benefit of such a cooperation agreement is that a rapid reaction is possible when inspections are carried out on turbines: the coordination and communication between experts, skylift company and the operator's team is much more effective. Minor defects can already be rectified during the inspection itself. Machinery diagnosis is performed with the aid of a database.

For the more than 130 expert appraisals conducted thus far within the scope of the cooperation of Vestas and GL Wind, all activities went smoothly. The expert appraisals covered the following services: periodic monitoring, condition-oriented maintenance, condition surveys at the end of the warranty period, and condition surveys after commissioning.

Engineers on a Thread?

It is eight o'clock in the morning on a cold and cheerless Wednesday in March. The fields and meadows around the 21 turbines belonging to Apensen wind farm, some 15 kilometres from Buxtehude, are covered by a thick layer of snow. "I was able to climb before I could even walk," says Thomas Hörster and gets ready for action.

Hörster is a rope access technician. Under the leadership of Knut Foppe, he provides supervision for a working procedure that is now being offered by Germanischer Lloyd WindEnergie GmbH (GL Wind) to its customers. The two graduate engineers Olaf Robenek and Christoph Römling have just completed the first level of basic training in rope access technology (RAT), and now they will be using it to perform the periodic monitoring of the rotor blades of a wind turbine. Hanging in the air without a safety net, their lives on a silver thread.

"Safety first," says Knut Foppe and goes through the equipment with the aid of a checklist. Eight kilograms have to be carried. Foppe will support the testing manoeuvres as the supervising high-access expert, and in this capacity will also be responsible for assessing the risk during the mission and evaluating the basic safety of the structure. There are three levels of training in rope access technology – also called "high rope access" – and only those who have passed all three courses with the corresponding practical and theoretical examinations are allowed to carry out the work at the rotor blade without a safety supervisor. Foppe rummages about in the documents, and says: "Hub height: 67 metres." Then he checks the sky: "Okay. The weather is still suitable for rope work."

Usually, rotor blades are checked by hoisting the engineers up with the aid of a telescopic platform, or "skylift". But the wind turbines are rapidly growing larger, and there are only two telescopic platforms in the whole of Germany that can serve a hub height of 100 metres. What is more, the vehicles are expensive and may only be moved to their destinations at night, and they also require a special permit – which practically makes it a heavy-lift transport operation. And when a good deal of snow has fallen, conventional skylifts also experience difficulties. This is what happened in Apensen on Monday, when a vehicle got stuck in the snow when attempting to go up a small hill. As a result, the team was not able to begin work for several hours.

PHOTOS: MICHAEL BOGOMIL, COMPOSING: SWN

"I was inspired by Christo and Jeanne-Claude"

Rope access technology is already firmly established as a flexible and efficient way of working at great heights; in recent years, these techniques have proven their worth throughout Germany, especially in forestry, tree care and the cleaning of buildings as well as for work on towers, chimneys, glass facades and industrial structures. And now also in the field of wind energy. The techniques that are applied here, as Knut Foppe explains, originate from cave exploration and mountain climbing.

He himself was initially attracted to the job through the wrapping of the Reichstag by the artists Christo and Jeanne-Claude in June 1995. At the time, Christo insisted that the work be carried out by professional "industrial climbers". This sparked off public debate about the safety – or lack thereof – and the employers' liability insurance associations posed question after question. Since 1997, there has been a professional certification body in Germany for rope-supported working techniques, FISAT, which monitors the training of rope access technicians and issues guidelines for the corresponding procedures.

A conventional telescopic platform

Knut Foppe is a mountaineer. He knows some of the four-thousand metre peaks in the Alps as well as he knows the difference between a slipknot and a figure-of-eight. The two GL engineers also have an affinity for rock climbing; the earnest engineering profession by no means excludes a love of excitement and adventure.

The wind freshens, the rotor blades start turning faster – skylifts cannot be used at high wind speeds – and Foppe resumes his briefing: "All of the equipment is ready and safe. The ropes are okay. Rescue material is at hand." A possible rescue operation must be taken into consideration by the rope access technicians from the very start. In any situation, too: although there is little to go wrong during the actual work at the

"Inspection of a rotor blade chiefly means tapping and listening"

rotor blade, it is for example possible that someone could lose consciousness after underestimating the chilling effect of the wind. The rescue unit specialized in such cases is stationed 60 kilometres away in Hamburg, too far to be of use in an emergency.

"During our training, we practised rescue drills in all possible situations," explains Olaf Robenek from GL. "The focus was not only on how you can best inspect the rotor blades when dangling from a rope, but especially also on how to rescue people." In the final phase, the GL engineers exercised under the competent supervision of rope access trainer Knut Foppe in a Hamburg factory hall at 0 °C.

And now it is time to get down to the actual work: several trips of the tower lift are needed before the team and equipment are all ready in the engine nacelle of the turbine. Then the rotor is immobilized with the aid of two locking bolts. The engineers put on the harnesses and fix their ropes to the attachment points. The system consists of a working suspension line and a back-up safety line. Suddenly, a question is to be heard: "Hey, where's my notepad?" Experienced engineers know that situations like these can be a nightmare. There you are, standing all ready for action with all your gear on, at the giddy height of 80 metres, and you suddenly find out that an indispensable spanner is still lying in the car.

But then the missing pad turns up after all. The exit hatch is opened. Robenek moves out first and disappears behind a massive rotor blade. He is followed by Römling with the working materials: a knife for tapping and scraping out cracks, the notepad and a camera. The blade length is all of 32 metres, and observers from below can see how the two men slowly get to work on the rotor blade. One engineer works on the pressure side, the other on the suction side. Their supervisor just "hangs around" in the air and keeps a watchful eye on the activities.

Inspection of a rotor blade chiefly means tapping and listening. Rotor blades are assembled by applying a special bonding technique, with shear webs on the inside holding the structure of the outer shell together. By tapping the shell, the engineers can find out whether the adhesive bonds have become detached. Normally, the blade wing sounds dull, and the large hollow spaces produce deep booming sounds. If there is a small void at the bonds between the spar and shear webs, a higher-pitched tone may be heard.

Almost an hour is needed by the engineers to tap their way to the blade tip. In the nick of time, because the sky over Apensen has darkened suddenly. Snow starts falling. Skilfully and speedily, the GL surveyors abseil down to the ground. They have passed their first "baptism of fire" in rope access technology. Out at sea, where it is simply not possible to use a telescopic platform, this technique is the only possible way of examining the condition of rotor blades.

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"Now We are Industrial Climbers!"

A new era has dawned, not only for GL Wind – on a rope. Reason enough for beaufort 6 to speak to the two new rope access technicians about their exciting work.

Christoph Römling
Study of Future Energies (on the basis of Mechanical Engineering) at the Georg Agricola University of Applied Science in Bochum; graduate thesis on vibration measurements at WINDTEST. Surveyor at GL Wind since 1.12.2005.

Olaf Robenek
Training as motor mechanic, followed by one and a half years as journeyman; study of Mechanical Engineering at Lübeck University of Applied Sciences. Surveyor at GL Wind.

When you tap on rotor blades at a height of 80 metres while hanging from a rope, what happens to your adrenalin level?
Robenek: During the rope training, I certainly had a lot of adrenalin pumping around. We did a whole series of dry runs beforehand, initially at a height of four metres. But when we actually stepped out over the hub into the open air during our first mission in Apensen, our nerves soon settled down. I wouldn't go so far as to say that it's already all a matter of routine, but it certainly is astounding how fast you can get accustomed to new situations.

How did an engineer come to such a sporting branch of work?
Römling: Well, I already enjoy rock-climbing, so handling ropes is not really anything new for me. Besides, I have already completed many climbing exercises as part of my leisure-time education activities with children. Heights of 80 or 100 metres simply represent a new challenge for me.

So the two of you were actually looking for new challenges?
Robenek: Yes, of course. After all, we are really industrial climbers. The novelty of wearing two hats – that is, being a "surveyor in field service" with the prospect of offshore assignments, and meeting the demands of Germanischer Lloyd and its customers – is a unique combination.

And the good feeling you have with your work also comes about through the stringent safety philosophy of GL Wind?
Römling: Yes, we are supported by both a suspension rope and a safety rope. You can also speak of redundancy in this connection – all safety systems are designed to be twofold and independent of each other. During our rope training, we also practised rescuing each other from a variety of sticky situations.

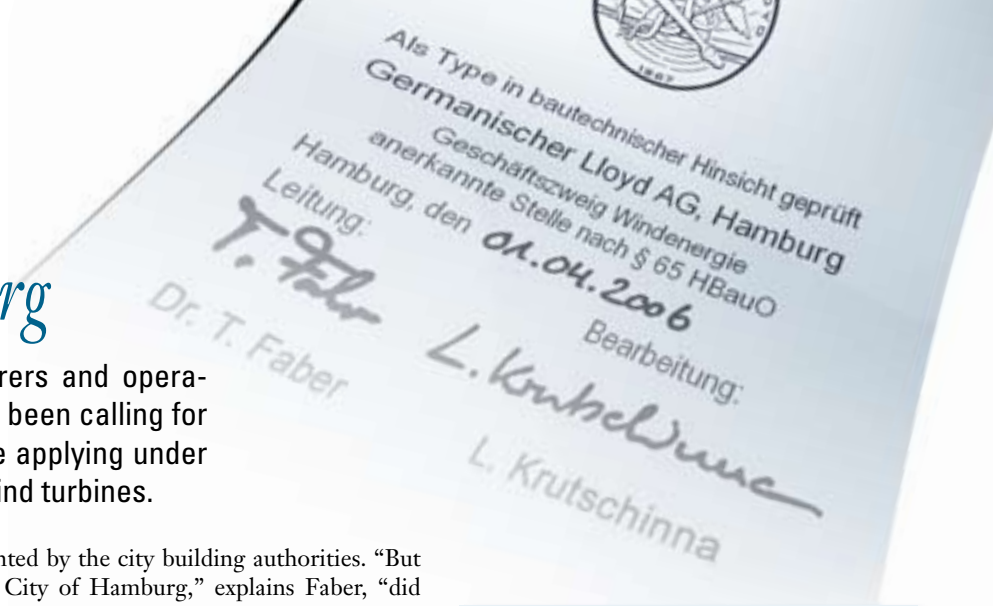
But, for the time being, there is still a supervisor on hand – or rather, on the line – when you work?
Robenek: That's just a temporary measure; our objective is to be able to do the work entirely on our own, as a two-man team. For this, we need a total of 300 rope hours. I believe we will be able to achieve that goal within a year.

Up to what wind speeds can you work on the rotor blade?
Robenek: In principle, for as long as you can hold yourself against the structure. Thus far, we have been able to work at wind speeds of up to 15 m/s without any difficulty. That would be wind force 7. For comparison: a telescopic platform can only work reliably and without any limitations up to wind force 5. Our experience in Apensen was that we were still able to work comfortably on the rope after the safety systems of the skylift had already issued an alarm – the boom of the telescopic platform was swaying too strongly in the wind.

You have to tap on the rotor while you are hanging from the rope for a whole hour, and you also have to listen carefully for any change in the sound. Isn't that very strenuous?
Römling: That too is a matter of routine. Whether there is a cavity or not, you can hear from the tapping very well whether there are any defects, even at strong winds. We are also considering the possibility of using thermography, i.e. an infrared camera, to check the condition of the rotor blades. Working on a permanent basis with such a camera is a definite project for the future.

TYPE APPROVAL

Streamlining the Bureaucracy in Hamburg



For a long time now, turbine manufacturers and operators, both national and international, have been calling for a simplification of the approval procedure applying under German building law for the erection of wind turbines.

The new Hamburg Building Regulations came into effect on 1 April 2006. This represents a decisive liberalization of the German wind energy market. At long last, the responsibility for the construction of a turbine now lies entirely in competent hands: Germanischer Lloyd WindEnergie GmbH has been authorized to issue such type approvals throughout Germany. These type approvals are an essential prerequisite for obtaining a building permit to erect a wind turbine. An additional examination by the Building Regulations Authority in Hamburg is now no longer necessary. The new ordinance achieves a reduction in bureaucracy, which in turn will lead to substantial cost savings for the turbine manufacturers. What is more, this simplification will bring about a considerable acceleration of the approval process.

"We fought for this simplification for a long time, and now our efforts have been rewarded," is how GL engineer Torsten Faber welcomed the new dispensation. The background: like all buildings, wind turbines also need a building permit, to be issued by a local building authority of the corresponding federal state. Since the wind turbines are series-manufactured products, their statics are examined within the scope of a type approval. Until now in Hamburg, this could only be granted by the city building authorities. "But the City of Hamburg," explains Faber, "did not have the comprehensive know-how that is necessary, and so GL Wind was always commissioned to actually conduct the type testing. Following successful testing, the City then gave the turbine its stamp of approval. Over the years, we have demonstrated our competence to the authorities, and so GL will in future itself be able to issue the stamp."

"The new Hamburg Building Regulations represent an appreciable simplification in the approval procedure for new types of wind turbines," is the comment from Aloys Wobben, Managing Partner of Enercon GmbH, on the trailblazing decision taken by the Senate of Hamburg. Type approvals in Hamburg will be processed much more simply and rapidly, with a simultaneous reduction in costs.

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Lidar on the Research Platform FINO 1

Since March of this year, a lidar („**li**ght **d**etection **a**nd **r**anging") measurement system has been undergoing trials at sea for the first time ever – namely on the FINO 1 platform in the North Sea, 45 km north of Borkum.

The measurement campaign is being conducted by WINDTEST Kaiser-Wilhelm-Koog GmbH, a 70-percent GL Wind subsidiary. The fundamental principle of lidar is comparable to that of radar ("**r**adio **d**etection **a**nd **r**anging") and sodar ("**s**ound **d**etection **a**nd **r**anging") and is used for contactless determination of the three-dimensional wind field.

The system, of the type ZephIR made by the British manufacturer QinetiQ, is based on a laser beam which is focused at various heights to measure the wind speed with the aid of the Doppler effect and small airborne particles called aerosols. The unit can generate wind profiles up to a height of 150 metres. On FINO 1, the aim is to demonstrate its performance capabilities as a wind profiler in comparison to the conventional cup anemometers, which are mounted on the 100-metre measurement mast. Preliminary tests on land were passed by the lidar device with very promising results.

Now the tests will concentrate on finding out whether the lidar is able to replace a complex and costly offshore wind measurement mast. This question is to be answered conclusively in August 2006.

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Successful Clipper Projects

Amir S. Mikhail (centre), Vice President of Engineering Clipper Windpower, came to Hamburg on 7 March 2006 to receive the certificates "Statements of Compliance for the Design Assessment" in respect of the wind turbine Clipper C-96 2.5MW (IEC Class IIB) und Clipper C-93 2.5MW (IEC Class IIA). Together with GL Wind Managing Director Christian Nath (right) and Project Manager Axel Dombrowski (left), Mikhail was optimistic that, thanks to the Clipper projects now coming up to speed, the entire wind energy market in the USA would continue to boom. With a total new installed output of 2,431 megawatts in 2005, the USA had the highest commissioning rate for turbines worldwide.

FINO 3 - NEPTUN

With funding by the Federal Government and the State of Schleswig-Holstein, yet another research platform, to be called "FINO 3 – NEPTUN", will be constructed in the North Sea some 80 kilometres west of the island of Sylt early in 2007; amongst other activities, meteorological measurements will be performed at heights of up to 100 m on a meteorological mast. Water depths of about 25 m, a design wave of 20 m and a mean tidal current of approx. two knots must be expected at the site.

The meteorological examinations will be conducted in coordination with the measurements already under way at the research platform FINO 1, north of Borkum. Besides the standard meteorological measurements, the plans are to carry out examinations on high-frequency turbulence of the wind, on lightning strikes (using receptors on the measurement mast), on bird migration, on marine currents and waves, on the propagation of underwater sounds from the installation, on the development of the flora and fauna near the platform, and on the soil mechanics at the monopile and in its vicinity.

WINDTEST Kaiser-Wilhelm-Koog GmbH will plan and design the meteorological measurements, and also ensure smooth operation during the entire course of the project. Furthermore, the data collected will regularly be evaluated, backed up, and stored in structured databases for efficient access.

Business Profile for GL Wind

The services offered by GL Wind comprise the comprehensive certification of wind turbines, including prototype tests, site assessment, and technical witnessing of production up to commissioning. Regular quality assurance measures, repowering and the possible dismantling of wind turbines also belong to the performance spectrum of GL Wind. The corporate mission is to achieve safe design, technology and construction through the meticulous inspection and certification of wind turbines. GL Wind is the leading certification body for wind energy. Its worldwide market share currently exceeds 50 percent. The "Guideline for the Certification of Wind Turbines" published by GL Wind is now recognized as an international standard.

In addition to the constant growth of experience in the technical surveillance of wind turbines, the company is also engaged in research into the possibilities of optimizing wind turbine operation.

Dates

MAY

15-16.05.2006, Hamburg

Project Certification of Wind Farms Seminar
This seminar explores all aspects of project certification, both onshore and offshore.

JUNE

4-9.06.2006, Hamburg

International Conference on Offshore Mechanics and Arctic Engineering (OMAE 2006)
Marcus Klose will speak on the „Interaction Of Load Analysis And Structural Design Of Offshore Wind Turbines". www.asmeconferences.org/OMAE06

13-14.06.2006, London

Offshore Wind Power Seminar
Joint event by Garrad Hassan and GL Wind.

28.06.2006, Bremerhaven

Offshore Wind Farm Design and Project Certification

AUGUST

20-25.08.2006, Southampton

16th International Ship and Offshore Structures Congress (ISSC 2006)
www.issc.ac

SEPTEMBER

12-13.09.2006, Hamburg

5th Offshore Wind Energy Conference of GL Wind and www.windmesse.de

"Offshore Wind Power Seminar"

On 13 and 14 June 2006, the leading wind-energy consultancy Garrad Hassan and GL Wind will convene a joint seminar in London. For operators of wind turbines, project developers, financiers, engineering offices and turbine manufacturers, this seminar offers a comprehensive overview of the planning and design of offshore wind turbines. Funding possibilities and the technical aspects of load calculations will also be covered.

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