

Windpower Monthly の年末特集 Turbine of the Year 表彰

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Turbines of the year 2018: OEMs look to escape the tender trap

<https://www.windpowermonthly.com/article/1521586/turbines-year-2018-oems-look-escape-tender-trap>

・陸用風車(3MW未満)、陸用風車(3MW以上)、洋上風車、主軸系、ブレード、革新技術の6部門。

1位 EnvisionEN141-2.5、NordexN149 4.0-4.5MW、SGRE8.0-167DD、EcoSwing超電導、Vestas V120、Blancair CO2回収

・2018年の流行は、Module設計、デジタル化、ロータ径拡大、Supplier Chain整備、メンテ費削減。中国風車メーカーも複数表彰されています。

1. 陸用風車 (3MW未満)

China's second-largest turbine OEM has a turbine to match the best of the European competition in the ultra low-wind sector

Model	IEC Class	Rating	Drive	Hub Height	Rotor Diameter
Envision EN141-2.5	S (ultra-low wind)	2.5MW	HSG-DFIG	105m, 115m, site-specific	141m
Vestas V120-2.2MW	IIB/S	2.2MW	HSG-DFIG	80-137m	120m
Goldwind GW 131/2200	S	2.2MW	DD-PMG	120m, 140m	131m
SGRE SG 2.1-114	IIA/IIIA/S	2.1MW	HSG-DFIG	68-153m, site-specific	114m
SGRE SG 2.1-122	III/S	2.1MW	HSG-DFIG	108-144m, site-specific	122m
Suzlon S128 2.6MW	S	2.6-2.8MW	HSG-DFIG	Up to 140m	129m
Senvion 2.3M120	S (based on IIIA)	2.33MW	HSG-EESG	90-120m	120m
Enercon E-103 EP2	IIIA	2.35MW	DD-EESG	98m, 138m	103m
Nordex N117/2400	IIIA	2.4MW	HSG-DFIG	up to 141m	117m
GE Renewable Energy 2.3-127	II/III/S	2.2-2.5MW	HSG-DFIG	69-129m, site-specific	127m

2. 陸用風車 (3MW以上)

Most of the leading OEMs are developing 4-5MW turbines with rotor diameters of around 150 metres, but Nordex was first to install two prototypes

Model	IEC Class	Rating	Drive	Hub Height	Rotor Diameter
Nordex N149/4.0-4.5MW	S	4.0-4.5MW	HSG-DFIG	105m, 125m / 164m (hybrid)	149m
Vestas V150-4.2MW	IIIB, S	4.0MW/4.2MW	HSG-IG	site- / country-specific	150m
Enercon E-126 EP3	IIA	3.0-4.0MW	DD-EESG	86m, 99m, 116m, 135m	127m
Senvion 4.2M140 EBC	S (based on IIB)	4.2MW	HSG-IG	Project-specific	140m
Enercon E-141 EP4	IIIA	4.2MW	DD-EESG	99-159m	141m
SGRE SG 3.4-132	IA/IIA	3.3-3.75 MW	HSG-DFIG	84m, 165m, site-specific	125m
Nordex AW125/3150	IIB	3.15MW	HSG-DFIG	120m, 137.5m	125m
Ming Yang MYSE 3.2-145	S	3.2MW	MSG-PMG	85-140m, site-specific	145m
Goldwind GW 136/4.2	S	4.2MW	DD-PMG	100m, 110m	136m
Envision EN141-3.0	S	3.0MW	HSG-DFIG	106-140m, site-specific	141m

3. 洋上風車

The latest development of Siemens Gamesa's direct-drive offshore platform is attracting orders in high numbers

Model	IEC Class	Rating	Drive	Hub Height	Rotor Diameter
SGRE SG 8.0-167	IB	8.0-9.0MW	DD-PMG	Site-specific	167m
MHI Vestas V164-9.5MW	IB	9.5MW	MSG-PMG	Site-specific	164m
SGRE SWT-7.0-154	IB	7.0MW	DD-PMG	Site-specific	154m
MHI Vestas V164-8.0MW	S	8.0-8.4 MW	MSG-PMG	Site-specific	164m
Envision EN148-4.5MW	S	4.5MW	HSG-IG	106m, 126m, site-specific	148m
Ming Yang MYSE5.5-155	IB	5.5MW	MSG-PMG	100m	155m
Goldwind GW 171/6.45	S	6.45MW	DD-PMG	109m or site-specific	171m
Goldwind GW 140/3300	IIIA	3.3MW	DD-PMG	100m	140m
GE Haliade 150-6MW	IB	6.0MW	DD-PMG	100m or site-specific	150.8m
Sewind W4000-130	IB	4.0MW	HSG-IG	Site-specific	130m

5. ブレード (Rotor & Blade)

Vestas' success in producing a longer blade without increasing the blade root diameter and with a minimal weight penalty earns the top prize

Type	Product	Highlight	Status	
Vestas	59-metre blade for V120-2.2 MW	Slender pre-coning blade for the company's latest low and medium-wind 2.2MW turbine	Structural-shell design with single vertical web allows extending length while retaining 1.8-metre root diameter and minimising mass increment	First blade set installed on turbine prototype in March 2018
Vestas	73.7-metre blade for V150-4.2 MW	New slender 73.7-metre lightweight blade for low-wind onshore model	Structural-shell design builds on the V126 and V136 blade development experiences; enables more efficient carbon use and blade pre-bending	First blade set fitted on the V150-4.2 MW prototype scheduled December 2018, weather permitting
Ming Yang	76.6-metre blade for MYSE 5.5-155	In-house developed blade for new high-wind offshore turbine	Large blade for IEC IB conditions made from glass-fibre reinforced polymer	Blade sets mounted on two offshore prototypes
Goldwind	84-metre blade for GW 171/6.45	Blade for low-wind offshore turbine aimed at Chinese market	Glass-fibre reinforced polyester and glass- and carbon-fibre reinforced epoxy designs for the largest 171m commercial rotor	Prototype in 2017; 20 units installed at a wind farm in China
LM Wind Power	77-metre segmented blade for GE Cypress 5.3-158	Two-piece blade for GE Cypress onshore turbine	Segmented blade with carbon; currently for the largest 158m onshore rotor	No info available; Cypress prototype planned for late 2018

4. 主軸系 (Drive Train)

Nine-partner consortium claims a 40% reduction in mass over PMG with pioneering superconductive generator

Model	Description	Innovations	Status
EcoSwing Superconductor	Superconductive generator for multi-megawatt turbine	World's first superconductive generator deployed in wind turbine	Bench-tested; installed in a wind turbine and commissioned, first power produced
Moventas Exceed Evolution Gearbox for 4-5MW onshore turbines	Advanced compact three-stage modular gearbox	Combination journal bearings, Flexspider, new planet carrier and wide planets allows 1.9m first-stage ring gear diameter; reduced dimensions and mass	Exceed Evolution gearboxes already delivered for prototypes up to 5.3MW
Enercon EP3 Direct-drive EESG with incorporated two-bearing unit	Air-cooled EESG with 7.5-metre airgap diameter	New layout with semi-integrated "hollow" split two-bearing unit; aluminium form coils	E-126 EP3 prototype installed; immediate serial ramp-up
Goldwind 6S Direct-drive PMG	In-house PMG for Goldwind 6MW 6S platform with three model versions	Generator with 7.4m outer diameter; stator electrically split into four segments, each with an individual converter and switchgear	Incorporated in three offshore prototypes and in one 20-turbine wind farm
GE Renewable Energy DFIG for Cypress 5.3-158	Latest and highest rated DFIG for onshore	Retains position as cost-effective scalable generator-converter solution	GE prototype planned December 2018



Superconductors are breaking into the energy industry for the first time after a conventional, working wind turbine had its permanent magnets replaced by superconducting tape. The switch means that it's possible to build lighter, smaller wind turbines that are less dependent on expensive rare earth elements. This means that the price tag of turbines could fall and, in turn, cut energy costs.

Wind turbine generators today use permanent magnets, often neodymium-iron-boron ones, which makes them heavy. Just like a bicycle dynamo, these magnets turn inside coils that transform magnetic power into electricity. They require substantial quantities of rare earth metals, however, which are expensive and are mostly mined in just one country - China - which has led to worries over security of supply.

Generators could be made from superconducting magnets, however, offering significant savings in size and weight. "We can make a machine that will



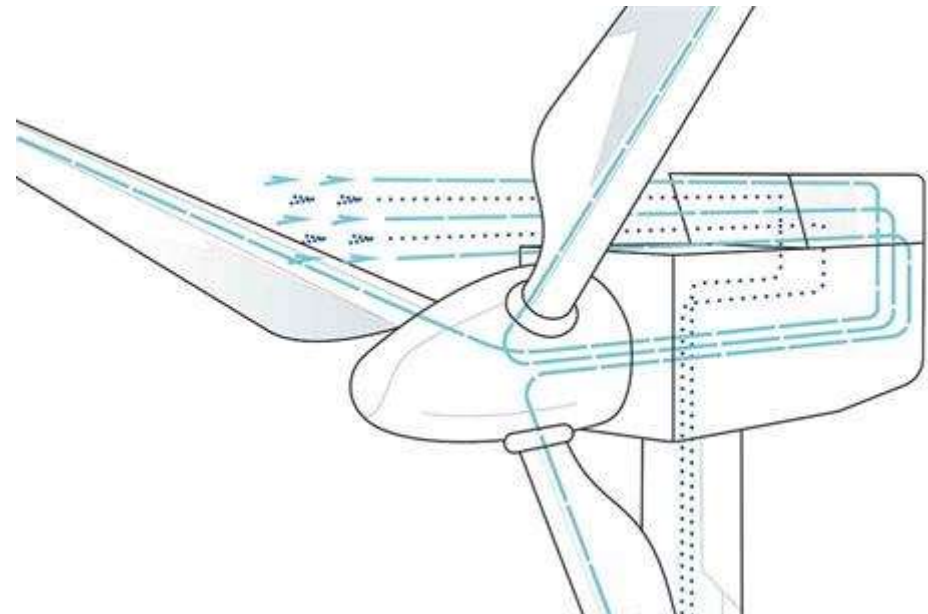
1位の ExoSwing Superconductor は、
2枚翼の 3.6MW の超電導発電機の試験風車。
中国の風車メーカーの Envision (遠景能源) が、
EUの研究資金 Horaizon2020 を使って、
2018年11月にデンマーク北西部の
Thyboron に設置した。



6. 革新技術 (Innovation)

Aerospace engineering consultancy points renewable energy in an even greener direction with radical concept

Make / Model	Description	Noteworthy	Status
Spitzner Engineers – Blancair	Removes CO2 from the air while improving wind-turbine efficiency and extending (offshore) rotor-blade lifetime	Combines multiple ground-breaking ideas in a clever, largely “passive” concept that contributes to counteracting climate change	Concept fully developed and patent granted
Stiesdal TetraSpar	Modular-design three-legged semi-submersible floating foundation	Retractable keel, lightweight tetrahedral structure, focus on industrialisation	Concept fully developed; prototype with 3.6MW DD SG turbine to be installed in 2019
6MW floating offshore wind turbine self-aligning tower	Self-aligning four-legged semi-sub lightweight steel floater with integrated tower	Applies shipbuilding principles through standardised automated industrialised manufacturing of modular box-type steel structures	Concept validation completed; patent granted
Enercon E-charger 600 rapid charging solution for high-performance vehicles	Technology spin-off from advanced in-house frequency converters	Uses grid-side DC/AC inverter part, including its incorporated grid support and stabilising features	Several chargers in operation
Ampyx Power Airborne Wind Energy System (AWES)	2MW AP4 twin-body aircraft for floating far-shore airborne wind farm	New aircraft scaling step and emphasis on optimised offshore power generation	Envisaged AP4 prototype by 2023 and first pre-series in 2028



1位の Spitzner Engineer 社の Blancair のコンセプト

- ブレード内の空気が遠心力で押されて、翼先端の出口から噴出する。
- それによる負圧でブレード上部から冷却用の空気を急進する。
- 空気の流路内に設置した回収用フィルターで CO2 を回収する。
- 回収した CO2 はメタンガス生成等に利用する。

Spitzner Engineers

<https://www.mintselection.com/tag/spitzner-engineers/>



Wind power generation with CO2 harvesting

Posted on November 5, 2018

German business, Blancair, is working on enhancing the technology used within the wind industry. Created in 2007, Blancair specialises in delivering lightweight structures for the aerospace market. Their engineers have also worked on creating advanced solutions for the wind market. Their latest project aims to support the transition from nuclear and fossil fuels towards the

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Posted in Environment Tagged Blancair, Spitzner Engineers

2位の Stiesdal Tetraspar 浮体式洋上風力のコンセプト

- ・単純な鋼管をトラス状に組合せた構造で汎用性と量産性に利点あり。
- ・Bunus/Siemens の OB の Stiesdal 氏が提唱。
- ・大手企業（Innogy と Shell）の支援を得て、Siemens 3.6MW 風車による試験機を 2019 年にノルウェーの Marine Energy Test Centre (Mrtcenter) に建設予定。

3位 Self-aligning floater with integrated tower follows shipbuilding principles タワー一体型浮体

<https://www.windpowermonthly.com/article/1519231/self-aligning-floater-integrated-tower-follows-shipbuilding-principles>

- ・ナセルをタワーに直結、ヨー軸受を除去。
- ・1点係留で浮体全体で風向追従する。

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BUSINESS GUIDE

<https://www.offshorewind.biz/2018/10/05/innogy-and-shell-back-stiesdals-tetraspar-concept/>

Innogy and Shell Back Stiesdal's TetraSpar Concept

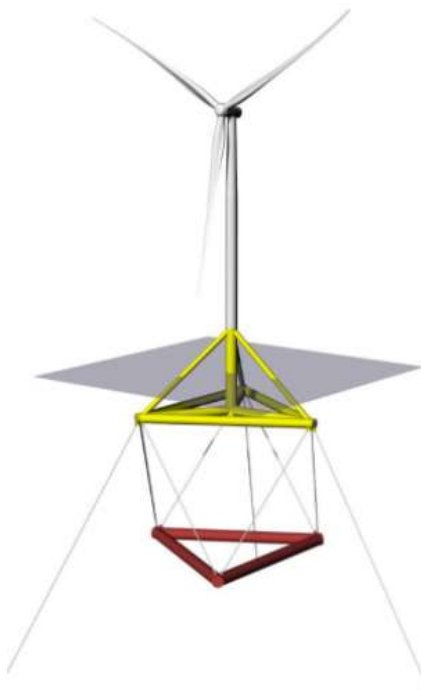
Posted on October 5, 2018

Innogy, Shell and Stiesdal Offshore Technologies A/S (SOT) have signed an investment and cooperation agreement to build a demonstration project using SOT's TetraSpar floating foundation concept.

The demonstration project will feature a 3.6MW Siemens Gamesa direct-drive turbine due to be deployed in 2019 at the test site of the Marine Energy Test Centre (Metcentre) near Stavanger, Norway, in water depths of 200m.

The foundation will be manufactured and assembled in Denmark, with the turbine installed in the port of Grenaa, from where it will be towed to the project site some 10km off the coast, moored to the seabed with three anchor lines and connected to the electrical grid.

According to innogy, the modular layout comprises a tubular steel main structure with a suspended keel, expected to offer important competitive advantages over existing floating wind concepts, with the potential for leaner manufacturing, assembly and installation processes with lower material costs.



Source: Stiesdal Offshore Technologies A/S

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MONTHLY

Self-aligning floater with integrated tower follows shipbuilding principles

30 November 2018 by Eize de Vries GERMANY

A German consortium has developed, tested and validated a self-aligning, lightweight, four-legged semi-submersible floating-platform concept that integrates the turbine tower. Eize de Vries highlights the technological innovations.

