HUSUM DAILY

in association with HUSUM Wind
produced by WINDTECH

Tuesday 15 september 2015

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Welcome to HUSUM Wind 2015

The meeting place and shop window of the wind industry for over 25 years

For the last 25 years HUSUM Wind has been the leading biennial trade fair for the wind industry. HUSUM is now increasingly focused on the core market of Germany and its neighbouring countries. As the showcase for innovative wind technology and solutions, we invite manufacturers and suppliers, operators, project developers and service providers, utility companies, municipalities and investors from all parts of the world to join us again in 2015 to learn about energy transition and wind power in action – with a special practical and market orientation – in an environment full of pioneering spirit and innovative power. Being close to the heart of the market makes us special, and this is also what makes visitors and exhibitors so enthusiastic about HUSUM Wind.

Congress

The HUSUM Wind Congress, which runs parallel to the fair, has long been the forum for presenting new technology and discussing the new challenges facing the industry, and 2015 will be no exception. The more hands-on experience we have, the more we can talk hard facts, discuss experiences and suggest solutions. This is where old hands and newcomers alike can learn from one another, and develop their visionary ideas for the future. On page three you can find today's programme.

Socialising

Some HUSUM Wind exhibitors invite their business partners, customers and visitors to a reception or a few drinks at their stand at HUSUM Wind – this has become something of a tradition at the wind trade fair in Husum. If you are invited to an exhibitor's reception, use the opportunity to round off the day with partners, exhibitors and other visitors in an informal atmosphere. To visit a stand party you just need a valid exhibitor or visitor pass for the day in question.

HUSUM Daily

This is the first edition of HUSUM Daily, which is a cooperation between Messe Husum and Windtech International. In total four issues will be produced and handed out to all visitors and exhibitors. This enables us to keep you updated about the latest developments and hottest news during this year's event.

If you have editorial material you want considered for publication, please make sure that we have it by 13:00 each day. The editorial team is located in the congress centre, at the first level in the backstage area. Enjoy reading the HUSUM Daily and we wish you all a successful show.

Out-of-exhibition events

Town Hall Reception, 15 September 2015

The Town Hall Reception is traditionally the festive start to the after-hours activities. Hosted jointly by the mayor and the corporation of Husum and the Schleswig-Holstein state government, the convivial atmosphere in the harbour-side town hall reflects the spirit of optimism felt by exhibitors from all over the world.

Windwanderer Festival, 15 September 2015

Once you have passed the midway point of this traditional wind trade fair, you can enjoy a festival that has become a firm favourite with everyone. Enjoy the various Windwanderer venues dotted around Husum's picturesque harbour. Different bands and artists offer a variety of musical styles at different locations, so you can stay listening to your favourite music in one place, or wander from venue to venue and enjoy it all.

HUSUM Wind Excursions, 16 and 17 September 2015

Schleswig-Holstein is wind pioneer country, especially on the west coast, where Europe's first wind farms were built in the 1990s. In the following decades the use of wind energy played an increasingly important role in the region's economy. Today there are over 2,000 Schleswig-Holstein-based businesses operating worldwide, from development and planning to manufacturing, installation and operation of wind turbines.

At HUSUM Wind 2015 the trade fair host, in cooperation with the windcomm schleswig-holstein network agency, is arranging excursions in and around Husum so that you can get to know these innovative enterprises and see the latest technical developments in the wind industry up close. There are two excursions in English on 16 and 17 September, each from 09:30 to 13:00. The topics are as follows:

- Excursion I (in English): Production and Innovations (Senvion/ Windtestfeld Nord)
- Excursion II (in English): Citizens' Energy and Energy Storage (GP Joule)

The number of participants is limited to 45 persons per excursion. Booking is only possible via the HUSUM Wind Online Shop (https://windshop.messe-husum.com/).

Windcareer, 18 September 2015

The Windcareer job fair on the last day of HUSUM Wind 2015 (Friday 18 September) is dedicated to careers, training and retraining in the wind industry. Personnel managers from enterprises such as Enercon, Deutsche Windtechnik AG, UKA, Ferchau and Nordex will be appearing as employers and trainers in the main auditorium of the congress centre from 10:00 to 18:00, where they will also be available for discussions. Training, retraining and advanced training establishments such as the Oldenburger ForWindAcademy will be providing information about their seminars and courses. Also, together with them the fair will be holding a workshop with well-known speakers like Florian Rathkamp (Enercon) and Moses Kärn (ForWind).

Visitors to Windcareer not only profit from a comprehensive overview of potential employers, job vacancies and a wide variety of training opportunities, but can also take part in various workshops and have their job application folder and CV checked by Federal Employment Agency (Budesagentur für Arbeit) staff.

Congress programme Tuesday 15 September 2015

Time	Auditorium	Room 6	Room 2	Room 1	Room 3	Room 4	Room 5
09:00–10:30	09:45 DE **Eröffnung HUSUM Wind 2015** (nur geladene Gäste) **Opening** HUSUM Wind 2015 (by special invitation only)			**Geschlossene Veranstaltung** Closed Event			
10:30–12:15		11:00 **Pressekonferenz Eröffnung** Opening Press conference	**Geschlossene Veranstaltung** Closed Event				
13:30–14:15	D1 GB **WWEA – World Wind Energy Association** Internationale Trends der Bürgerenergiewende – Die künftige Rolle von KMUs und Energiegenossenschaften International Dialogue, Trends in Community Power – the Future Role of SMEs and Energy Cooperatives						
14:30–15:15					D3 DE **EMD Deutschland GbR** Zeitreihenbasierte Ertragsprognose mit windPRO 3.0(geschlossene Veranstaltung, Info am Messestand Halle 4 A11) Expected success rate based on time series with windPRO 3.0(closed event, please ask for further information at stand 4A11)	D4 DE **GE Wind Energy GmbH** Die neuen leistungseffizienten Anlagen und Serviceangebote von GE Wind für den deutschen Markt GE's new performance – optimized systems and services for the German market	
15:30–16:15		D2 GB **CEZ a.s.** Herausforderungen ausgelöst durch die Einführung von Auktionen mit dem Schwerpunkt auf „Polnische Erfahrung" Challenges introduced by auction schemes, with a focus on the Polish experience			**Geschlossene Veranstaltung** Closed Event		D5 DE Beginn: 16:00 Uhr **Pressekonferenz VDMA** Press conference VDMA Presseclub VDMA Power Systems: CEOs zur Lage der Windindustrie in Deutschland VDMA Power Systems Press Club: CEOs on the state of the wind industry in Germany
16:30–18:15							

International dialogue

Trends in community power – The future role of SMEs and energy cooperatives

Organised by the World Wind Energy Association, Tuesday 15 September, 13.30 - 18.15, Auditorium

This symposium will explore the status and new developments in community power in Germany, Europe and worldwide. An international distinguished group of panellists will describe the challenges that small and medium-sized enterprises (SMEs) and community-based investors like energy cooperatives are facing today. Together with the audience, the panellists will discuss the role such investors will play in the changing business landscape.

A special focus will be on policies that are required to support the switch to a more decentralised energy supply structure. One guiding question will be: Which policies do community wind projects need to further succeed?

Beyond this, options and prospects of a 100% renewable energy supply will also be presented. Another question to be considered is: Which existing and new business models will allow communities to harvest locally renewable energy?

Panellists:

- Stefan Gsänger, World Wind Energy Association (WWEA)
- N.N. Bundesverband WindEnergie/German Wind Energy Association (BWE)
- Dirk Vansintjan, REScoop, Belgium (to be confirmed)
- Christine Koenig, Ontario Sustainable Energy Association (OSEA), Canada
- Shota Furuya, Institute for Sustainable Energy Policies (ISEP), Japan
- Morten V. Petersen, Danish Small Wind Association
- Anna Leidreiter, Global100%RE campaign go100re.net/World Future Council
- Tobias Natt, WWEA Legal Working Group
- Volker Thomsen, WWEA
- Brett Pingree, Endurance Wind Power, United Kingdom
- Ruth Brand-Schock, Enercon GmbH, Germany (to be confirmed)
- Henning Zint, FWT energy GmbH, Germany
- Henning Holst, ARGE Netz/Ingenieurbuero Henning Holst, Germany
- Tanay Sıdkı Uyar, Marmara University Istanbul Turkey & WWEA, Turkey
- Kevin Hayward, Clean Energy Sourcing AG, Germany

Capacitance for wind turbines

Capacitors can help wind turbines improve grid reliability and efficiency while reducing maintenance. In the last five years or so, wind turbines have started to incorporate what is called blade-pitch control. This allows wind turbine operators to maximise the angle to the wind (or pitch) for each individual blade, so they get the most spin out of each turbine, and it also allows them to pitch the blades out of the wind if there is an emergency – such as a high-wind event – to keep the blades from spinning too fast.

For reliable and safe operation, turbine manufacturers use either hydraulic or electrical-based pitch control systems. In recent years there has been a trend towards electrical pitch control systems because of environmental and maintenance concerns. To ensure reliable and safe operation of the electrical pitch control systems, capacitors are used to provide the necessary boost power or back-up power, in the event of a power loss, to orient the rotor blades in a fail-safe position. To do this, manufacturers originally used hydraulics, and then they went to batteries, but they are quickly moving towards ultracapacitors because of the short life cycle of batteries. About 75% of electrical pitch systems now use capacitors.

For wind turbines, capacitors can also smooth the output of the wind generator. The smoother the energy output is, the more you can charge for your energy. A capacitor is a short-term uninterruptible power supply for several seconds, not hours or minutes. If there is a slight change in wind speed, the capacitor can provide energy to hold up the output, leading to a smooth transition. If there is an overcharge, the capacitor accepts that energy.

At HUSUM Wind 2015 capacitor specialist FTCAP (Booth 4C02) is presenting a series of solutions for wind turbines. An example is an innovative capacitor module. Users obtain a module that is ready for installation. FTCAP designs and manufactures capacitor modules according to customer specifications.

FTCAP also participates actively in research on new capacitors specially designed for wind energy applications – for example, in the context of the innovation cluster power electronics for renewable energy supply.

FTCAP has expertise in a range of high-performance capacitors for inverters. An example is the high temperature dielectric PEN-HV, which can handle temperatures up to 125°C. On 16 September at 16:10 in the foyer of the Congress Centre, Dirk Hermann, Head of Sales at FTCAP, will give a presentation on ‘Elko versus Fiko: Innovations in capacitors’

Frits Ogg

Artist Gisela Meyer-Hahn lights up Windmills

Anyone crossing from the A23 to the B5 – or vice versa – will literally see the light. At the Heide-Süd turn-off, the five vibrantly illuminated windmills up to 150 metres in height herald a special event: HUSUM Wind 2015.

The artist responsible for both the idea and execution of the project 'Colourful Light – Energy Giants in the Wind' is Gisela Meyer-Hahn. The project will be visible throughout HUSUM Wind from 20:00 to 24:00 each day. Meyer-Hahn's subject is the effect that colours and lights have on our sensory perception. She transforms rooms, buildings, landscapes and objects with textiles, colour and light. 'Wind turbines have significantly changed our landscape in recent years', says the artist. 'Although I am fundamentally a fan of wind energy, at night I find them a bit spooky. Thus, I am using light in order to change the way we perceive wind turbines', explains the 63-year-old native of Hesse, now resident in Pinneberg. The project is supported by wind turbine operators The Windmillers (Die Windmüller), Karl-Albert Brandt, Peter Looft and Wilhelm Borcherding, who were enthusiastic about the project from the very beginning.

The light show is made up of eight colour and light compositions, which Meyer-Hahn has written for the same number of spotlights. These have in turn been gathered together in groups for the numerous projections, each programmed to run for five hours. 'I can choose between them on a nightly basis, depending on the weather.' Surprisingly, bad weather is not necessarily bad for the light show, quite the opposite is the case: 'The light show is particularly impressive in rain or fog', explains the graduate designer with a fascination for natural phenomena and the interaction between them. The eight borrowed one-of-a-kind spotlights, each equipped with 1,248 LEDs and only requiring 300 watts, can shine at various angles (between 8 and 63 degrees) and because of that follow the conical shape of the towers. Colours and sequences are designed to correspond to the conditions and characteristics of the region, alternating between pastel and intensive tones.

Meyer-Hahn has been working as a freelance light artist for 30 years, and has had her studio, Atelier Frabton, in Pinneberg since 1988. She has won several design prizes, and her development of an unusual form of stained glass (silk between two panes of laminated glass) earned a nomination for the German Design Prize in 2008. In 2010, the artist was awarded the first City of Pinneberg Bürgerzukunftspreis (Citizens Future Prize). She herself had designed the sculpture to be given to the winner, naturally not for a moment even dreaming that it was she who would later be presented with the award.

Gisela Meyer-Hahn

Meyer-Hahn's next big light composition will take place on 15 November in the Schleswig Cathedral. It is being staged along with a performance of Joseph Haydn's oratorio The Creation with the Schleswig Cathedral Choir and the Bremen Chamber Sinfonia, starting at 19:00.

Find detailed information about the artist and her projects *at http://www.meyer-hahn.de/.*

Find information about The Windmillers here: *http://www.windmüller-dithmarschen.de/Die-Windmueller.*

Nele Rissmann

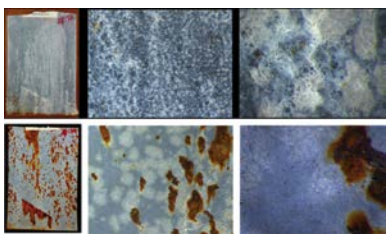
News

Win training worth €1,110

The Met Office is offering one lucky person the chance to win a two-day scheduled training course, 'Introduction to meteorology for wind energy professionals'. Worth €1,110, the course aims to help professionals in the wind energy industry better understand and interpret meteorological information. In turn this helps them with decision-making, and optimising operations and site safety. Modules covered include weather regimes and fronts, weather hazards, general wind effects, localised wind effects, sea state and Met Office forecasts. For a chance to win, simply visit the Met Office stand and submit your details.
Booth 5A14

Hempel introduces AvantGuard primers

The new anti-corrosive zinc primers HEMPADUR AvantGuard is based on patented AvantGuard technology. The technology uses a combination of zinc, hollow glass spheres and a proprietary zinc activator to activate more zinc in the coating, ensuring a higher galvanic effect than zinc primers without the AvantGuard. The technology also enables barrier and inhibitor protection, and so combines three protective effects in one: barrier, inhibition and galvanic. Furthermore, the formulation improves the coating's mechanical strength, which is essential for applications with, for example, extreme temperature and humidity fluctuations.
Booth 1A14



Top: Zinc epoxy with AvantGuard technology. Below: Zinc epoxy without AvantGuard technology

juwi brings wind power to new regions

juwi group is expanding its wind energy footprint in Germany. In 2014 the project developer installed 91 wind turbines with a total capacity of more than 250MW. With a strong home market in the southwest of Germany, juwi is now increasing its footprint in south and east Germany (e.g. Thuringia and Saxony).
Booth 2B15

heightec launches new specialist height safety equipment

heightec has launched a range of new products for work at height and rescue in the renewables industry. These include:

- Duon – The only industrial helmet that offers full compliance with two European helmet standards.
- Rotor – An automatic rescue and evacuation descender with a 10+ year lifespan.
- FastClip – A dedicated vessel transfer connector with a stainless or alloy version.

Duon Air Height Safety Helmet

- Nexus Offshore Lifejacket Harness – A SOLAS lifejacket fitted with a two-point harness.
- Lifting and Lowering Kits – Complete systems for lifting and lowering.

Booth 3J56

Hamburg network presents itself at HUSUM Wind 2015

The network Renewable Energy Hamburg at HUSUM Wind 2015 will showcase five sub-exhibitors and three logo partners. They are: Fraunhofer ISIT, Görg Rechtsanwälte, Kaiserwetter Asset Management GmbH, Osborne Clarke and SGS Germany, and Adios Patent GmbH, cms@wind and windsourcing.com. The side event 'German Onshore Wind – perspectives for investments in the leading EU market' looks set to be a highlight of the programme. Target groups are international investors, project developers, and legal and financial experts who want to inform themselves about the market perspectives in the field of onshore wind energy in Germany.
Booth 3B14

Brüel & Kjær Vibro now offers CMS as a service

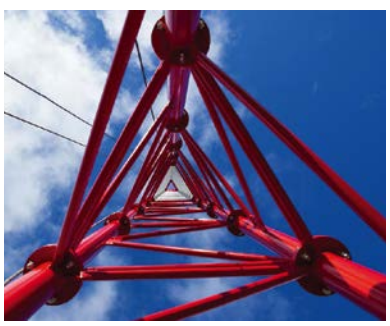
Brüel & Kjær Vibro (B&K Vibro) offers a condition monitoring solution (CMS) supported by a leasing programme. No capital investment or significant client CMS expertise is required. Included are fault detection, diagnosis and service recommendations. The monitoring of the wind turbines is provided by B&K Vibro's certified vibration specialists.
Booth 4D01

Mita-Teknik launches new GL-certified condition monitoring system

Mita-Teknik continues its development of solutions for the wind industry by introducing the latest in condition monitoring – MiCMS. MiCMS Condition Monitoring is designed to effectively optimise the overall output of the wind turbine, and features the latest in predictive maintenance strategy. MiCMS Condition Monitoring is GL certified by DNV for both stand-alone and integrated versions.
Booth 1A04

windhunter introduces new products and services

At HUSUM 2015 windhunter is introducing a brand new self-supported wind measuring tower for cramped sites (e.g. on a narrow mountain ridge, in forests, offshore platforms, or where space for construction is limited). The company also offers a building permission service for customers who need bankable wind data with low uncertainties but do not want to bother about building permissions in Germany. During the event, the company will also be showing a dedicated bat mast for measuring bat sounds.
Booth 1E19



The windhunter IEC 61400-standard met mast

Weidmüller shows its solutions for wind turbines

At this year's HUSUM Wind Weidmüller presents its solutions for wind turbines. The shown solutions include a communication-capable current measuring transducer, the lighting and installation system 'FieldPower Wind Energy', and automation and monitoring solutions for rotor blades.
Booth 5B09

DEWE-638-PNA for mobile wind power monitoring

DEWE-638-PNA is one of Dewetron´s smallest measurement devices for several mobile wind power monitoring applications. With the small size and light weight of 2.5kg the instrument is very handy to use. To control the instrument, it can be connected to a LAN via TCP/IP or using an UMTS modem. The setting and the report generation is done by using any internet browser the customer is familiar with. DEWE-638-PNA provides an online reporting tool to generate reports according to IEC61400 and EN50160 standards.
Booth 1A13

VIKING life-saving equipment

VIKING's Offshore Safety Agreements can simplify safety equipment logistics at over 80 per cent of offshore sites, including wind turbine installations. Safety equipment servicing can often involve multiple brands, fluctuating costs and complex administration. VIKING Offshore Safety Agreements are transparent and predictable, and cover multi-brand, multi-type safety equipment servicing.
Booth 2D30

Excursions, and information about investment

On September 16 and 17, leaving at 09:30 from the main entrance of the fair, windcomm is offering excursions to interesting wind

energy companies around Husum. The schedules include the Senvion production site at Husum harbour, a test field for wind energy plant prototypes and information about community-owned wind farms and power-to-gas storage technologies. Information about entry to the German market will be provided on Wednesday 16 September at the event 'German Onshore Wind – Perspectives for investments in the leading EU market' in the Auditorium of the Husum Congress Centre.
Booth 3A07

Gamesa at HUSUM Wind 2015

At its booth Gamesa will offer a first-hand view of its latest developments, which include the 5.0MW platform, its technological solutions for regions with icy conditions and the company's new generation of SCADA, Gamesa WindNet PRO.
Booth 3B12

PNE Wind's Chransdorf YieldCo project fully commissioned

Almost ten months after the start of construction, the commissioning work on the 24th and last wind turbine of the Chransdorf wind farm in Brandenburg, Germany was finalised. The wind farm with a nominal capacity of 57.6MW will supply electricity to about 57,000 households. In addition, the entire wind farm is now incorporated into the YieldCo established by PNE and, as the largest individual project in the company's history, it is an essential part of the YieldCo portfolio, which is expected to achieve a volume of about 150MW by the end of 2016.
Booth 5B06

Danwind launches Amsoil synthetic gear oil in Europe

At HUSUM Wind 2015 Danwind Spare Parts will present gear oil from the American producer Amsoil Inc. Danwind has been appointed exclusive distributor in Europe.
Booth 3B18E

Viking Rubber shows extreme access climbing suit

Viking rubber shows an extreme access climbing suit for people looking for high comfort when climbing. It prevents pressure marks when wearing fall protection. The optimal fit, with a tight cut, is designed for extreme weather conditions. The suit can be used as a two-piece or zipped together as a coverall.
Booth 2C01

Extreme access climping suit

AFSR launches BobTail

Alcoa Fastening Systems & Rings (AFSR) has launched the BobTail lockbolt fastener. Designed to overcome inherent weaknesses with standard lockbolts, the BobTail has no pin-tail and as a result of this zero pin-break, no waste material to collect and dispose of or potential corrosion issues post-installation. The lightweight, low-noise, low-maintenance tooling, which can be used for both installing and removing fasteners, provides a smooth, shock-free, speedy installation sequence.
Booth 1E30

New monitoring system from Gram & Juhl

M-System Mi, a new monitoring system from Gram & Juhl, measures wind turbine vibrations using accelerometers. The system warns technicians when vibrations are abnormal, making it possible to cut costs on maintenance because wear on spare parts is discovered early on. Gram & Juhl has designed the M-System Mi for retrofit projects, and sells it as part of the company's bundled TCM Retrofit & Monitoring service.
Booth 3B18D

Winergy presents new options for the maintenance and service of gearboxes

Up to now, if the bearing of the planet carrier in a gearbox was to be replaced or serviced it was always necessary to remove the gearbox from the turbine. Winergy has now developed a procedure in which the bearing of the planet carrier can be replaced without having to remove the gearbox from the nacelle. With the aid of specially designed fixtures it is possible to move the gearbox in the nacelle and, thus, the bearing can be removed. This procedure has been successfully tested on a gearbox on a customer's turbine and others are to follow. At HUSUM Wind, Winergy will present the new feature in a 3D animation. There will also be demonstrations on a gearbox exhibited on the Winergy stand of how to replace the intermediate shaft of the cylindrical gear stage on a turbine.
Booth 2C10

Leine Linde Systems shows IPMS 2.0

According to Leine Linde Systems, the preventive ice detection IPMS recognises frost and ice formation earlier than conventional ice sensors. As a rule, normal ice sensors detect ice only if it has already formed. In the built-in IPMS Live Video transmission, the current icing status of wind turbine blades, the local weather conditions and the environment are shown to the operator or other persons by a live stream.
Booth 4D04

The IPMS 2.0

HUSUM Daily 2015

During the four days Windtech International will publish the HUSUM Daily. The HUSUM Daily will be prepared and edited by a team from Windtech International in cooperation with staff from HUSUM Wind. Each day we will work on the issue to be published the following morning. If you have editorial material you want considered for publication please make sure that we have it before 1 pm each day.

Feel free to contact us at advertisinghusum@windtech-international.com for advertising

and editorialhusum@windtech-international.com for editorial contributions.

or by phone +31 6 51209053

Publishing Company
Siteur Publications
Publisher: Floris Siteur
Layout Editor: Jolanda Hooiveld
Editorial Assistant: Carolina Randado
Contributing Editor: Philp Totaro
Contributing Editor: Frits Ogg
Sub-editor : Karin Fancett

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Postal address:
Siteur Publications
Dr C Hofstede de Grootkade 28
9718 KB Groningen
The Netherlands
info@windtech-international.com
www.windtech-international.com

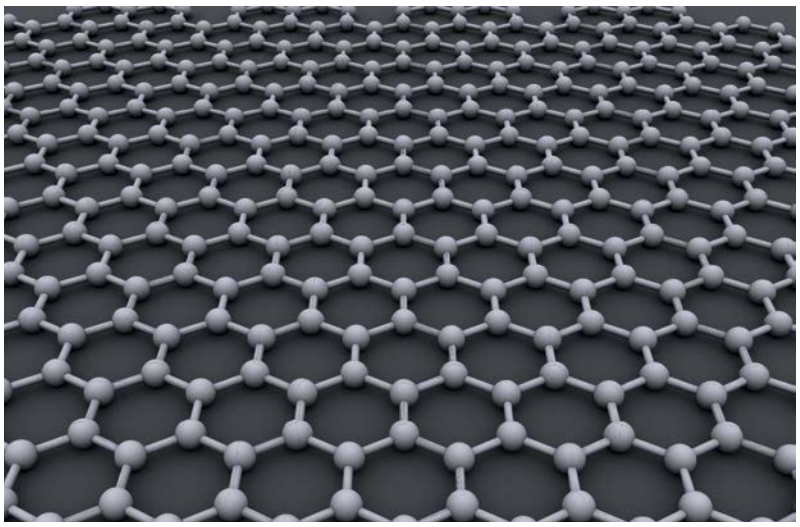
The future of technology – Materials

As the renewables industry contemplates the future of technology, we contend, as we have in the past, that materials science will have the greatest impact on forthcoming cost reductions. With significant investments being made in R&D, we see a few classes of materials which deserve special attention, and potentially some additional investment.

Power Conversion Efficiency

While most renewable energy systems operate at over 90% power conversion efficiency, there is still room for improvement. Synthetic materials look poised to make a dramatic impact.

Graphene and germanene are two emerging synthetic materials that could improve system-level electrical conversion efficiency by 5–7% while reducing mass of the generation and electrical systems.



Graphene (source AlexanderAlUS)

According to the University of Manchester, which first uncovered graphene in 2004, 'It is ultra-light, yet immensely tough. It is 200 times stronger than steel, but is incredibly flexible. It is fire resistant yet retains heat. It is a superb conductor, but not even helium can pass through it.' Similarly, germanene, which was developed in 2014 by a team of European researchers, can be used in a transistor that would remain at room temperature but increase output due to the power density of the material. This would mitigate the need for expensive and bulky cooling systems on electrical converters and generators/motors and potentially improve durability by up to 50% for certain electrical system components.

The processing technology for development and mass production of synthetic materials has significantly improved lately, but wide-scale commercial use of power electronics or energy storage products comprised of these wonder materials is still several years off.

In the interim, silicon carbide (SiC)-based transistors are actively being investigated for use in converters, and are already commercialised for some solar applications. SiC-based insulated-gate bipolar transistors (IGBTs) offer much higher performance at the same temperature levels as conventional IGBTs. Nevertheless, scaling of the supply of SiC-based IGBTs will be necessary to achieve a cost/benefit parity.

Structural Enhancement

Nanoparticles, essentially arrangements of carbon atoms in various configurations, have a multitude of applications from structural enhancement to energy efficiency. They are also currently being explored for their properties related to ice-phobic or erosion protection coatings, their addition to lubricant additives and as resurfacing agents. While the production of these nanoparticles has become more cost-effective, the manufacturing process to apply them to surfaces consistently and uniformly still requires more development.

Metal–composite hybrid materials which combine lighter weight composites with the durability of aluminium, zinc, copper or steel can enable the manufacture of structural components with slightly more mass than carbon fibre but at significantly lower cost. Look for these to show up in wind turbine blades in the near future.

We're still a way off from 3D-printed 80m-long wind turbine blades, but expect to see more on this in a few years as sub-components manufactured with this technique are presently under evaluation.

All told, the materials revolution for renewables is set to have a profound impact. A keen eye will spot investment opportunities which will cultivate the next generation of commercially viable and cost-competitive renewables.

Philip Totaro, Founder & CEO, Totaro & Associates