EDISON

Windar Photonics

Strategy update

Harnessing the wind more effectively

Alternative energy

Windar's patented low-cost, nacelle-mounted wind measurement system increases wind turbine efficiency and reduces operational wear. This is attractive to independent power producers (IPPs) and wind turbine OEMs as the constant change in power tariffs and government subsidies means there is increased emphasis on minimising the total cost of energy through increasing productivity per turbine and extending turbine life. Windar already has over 250 pilot installations worldwide. We reinstate our estimates, with deliveries now reaching c 5k units in FY20, rather than FY19 previously. The announcement in December of a transformational contract for 300 LiDAR for volume installation on wind parks in China gives greater confidence that the industry is finally beginning to adopt Windar's proposition of integrating LiDAR into individual wind turbines.

Year end	Revenue (€m)	EBITDA (€m)	PBT* (€m)	EPS (c)	DPS (c)	P/E (x)
12/15	0.9	(2.8)	(3.3)	(8.7)	0.0	N/A
12/16	1.2	(2.4)	(3.0)	(7.6)	0.0	N/A
12/17e	2.2	(1.1)	(1.9)	(4.6)	0.0	N/A
12/18e	5.6	0.7	0.2	0.4	0.0	236

Note: *PBT and EPS are normalised, excluding amortisation of acquired intangibles, exceptional items and share-based payments.

Increasing energy efficiency via turbine alignment

Windar's LiDAR systems are designed to be cost-efficient, allowing Windar to offer them at c 80% lower prices than other LiDAR manufactures. This means the LiDAR can be mounted on top of individual turbines where they measure forward-looking wind direction. The information enables dynamic control of the direction and pitch of the turbine, resulting in increased power output and reduced damage from strong winds. The low cost compared to other systems enables payback times that are sufficiently attractive to drive commercial uptake of the system.

Volume roll-out about to commence

Windar's pre-close trading statement notes that FY17 revenues are likely to be €2.2m, an 84% increase on FY16. The recent sequence of contract awards indicates that this revenue ramp-up will be sustained through FY18. The part of the transformational Chinese order scheduled for delivery in H118 represents substantially more LiDAR systems than were shipped in FY17, with potential for follow-on orders in H218. Combining this with a streamlined cost base following a review of operations in H216, we now expect this revenue growth to take Windar to positive EBITDA in FY18.

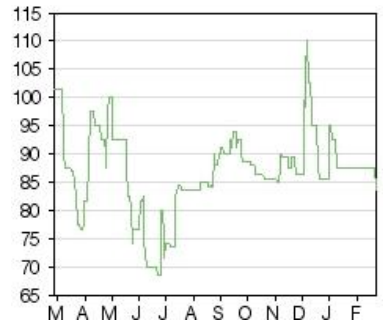
Valuation: Further orders should drive share price

Our valuation analysis is based on a DCF using a discount factor of 25% to reflect current levels of risk and a terminal growth rate of 2%. This implies an indicative value of 121p/share. Receipt of further volume orders should give investors better visibility on the technology adoption and market penetration, albeit at slower rate than expected at the IPO, providing support to the share price.

23 February 2018

Price	**83.5p**
Market cap	**£35m**
	£/€1.13
Net cash (€m) at end June 2017 excluding Growth Fund loan and subscription in July raising £1.25m (gross)	0.4
Shares in issue	41.8m
Free float	47.8%
Code	WPHO
Primary exchange	AIM
Secondary exchange	N/A

Share price performance



%	1m	3m	12m
Abs	(4.6)	(6.7)	(17.7)
Rel (local)	1.2	(4.7)	(18.2)
52-week high/low	110.0p		68.5p

Business description

Windar Photonics is a UK-registered, Copenhagen-based developer and manufacturer of an innovative low-cost light detection and ranging (LiDAR) system. Approaching wind direction and speed is measured ahead of a wind turbine, allowing appropriate yaw alignment, increasing efficiency.

Next events

FY17 results	April 2018

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Investment summary: Innovative and disruptive LiDAR

Company description: Innovative low-cost LiDAR

Windar Photonics was founded to develop and commercialise a low-cost light detection and ranging (LiDAR) system. This is mounted on top of an individual wind turbine where it measures forward-looking wind direction. The information enables dynamic control of the direction and pitch of the turbine, resulting in increased power output and reduced damage from strong winds. The competitive advantage of the system is its low cost, around 80% below existing systems, enabling payback times that are sufficiently attractive to drive commercial uptake of the system.

Financials: Revenue ramp-up expected to continue

The pre-close trading statement notes that revenues rose by 84% year-on-year during FY17 to €2.2m. The cost base realignment resulted in a 30% reduction in operating costs to €2.1m and a 57% cut in EBITDA losses to €1.1m. The recent sequence of contract awards indicates that this revenue ramp-up will be sustained through FY18. Our reinstated estimates show sales of €5.6m in FY18, enabling EBITDA break-even (€0.7m). In July 2017, Windar completed a subscription raising £1.25m (gross) at 82p/share, resulting in Windar having cash holdings of €1.1m (excluding restricted cash) at the end of December 2017. Noting arrangements with the Danish Export Credit Agency and a factoring agency to reduce working capital requirements, we calculate that this is sufficient to take Windar through to a sustainable cash-generative situation.

Valuation: Further volume orders should benefit share price

Since Windar has only recently received its first order for volume deployment of its systems, we use a DCF valuation out to 2026 based on conservative assumptions regarding rate of market penetration, ie 15% of the OEM market in the long-term and 4% of the larger retrofit market. We apply a discount rate of 25% and terminal growth of 2% (see page 9 for more details). This gives an indicative value of 121p/share at current levels of risk, and 230p/share as risk reduces to normal levels (10% discount for risk). Receipt of further volume orders such as the transformational Chinese contract should help address investor concerns about the rate of roll-out and potential market penetration, moving the share price towards our indicative value.

Sensitivities: Related to commercial success

To achieve substantial scale and value Windar needs to manage a number of sensitivities:

- **Adoption of dynamic yaw adjustment methodology.** Deployment of Windar's systems involves a switch in turbine control methodology and requires widespread understanding of this change in wind farm management processes.
- **Regulatory/policy impact on wind industry.** Wind turbine production and wind farm economics are in many instances driven by regulation and subsidy policies. Recent changes in Europe are less significant given the opportunities in China and the US are so much greater.

Company description: One LiDAR per turbine

Windar Photonics was created from technology developed by founder Jørgen Korsgaard Jensen and the Danish Technical University (DTU) to develop and commercialise a low-cost LiDAR system for measuring wind speed. Unlike competitive products, Windar's LiDAR is designed for a price point at which it is economically viable to mount a LiDAR system on an individual wind turbine to measure the strength and direction of incoming wind directly. This information is used to adjust the orientation of the turbine in real time so as to optimise electrical power output and reduce damage to the turbine. The monetary value of the increased power output gives a payback for the LiDAR of one to four years, depending on the turbine size and local electricity tariffs.

Windar was admitted to AIM in March 2015 at a share price of 100p. It is based in Copenhagen and employs more than 20 people. Exhibit 1 below shows the timeline of the company's development.

Exhibit 1: Windar Photonics development timeline

2005	Initial LiDAR research within DTU.
2006	OPDI and DTU enter into a semiconductor-based LiDAR development project.
2008	Windar Photonics A/S established. IP rights acquired from OPDI.
2010	Proof of concept made in co-operation with DTU.
2011	Polarisation system developed, second patent filed.
2012	First installation on a wind turbine.
2013	Test phase with OEMs and utility companies. Commercial launch.
2014	Advanced installation and beam scanning technology patents filed. Windar Photonics plc established. Pre-IPO funding of £6m.
2015	Control System for lower power output turbines and four-beam LiDAR system developed. Trial installations with utilities and OEMs. First volume order. Admission to AIM.
2016	Start of wake detection programme. Development of distribution network to address IPPs. Subscriptions collectively raising £2.0m.
2017	Subscription raising £1.25m. Transformative contract for 300 units received – first 50 units shipped.
2018	Integration programmes continuing with wind turbine OEMs.

Source: Edison Investment Research

LiDAR allows accurate measurement of approaching wind

The LiDAR technique has been around since the 1970s. It is based on firing a low-power laser beam into wind, measuring the reflections of the light from moving air particles and using this information to calculate the speed and direction of the wind using the Doppler principle. Windar's LiDAR are designed for use as a turbine-mounted system, using solid-state lasers as the high-intensity light source, rather than relatively expensive fibre amplified lasers. This results in a system price point that is up to 80% cheaper than competitive products that have been developed from ground-based, expensive, high-fidelity technology. At this lower price point it is economically viable to mount LiDAR systems on individual turbines rather than having a single LiDAR for use across an entire wind farm. In addition, the LiDAR have no mechanical moving parts, are light (22.4kg for the two-beam WindEye variant), compact (500mm x 340mm x 140mm for the WindEye) and robust, easy to install and require limited maintenance, all of which is ideal for long-term deployment on top of a turbine.

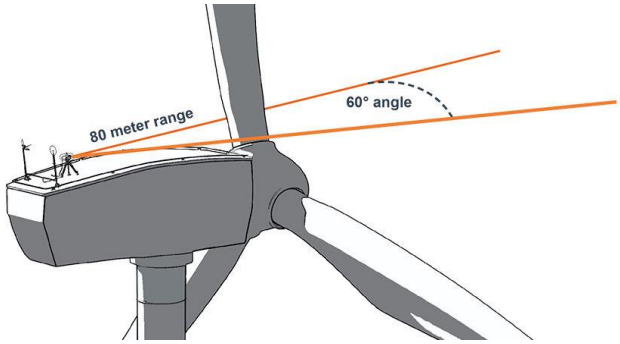
Reducing yaw misalignment and increasing efficiency

Accurate measurement of incoming wind

Windar's WindEye LiDAR emits two laser beams at 60 degrees to each other, extending 80 metres in front of the turbine. These measure the movement of particles in the air, giving precise information about the speed and direction of incoming wind (Exhibit 2) well before it reaches the turbine. Independent tests at the DTU comparing results from WindEye and a metrological mast,

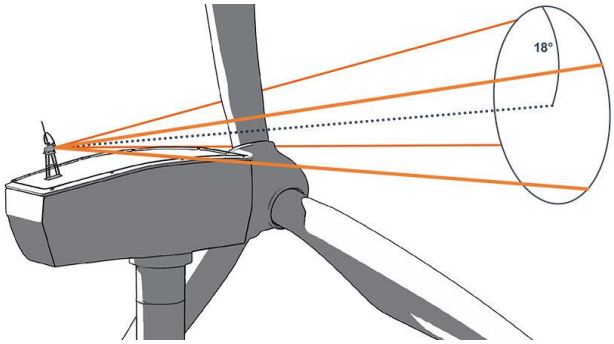
which is the standard for measuring wind speed, have confirmed that WindEye measures both the speed and direction of incoming wind with precision. WindEye supplies forward-looking wind direction and speed data in real time to the turbine control system. Knowing the correct wind direction enables the turbine to re-orientate so that it is always head-on to the incoming wind. This extracts the maximum amount of energy from the wind and reduces loads on vital parts of the turbine.

Exhibit 2: Two-beam WindEye for retrofit applications



Source: Windar Photonics

Exhibit 3: Four-beam WindVISION for direct integration



Source: Windar Photonics

Improved accuracy compared with conventional techniques

Windar's approach is different from conventional wind measurement methodology, where sensors take readings of air flow at the back of the turbine. The wind flow is distorted as it passes round the turbine, so the measurements taken of flow in this area are not the same as measurements of the incoming wind taken directly. The sensors have to be calibrated so that the true speed and direction of incoming wind can be estimated from the measurements they take in the turbine's wake. In practice, this calibration is not perfect because it is very difficult to calculate the impact of turbulence at the back of the turbine and to compensate for it. In addition, the wind sensors may be slightly misaligned: a 5 or 6 millimetre sensor misalignment can result in a 15 degree yaw misalignment, causing a 5-6% energy loss, and the terrain and neighbouring turbines may cause other distortions to the wind flow. As a result of these factors, the information the turbine controller receives about incoming wind direction from conventional sensors is often incorrect, resulting in a turbine orientation that is several degrees away from facing the wind.

Gusts, turbulence and wake adjustment

Improved pitch alignment and reduced wear

Accurate real-time information about incoming wind warns the turbine about sudden excessively strong gusts of winds, enabling it to twist the turbine blades so that the flat of the blade does not receive the force of the wind full on. This reduces the associated wear, increasing the potential life of the turbine components and lowering maintenance costs. Third-party testing has shown that forward-looking LiDAR sensors can reduce stress on the blades, gearbox and associated components by at least 10-14%.

Wake and turbulence detection

Typically, wind turbines are located in groups, so the wind flow round each turbine is modified by its neighbours, reducing the amount of power that can be generated. Similarly, neighbouring hills may modify wind flow, causing turbulence. Windar's LiDAR provide data that can be used by wind turbine operators to address these issues. In October 2016 Windar commenced an Energy Development and Demonstration Programme together with the DTU to expand the capabilities of its

LiDAR analytics to include wake detection and turbine optimisation. The project was awarded a €1.0m cash grant, to be shared equally by the two partners over a 24-month period.

Payback for operators based on energy efficiency gains

Windar's system has been tested on a wide range of wind turbine types and power ratings to identify the efficiency improvements that could be achieved by deploying WindEye. This includes wind turbines across the power spectrum from <1MW to the largest 6MW turbines designed for offshore use. The payback period for an operator of a turbine is one to four years, depending on the turbine power rating, average yaw misalignment, price of electricity and any subsidy regimes. Improved yaw alignment also causes additional stress loading on the turbine components, resulting in premature wear and tear and accelerating the maintenance cycle. The incremental cost of a Windar LiDAR (<€15k) is not significant compared with the cost of a turbine (c €1m/MW).

Retrofit opportunity

WindEye is designed for retrofit installations. The data output by the WindEye system is fed into the turbine control system via an intermediary subsystem, the WindTIMIZER. The WindTIMIZER allows the LiDAR to be integrated with the control system of the wind turbine without needing to change anything in the wind turbine control system. Retrofit integration with the WindTIMIZER is currently compatible with models using FT sonic wind sensors from Vestas, GE, Gamesa, Neg-Micon and Suzlon.

Four-beam variant gives extra functionality

Wind shear

Wind shear occurs when the wind speed varies significantly at different altitudes, causing the wind turbine rotor to be subject to vastly different oncoming wind speeds. This creates a significant amount of strain on the turbine's rotor and the gearbox. During 2016 Windar launched a four-beam LiDAR, WindVISION, which is able to take measurements in both the vertical and the horizontal planes. In addition to the functionality offered by WindVISION systems earlier, the four-beam configuration enables WindVISION to measure the wind speed at different altitudes, thus providing actionable data about wind shear in the vicinity of an individual turbine. Wind shear is particularly problematic for larger turbines.

Revised design

During the WindVISION development programme, Windar took the opportunity to refine the platform design, making it less complex, lighter and less expensive to produce, for example switching from fan cooling to passive cooling. This further enhances the competitiveness of the system and reduces the payback period.

Direct integration

Both the WindEYE and WindVISION units may be integrated with the wind turbine controller during the design phase of the wind turbine. Windar has supplied LiDAR units to the majority of the top 20 wind turbine manufacturers globally for direct integration programmes. The DTU programme mentioned above has attracted fresh interest from several major wind turbine OEMs keen to address turbulence and wake issues, leading to a record number of ongoing OEM turbine integration projects at the end of 2017. We believe it is likely that once one or two turbine manufacturers integrate the technology, others will follow so as not to lose competitive advantage. This in turn will encourage retrofit installations as IPPs will be keen to bring the efficiency of their existing turbines in line with newer models. Windar's LiDAR is currently the only option that gives wind detection capability at a cost-effective price point.

Market opportunity

Windar's products are used in the wind turbine market. This market is forecast to continue to grow as energy policies across the globe demand increased contributions from renewables and wind power is already an established and proven technology. According to the Global Wind Energy Council (GWEC), 53GW of wind turbine capacity were installed globally during 2017. This was less than the record 60GW installed during 2015 because installations in China totalled "only" 20GW compared with 30GW in 2015, when installations were rushed through ahead of reduction in feed-in tariffs in 2016. Cumulative installed capacity increased by 11% to 540GW. GWEC predicts that annual capacity installed globally will grow for the remainder of the decade, reaching 75GW in 2021, with an estimated 817GW cumulative installed capacity. Importantly for Windar, the constant change in power tariffs and government subsidies means there is increased emphasis on minimising the total cost of energy through increasing productivity per turbine and extending turbine life. We note that, while demand for wind power is expected to grow now that it has achieved grid parity with conventional modes of energy production in many geographies, Windar's proposition remains viable if the market stays still, as wind energy producers will still want to improve the efficiency of their assets.

China is the largest market with respect to both annual installations and installed capacity as its government is implementing policies intended to reduce dependency on coal for energy generation and the associated smog affecting its major cities. The Five Year Plan for Energy (2016-20) aims for 210GW of installed capacity by 2020. The current Five Year Plan is prioritising installations in the southern and eastern regions over those in the northern and western to address the curtailment issues, which meant that 17% of wind energy generated during 2016 was wasted or "curtailed. In the US, the tax deal struck at the end of 2015 for the extension and phase-out of the Production Tax Credit in the period up to 2020 is likely to stay in place, despite Trump's support for fossil fuel, because wind power has support from both parties in Congress and at state level and employs over 100,000 people. In 2016, wind power overtook coal to become the second largest type of power generation by cumulative capacity in Europe (natural gas is the largest).

Exhibit 4: Regional analysis of global installed wind power capacity

Total installed capacity at end 2017 (MW)		Capacity installed during 2017 (MW)	
PR China*	188,232	PR China*	19,500*
US	89,077	US	7,017
Germany	56,132	Germany	6,581
India	32,848	UK	4,270
Spain	23,170	India	4,148
UK	18,872	Brazil*	2,022
France	13,759	France	1,694
Brazil*	12,763	Turkey	766
Canada	12,239	Mexico	478
Italy	9,479	Belgium	467

Source: Global Wind Energy Council. Note: *Provisional.

Market opportunities and partnerships

Assuming that the current mean turbine rating is 2.5MW, the GWEC statistics represent around 216,000 turbines installed globally, with approximately 21,000 new turbines delivered each year. Windar is addressing the installed base through contact with the owners and operators of wind farms. It is addressing the new-build market though relationships with OEMs, with the goal of integrating LiDAR with turbine control systems during manufacture. The sales cycle is lengthy, with potential customers purchasing individual units for use on in situ trials before committing to a volume purchase. The large Chinese order announced in December 2017 represents a major milestone for Windar, as the order for 300 units primarily for volume retrofit installation follows on

from deliveries of smaller numbers of units for trials, demonstrating that the premise of one LiDAR per turbine is becoming a commercial reality.

Wind farm owners and operators

Windar has a significant number of trial installations with utility companies in Asia, Europe and North America. These are providing results that confirm the attractive business case for the adoption of its low-cost LiDAR systems. Windar has supplied 10 of the top 25 IPPs globally by market share. (Note: ownership of wind generation capacity is relatively concentrated, with the top 25 utilities collectively controlling 135GW, equivalent to 28% of the world total.) Management's target is to roll out LiDAR across the turbine portfolio of four of these major IPPs over the next one to three years. Management estimates that partnership with a single IPP could represent 100-300 LiDAR sales.

Windar is currently focused on development projects with IPPs in North America and Asia. The 300 units ordered under the transformational contract received in December 2017 from a Chinese partner are primarily for retrofit deployment. Other orders received during the last year include a repeat order of four units from a French IPP for direct integration into turbines, a 15-unit order through a Chinese distributor, an order for five LiDAR with associated WindTIMIZERs for integration into Vestas turbines from a Mexican IPP and an order for nine units from a Central American IPP, also for integration into Vestas turbines. This sequence of orders highlights the success of Windar's revised strategy, adopted in H216, of developing its network of distributors, which now totals 14, rather than investing in a costly direct sales team.

OEMs

Windar has delivered LiDAR, directly and indirectly, to seven out of the top 10 turbine manufacturers globally. (Note: the top 10 OEMs collectively, ie Vestas, GE, Goldwind, Gamesa, Enercon, Nordex Group, Guodian, Siemens, Ming Yang and Envision, output 39.7GW generating capacity in 2016, equivalent to 72% of total global capacity installed that year.) In April 2017 Windar announced an order for 25 LiDAR for delivery, some of which were for Chinese OEMS. In December it issued two announcements regarding orders related to OEMS. One was from a Chinese OEM manufacturer for five LiDAR systems. The other was from a Chinese distribution partner for five units, which will be delivered to two wind turbine OEMS. Management's target is for Windar's LiDAR to be designed-in to four or five turbine systems in the next two to three years, with the current focus on OEMs in Asia. Management estimates that integration into a single turbine model could typically represent 300-500 LiDAR sales annually, although for some models the volumes would be substantially higher.

Competitive environment

Windar's LiDAR has been designed using a solid state laser, resulting in a substantial price point discount to peers (Exhibit 5). Since the use of a semiconductor laser is a fundamental differentiator, Windar has patents for the use of a semiconductor laser in a LiDAR wind sensor in Russia, the US Japan and Europe with applications filed and pending in India and China. It has also filed for patents relating to polarisation scanning and micro-electro-mechanical (MEMs) scanning.

As the price differential is so great, the other systems are used in a different way from Windar's system and are therefore not true competitors. WindEye and WindVISION systems are mounted on individual turbines for the lifetime of the turbine, monitoring incoming wind in real time. Rival systems are used to monitor the difference between actual incoming wind speed and the results generated by the turbine wind sensors over an extended period, and this information is used to recalibrate the wind sensors. In this methodology, one system is used for many turbines, but yaw adjustment is not optimal and power yield is compromised. In practice, many wind farm operators

do not use LiDAR technology at all, and rely solely on measurements from traditional, simple wind direction and speed devices mounted behind the turbine.

Exhibit 5: LiDAR competitive environment

	Galion	ZephIR	Leosphere	Leosphere	Windar Photonics
Product name	Galion	Zephir	Windcube	Wind Iris	WindEye
Nationality	UK	UK	France	France	Denmark
Ownership	Wood Group, UK LSE listed	Natural Power, UK	Leosphere, France	Leosphere, France	Various partners, AIM-listed
Estimated price range	c €180k	c €140k	c €150k	c €100k	<€15k
Measurement distance	4,000m	300m	290m	250m	80m
Laser type	Pulsed wave	Continuous wave	Pulsed wave	Pulsed wave	Continuous wave
Size (mm)	840x660x660	800x400x400	543x552x540	810x540x330	500x340x200
Weight	85kg	55kgr	45kg	67kg	22kg
Temp range	-15 to +35ºC	-40 to +50ºC	-45 to +50ºC	-30 to +60ºC	-40 to +55ºC

Source: Windar Photonics, Edison Investment Research

Board strengthened to focus on delivery

The board of directors consists of founder and CEO Jørgen Korsgaard Jensen, who has been involved in optical technology R&D projects with Riso DTU for 12 years, and three non-executive directors. These are interim chairman, Johan Blach Petersen, Simon Barrell, who was formerly FD of Napier Brown Foods, and Søren Høffer. Johan assumed his current role in December 2017, having previously served as a non-executive director of Windar. He is an experienced business development consultant who is chairman of several small companies and has been involved with Windar since the very early stages of the company. Søren joined the board in December 2017. He has extensive experience of the wind energy market and is currently VP of sales and marketing for the LM Wind Power Group. In September 2016, Martin Rambusch stepped down from his position as CEO to focus on driving sales in his role as chief commercial director. In September 2017, Jørgen Korsgaard Jensen, who has been interim CEO since September 2016, became permanent CEO.

Sensitivities

Windar needs to manage a number of sensitivities to achieve its plans to fully commercialise the technology and achieve substantial scale and value:

- **Adoption of dynamic yaw adjustment methodology.** Deployment of Windar's systems is a switch in turbine control methodology and requires widespread understanding of this change in wind farm management processes for significant adoption. This is a lengthy process and has held up widespread deployment. The large contract announced in December 2017 suggests that industry perception of the technology has finally begun to change. However, there remains risk regarding the rate of adoption and the number of volume contracts that will be received during our forecast period.
- **Regulatory/policy impact on wind industry.** Wind turbine production and wind farm economics are in many instances driven by regulation and subsidy policies. Windar has therefore created a target database of all operating turbines by operator, type, rating and location, which enables a targeted sales approach in geographies where payback times are best. Recent policy changes in Europe are less significant given that the opportunities in China and the US are so much greater.
- **Supplier base.** Windar outsources production of the majority of components with final assembly and integration testing being undertaken at its operations in Denmark. The cost of these components varies considerably with increased volumes and, as such, Windar expects to

benefit from reduced unit costs as revenues increase. No single supplier accounts for more than 25% of the group's input costs.

Valuation

Given Windar's early-stage nature, we believe that relative peer rating valuation techniques are unsuitable and have therefore derived a DCF valuation out to 2026 based on modest assumptions regarding the rate of market penetration, ie 15% of the OEM market and 4% of the larger retrofit market in the longer term, and an average selling price of <€15k. These are the same growth rates that underpin our reinstated financial estimates. Noting that it is taking longer than originally expected for IPPs and OEMs to adopt Windar's technology, these new estimates take a more conservative approach, pushing back roll-out by about one year. As profitability is particularly sensitive to the rate of market penetration, we also present a "low" scenario, in which we assume 10% lower penetration than in our base case (on the same cost base) and a "high" scenario, in which market penetration is 10% higher than in our base case (also on the same cost base). Exhibit 6 shows our assumed expansion rates in each scenario using GWEC market forecast data.

Exhibit 6: Scenario analysis showing impact of different rates of market penetration

	2017e	2018e	2019e	2020e	2021e	2022e	2023e	2024e	2025e	2026e
Base case										
Share of retrofit market	0.06%	0.15%	0.69%	1.65%	2.50%	3.00%	3.50%	4.00%	4.00%	4.00%
Share of OEM market	0.12%	0.49%	2.51%	4.42%	6.00%	8.00%	10.00%	12.00%	13.50%	15.00%
Number of units	175	450	2,200	5,344	8,551	11,253	14,247	17,524	19,049	20,598
Revenues (€m)	2.2	5.6	25.3	61.5	84.7	109.2	135.5	163.3	173.9	184.3
EBITDA (€m)	(1.1)	0.7	8.8	29.7	39.5	51.9	65.3	79.8	84.8	90.6
Low case (-10% market share)										
Number of units	175	405	1,980	4,809	7,697	10,127	12,822	15,772	17,144	18,538
Revenues (€m)	2.2	5.1	22.8	55.3	76.2	98.3	121.9	147.0	156.5	165.9
EBITDA (€m)	(1.1)	0.4	7.4	25.9	34.8	45.7	57.7	70.7	75.1	80.3
High case (+10% market share)										
Number of units	175	495	2,420	5,879	9,406	12,378	15,673	19,276	20,954	22,658
Revenues (€m)	2.2	6.2	27.8	67.6	93.1	120.1	149.0	179.6	191.3	202.8
EBITDA (€m)	(1.1)	1.0	10.2	33.3	44.2	58.0	72.9	89.0	94.6	101.0

Source: Edison Investment Research, GWEC market data

Running our financial model for each of these scenarios, and assuming a tax rate of 22% and a discount rate of 25% to reflect that Windar is at the very beginning of its volume deployment, as well as a terminal growth rate of 2%, gives an indicative value at current levels of risk of 121p/share.

Exhibit 7: Edison DCF valuation using a range of forecast scenarios (p/share)

		Low case				Medium case				High case		
Discount rate		10.0%	25.0%	30.0%		10.0%	25.0%	30.0%		10.0%	25.0%	30.0%
Terminal growth	0.0%	128.6	85.3	67.8	0.0%	215.1	117.1	103.0	0.0%	245.3	147.9	131.5
	1.0%	130.2	86.2	68.4	1.0%	222.1	118.9	104.4	1.0%	247.7	149.1	132.5
	2.0%	131.9	87.1	69.0	2.0%	230.0	121.0	106.0	2.0%	250.1	150.4	133.6
	3.0%	133.7	88.1	69.7	3.0%	239.1	123.2	107.6	3.0%	252.7	151.7	134.7
	4.0%	135.6	89.1	70.5	4.0%	249.5	125.6	109.4	4.0%	255.4	153.1	135.9

Source: Edison Investment Research

The share price has picked up from a low of 68.5p in June 2017 following the sequence of announcements regarding contract awards. This sequence included the 300 unit order announced in December 2017, which is a clear demonstration of roll-out in volume, rather than technology trials. However, the share price is still below the IPO level of 100p/share, reflecting continued scepticism regarding volume adoption. Receipt of further volume orders such as the transformational Chinese contract should help mitigate these concerns and move the share price towards our base case indicative value of 121p/share, which is based on the currently adopted 25% discount rate, and ultimately towards the lower-risk valuation (10% discount) of 230p/share.

Financials

Revenues increased and losses reduced in FY17

Windar's pre-close trading update notes that FY17 revenues will rise by 84% year-on-year to €2.2m, supported by orders for at least 120 units. The strong revenue growth was primarily driven by demand from IPPs. Growth was particularly strong in Asia. The OEM segment accounted for only a small proportion of total revenue. There was also €0.2m revenue deferred from FY16 because of the timing of deliveries. Management undertook a thorough review of operations during H216, part of which was the switch away from reliance on a direct salesforce. The number of sites was cut, leaving only the production facility in Copenhagen and a sales and service office in China, but investment in product development was increased. The cost base realignment resulted in a 30% reduction in operating costs to €2.1m (including restructuring costs) and a 57% cut in EBITDA losses to €1.1m.

Getting closer to cash break-even

The cost savings made during H216 have helped the company approach EBITDA break-even. Cash consumption during H117 totalled €0.3m, €0.2m of which related to capitalised R&D costs. Capitalised R&D costs were lower than the €0.3m reported for H116, because the MEMs development taking place in FY16 was completed during that year. Cash flow benefited from a €0.4m reduction in inventory as finished goods ready at the end of FY16 were shipped out and stocks returned to a normal level. This left €0.4m net cash at end H117. In July, Windar completed a subscription raising £1.25m (gross) at 82p/share, which resulted in the company having cash holdings of €1.1m (excluding restricted cash and debt) at the end of December 2017. The funds from the placing are being used to support growth as some of these retrofit test projects with IPPs convert to volume roll-outs across wind farms and ongoing test programmes with wind turbine OEMs complete successfully.

Order book underpins continued growth in FY18

Order intake in FY17 of €5.9m represented a fourfold increase on FY16. The order backlog at the end of December 2017 for deliveries in FY18 is €3.9m. This is substantially higher than the total revenues achieved in FY17 and excludes any potential follow-on orders in H218 from the transformational Chinese contract. Following the release of the pre-close update giving preliminary financial data for FY17, we reinstate our estimates. These model sales of 450 LiDAR units (a combination of WindEye and WindVISION units) generating €5.6m revenues. This is fairly prudent, given the size of the order backlog at the end of FY17, which includes the remaining 250 units scheduled for delivery in FY18 under the transformational Chinese contract. We assume that the increase in volumes shipped will enable Windar to secure better pricing for components and outsourced manufacturing services, resulting in improved gross margins, and that operating costs will be retained at FY17 levels. We expect this volume ramp-up to result in Windar posting its first year of EBITDA profit. Interest payments include a loan from the Danish Growth Fund, bearing interest at 12%, which is shown as 'Other long-term liabilities' in the financial summary table.

Our estimates model shipments rising to 2,200 units in FY19 delivering an increase in revenue to €25.3m and €8.8m EBITDA. This is a slower ramp-up than our previous estimates, which exceeded the 5,000 mark in FY19, and management's original expectations. Our current trajectory has Windar reaching this level in FY20. The announcement in December of a transformational contract for 300 LiDAR for volume installation on wind parks in China gives greater confidence that the industry is beginning to adopt Windar's proposition of integrating LiDAR into individual wind turbines and that the volume ramp-up has finally commenced.

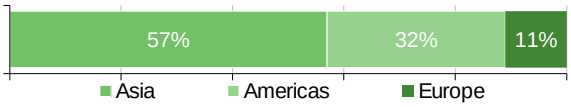
Windar is reducing the working capital required for this volume ramp-up, and the potential requirement for external funding, through two mechanisms. Around half of the units sold will be supported by the Danish Export Credit Agency. Under this scheme, Windar receives 80% of the invoiced revenue on delivery, and the remaining 20% is held as restricted cash and released after one year. The other units will be sold under a factoring arrangement, under which Windar receives 80% of the invoice value on delivery and the remainder after 90 days. We model modest levels of capitalised R&D and capex going forward as Windar already has commercial versions of both the WindEye and WindVISION products shipping and will continue to outsource most of the manufacturing at these volumes. As volumes increase further, it will become cost-effective for Windar to bring some of the manufacturing in-house. This will require investment of c €5.0m in a clean room facility, which is modelled in our DCF as taking place in FY20.

An additional way in which management is reducing cash consumption relates to the Growth Fund loan. It is currently adding interest payments to the value of the loan, rather than paying them in cash. Also, it has the option not to start repaying the loan from the Danish Growth Fund until the loan reaches maturity in June 2020. Management may at any point until the maturity of the loan either repay the loan in part or in full, or initiate an annuity repayment scheme over a four-year period. If an annuity repayment scheme is initiated, the interest rate will be reduced to 8% over the repayment period.

Exhibit 8: Financial summary

€'000	2015	2016	2017e	2018e	2019e
Year-end 31 December	IFRS	IFRS	IFRS	IFRS	IFRS
PROFIT & LOSS					
Revenue	946	1,196	2,188	5,625	25,300
Cost of Sales	(679)	(627)	(1,170)	(2,821)	(11,499)
Gross Profit	267	569	1,017	2,804	13,801
EBITDA	(2,821)	(2,422)	(1,066)	670	8,797
Operating Profit (before amort. and except.)	(3,217)	(2,850)	(1,606)	470	8,597
Intangible Amortisation	0	0	0	0	0
Exceptionals	(223)	0	0	0	0
Warrants	(365)	(317)	(271)	(100)	(100)
Operating Profit	(3,805)	(3,167)	(1,877)	370	8,497
Net Interest	(100)	(107)	(258)	(258)	(258)
Profit Before Tax (norm)	(3,318)	(2,957)	(1,864)	212	8,339
Profit Before Tax (FRS 3)	(3,906)	(3,274)	(2,135)	112	8,239
Tax	121	128	50	0	0
Profit After Tax (norm)	(3,318)	(2,957)	(1,864)	165	6,505*
Profit After Tax (FRS 3)	(3,785)	(3,146)	(2,085)	112	8,239
Average Number of Shares Outstanding (m)	38.2	39.0	40.9	41.8	41.8
EPS - normalised (c)	(8.7)	(7.6)	(4.6)	0.4	15.6
EPS - normalised fully diluted (c)	(8.7)	(7.6)	(4.6)	0.4	15.6
EPS - (IFRS) (c)	(9.9)	(8.1)	(5.1)	0.3	19.7
Dividend per share (c)	0.0	0.0	0.0	0.0	0.0
Gross Margin (%)	28.3	47.6	46.5	49.9	54.6
EBITDA Margin (%)	N/A	N/A	N/A	11.9%	34.8%
Operating Margin (before GW and except.) (%)	N/A	N/A	N/A	8.3%	34.0%
BALANCE SHEET					
Fixed Assets	1,363	1,357	1,027	1,077	1,177
Intangible Assets	1,120	1,184	894	944	994
Tangible Assets	144	119	79	79	129
Investments	98	54	54	54	54
Current Assets	2,632	2,705	2,771	3,445	13,914
Stocks	770	994	794	1,687	5,846
Debtors	1,072	558	558	1,259	4,413
Cash	594	783	1,049	128	3,284
Other	197	371	371	371	371
Current Liabilities	(488)	(1,316)	(1,516)	(1,978)	(4,057)
Creditors	(483)	(1,311)	(1,511)	(1,973)	(4,053)
Short-term borrowings	(4)	(5)	(5)	(5)	(5)
Long-Term Liabilities	(827)	(922)	(1,172)	(1,422)	(1,672)
Long-term borrowings	(25)	(21)	(21)	(21)	(21)
Other long-term liabilities (including loan from Growth Fund)	(801)	(901)	(1,151)	(1,401)	(1,651)
Net Assets	2,681	1,825	1,111	1,123	9,362
CASH FLOW					
Operating Cash Flow	(4,912)	(1,549)	(666)	(463)	3,564
Net Interest	(14)	(10)	(108)	(108)	(108)
Tax	70	(22)	50	0	0
Investment in intangible & tangible assets	(484)	(462)	(110)	(200)	(300)
Acquisitions/disposals	0	0	0	0	0
Financing	0	1,995	1,250	0	0
Dividends	0	0	0	0	0
Net Cash Flow	(5,340)	(48)	416	(771)	3,156
Opening net debt/(cash)	(5,549)	(564)	(758)	(1,024)	(103)
HP finance leases initiated	0	0	0	0	0
Other	356	242	(150)	(150)	0
Closing net debt/(cash)	(564)	(758)	(1,024)	(103)	(3,258)

Source: Company accounts, Edison investment Research. Note: *Normalised for tax.

Contact details	Revenue by geography
3 More London Riverside, London SE1 2AQ UK www.investor.windarphotonics.com	

Management team

CEO: Jørgen Korsgaard Jensen	Non-executive chairman: Johan Blach Petersen
Founder Jørgen Korsgaard Jensen, who had been interim CEO since September 2016, moved to a permanent position as CEO in September 2017. Jørgen is an expert in optical technology solutions and has been involved in R&D with Risø DTU for 12 years. He is also CEO and founder of OPDI Technologies, which develops and markets intelligent photonic sensors for IT and 'smart' energy solutions, and of O-Net WaveTouch, Hong Kong, which develops and markets optical touch screen technologies. Before this he was the CEO and founder of Karnitech International and CFO of Gram, Glasuld (Saint Gobain) and Farre Food.	Johan Blach Petersen is an experienced business development consultant, providing these services through J. Blach Petersen Business Development since 1987. He serves as chairman in a number of companies including M2Film, M2 Entertainment, London, Picture This Studio, Bangkok, Bila, JMM Group, Loevschall, Trifork, Teknikgruppen, Tuco Marine Group, TrimIt, Lindcon, Trekanten-Hestbæk, Østergaard Møbelindustri, Junget and is a board member of Poul Tarp, OPDI Technologies, Global Car Leasing and Kinnan. Prior to forming his own business he was a management consultant and also served as the Trade Commissioner for Denmark in Houston, Texas.
Non-executive director: Simon Barrell	**Non-executive director: Søren Høffer**
Simon Barrell qualified as a chartered accountant with Arthur Young in 1983. He then joined an accountancy practice in Nairobi, Kenya as a senior manager. On his return to the UK in 1987, he joined Binder Hamlyn. In 1994 Simon was appointed finance director of Napier Brown & Company and in 2003 FD of Napier Brown Foods. Since leaving Napier in 2005 he has acted in non-executive director and non-executive chairman capacities for a number of public companies. He continues to act as an adviser to listed and non-listed companies. He became a director of Windar in December 2014.	Søren Høffer has extensive experience in the wind energy industry market and currently holds the position of VP of sales and marketing in the LM Wind Power Group. He joined the board in December 2017.

Principal shareholders	(%)
Seed Capital, Denmark	16.9
Pasinika Sarl., Luxembourg	16.7
DTU Symbion Innovation, Denmark	10.0
M.M. 26 Holding, Denmark	9.7
Danmarks Tekniske Universitet, Denmark	5.6
Milton Holding Horsens, Denmark	5.1
Artemis Investment Management LLP, United Kingdom	4.8

Companies named in this report

China Ming Yang Wind Power Group (MY:US), General Electric Co. (GE:US), John Wood Group (WG:LN), Nordex Group (NDX1:GR), Senvion (SEN:GR), Siemens Gamesa Renewable Energy (GAM:SM), Vestas Wind Systems (VWS:DC), Xinjiang Goldwind Science & Technology Co (2208:HK)

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