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World Wind Energy Association





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# 2017 SMALL WIND WORLD REPORT

## summary

# 2017 Small Wind World Report Summary

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Data source: WWEA's Member Survey

## Small Wind World Market growing at a slower pace

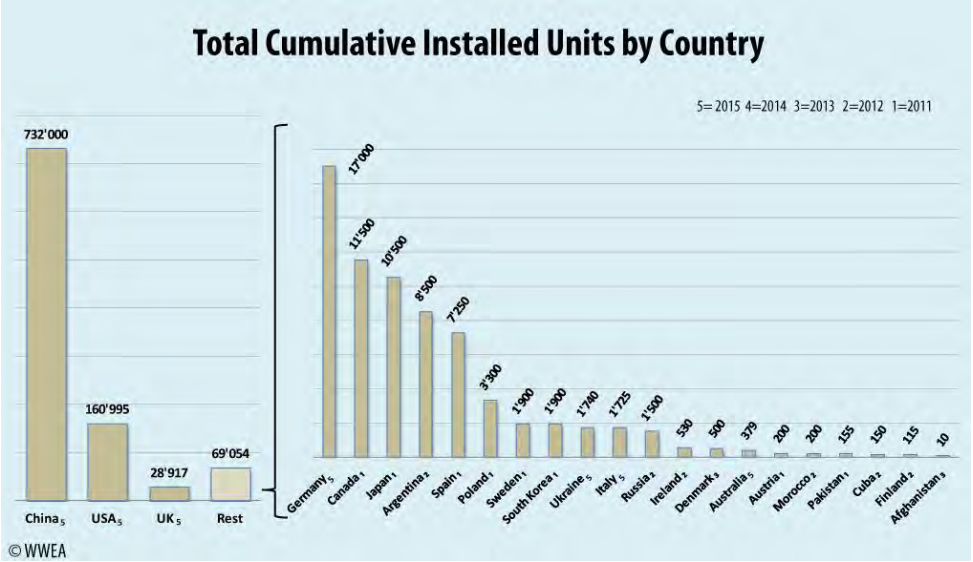
Following a recovery during 2014, the world market for small wind has again overcome a difficult 2015 with small growth in terms of units and big growth in terms of installations. The major markets, China, USA and UK, suffered again a decrease in the number of units installed in a year. A new giant in the small wind sector, the Italian market, has saved the year for many in the industry. As of the end of 2015, a cumulative total of at least 990'000 small wind turbines were installed all over the world. This is an increase of 5% (8% in 2014 and 7% in 2013) compared with the previous year, when 944'000 units were registered.


The numbers presented here are based on available figures and even exclude major markets such as India. WWEA therefore estimates an actual total number of close to one million units to be installed worldwide.

China continues to lead by far the market in terms of installed units. 43'000 units were added in 2015. Around 20'000 less than in 2014, reaching 732'000 units installed by the end of 2015. The Chinese market now represents almost 74% of the world market in terms of total installed units and 93% of the new installations in 2015. According to estimations, around half of the turbines continue to produce electricity in China given that this market started already in the early 1980s.

The small wind industry in the USA saw a similar number of new installations than in the previous year. 1'695 units were sold during 2015, 95 more than in 2014. USA is the second largest market with total cumulative units installed of 160'995, clearly behind China, but well ahead of a number of medium-sized small wind markets.

The changes in the Feed-In scheme introduced in the UK in November 2012, had a big impact in the market during the last years. Only 277 units were installed in the UK during 2015 under the FiT and Roofit program, the lowest level ever. Unfortunately there is no information available on off-grid installations.

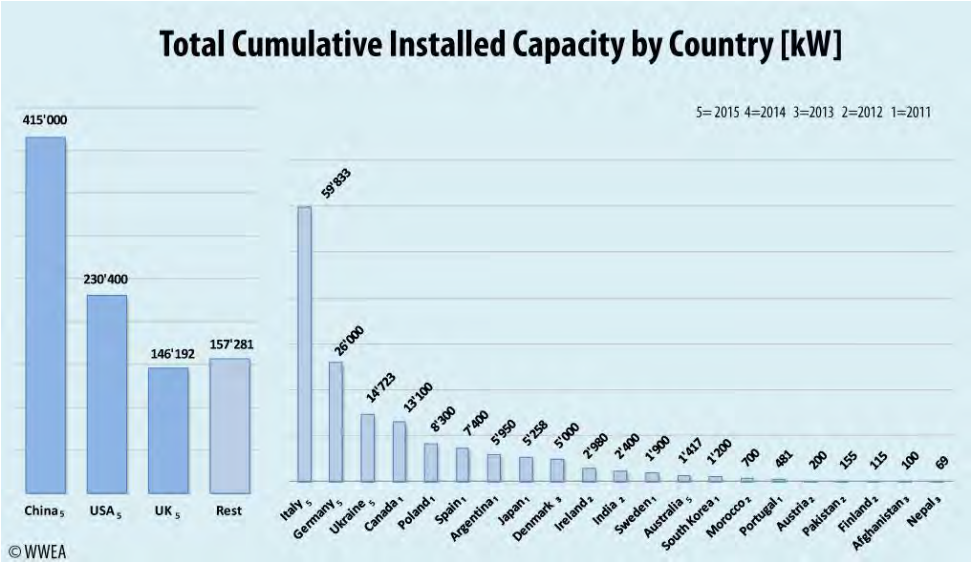



Italy has become the most important medium wind market worldwide, especially for the over 50 kW range. 115 new SWTs were installed during 2015.

Germany, Canada, Japan and Argentina are all medium-sized markets with total number of small wind turbines between 7’000 and 14’500 units.

## 14% increase in Global Small Wind Installed Capacity

The world market for small wind has showed a different picture n 2015. The small wind capacity installed worldwide has reached more than 948 MW as of the end of 2015. This represents a growth of 14% compared with 2014, when 830MW were registered.




In terms of installed capacity, China accounts for 44% of the global capacity, growing year by year as the average size of the SWTs installed in China increase. The second biggest market, USA, accounts for 25% and UK for 15%.

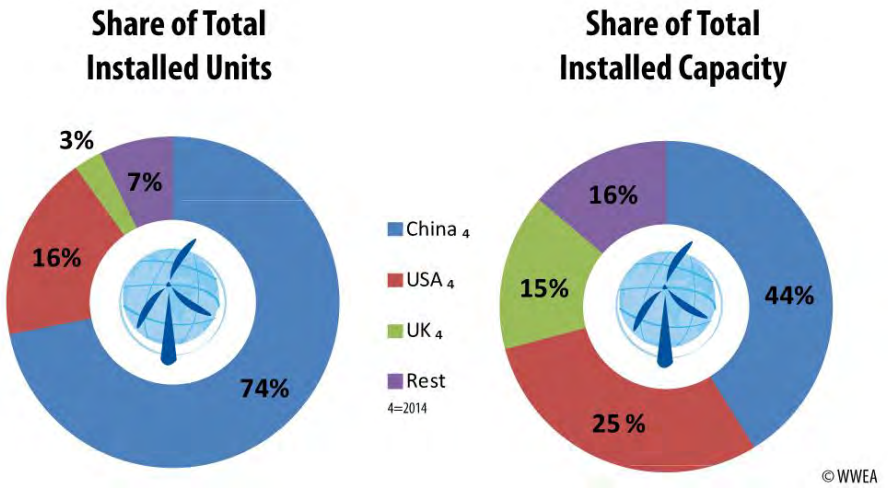
The USA small wind market grew by 4,4 MW in 2015, after 3,7MW in 2014. The small wind market accounted for $21 million in investment, slightly higher than the previous year[1].

[1] 2015 Distributed Wind Market Report, U.S. Department of Energy

In the UK, the range 1.5 – 15 kW seems to be the more active under the FiT program with 117 units out of 277 installed during the year 2015. Also, 143 units were installed under the Roofit program in the range 50 – 100 kW.

Globally, an increase in the average size of small wind turbines can be observed: In 2010, the average installed size was 0,66kW, in 2011 0,77kW, in 2012 0,84kW, in 2013 0,85kW, in 2014 0,87kW and in 2015 0,96kW.

Country wise, the average size is quite diverse: While the average Chinese turbine has a capacity of 0,56kW, small wind turbines in the US have an average capacity of 1,4 kW, in the UK the capacity has reached 5,1kW and in Italy a much higher number, 37,1kW.



## Small Wind Turbine Manufacturing

Five countries (Canada, China, Germany the UK and the USA) account for over 50 % of the small wind manufacturers. By the end of 2011, there are over 330 small wind manufacturers that have been identified in the world offering complete one-piece commercialised generation systems, and an estimate of over 300 additional firms supplying parts, technology, consulting and sales services.

Based on the world distribution of turbine manufacturers, the production of small wind remains concentrated in few world regions: in China, in North America and in several European countries. Developing countries continue to play a minor role in small wind manufacturing.

## Technology and Major Applications

The early HAWT technology has dominated the market for over 30 years. Based on the study of 327 small wind manufacturers as of the end of 2011, 74% of the commercialised one-piece small wind manufacturers invested in the horizontal axis orientation while only 18% have adopted the vertical design. 6% of the manufactures have attempted to develop both technologies. As the majority of the vertical axis models have been developed in the past 5 to 7 years, the scale of market share remains relatively small. The average rated capacity of VAWT is estimated to be 7,4kW with a median rated capacity of merely 2,5kW. In comparison with the traditional horizontal axis orientation, the average and median rated capacity are much smaller. Out of the 157 models of vertical turbines catalogued in this report, 88% are below 10kW and 75% are below 5kW. This corresponds well with the actual market demand, as the average unit sold in 2011 had a capacity of 1,6 kW.

Despite a market trend that leans towards a grid-tied system with larger capacity, off-grid applications continue to play an important role in remote areas of developing countries. Off-grid applications include rural residential electrification, telecommunication stations, off-shore generation, and hybrid systems with diesel and solar. Over 80 % of the manufacturers produce stand alone applications. In China, off-grid units comprised 97% of the market in 2009, and 2,4 million households still lack electricity. In USA, off-grid small wind turbines account most of units deployed in distributed wind applications. For these reasons off-grid systems

will continue to play a significant role, in China and in many other countries with non-electrified areas.

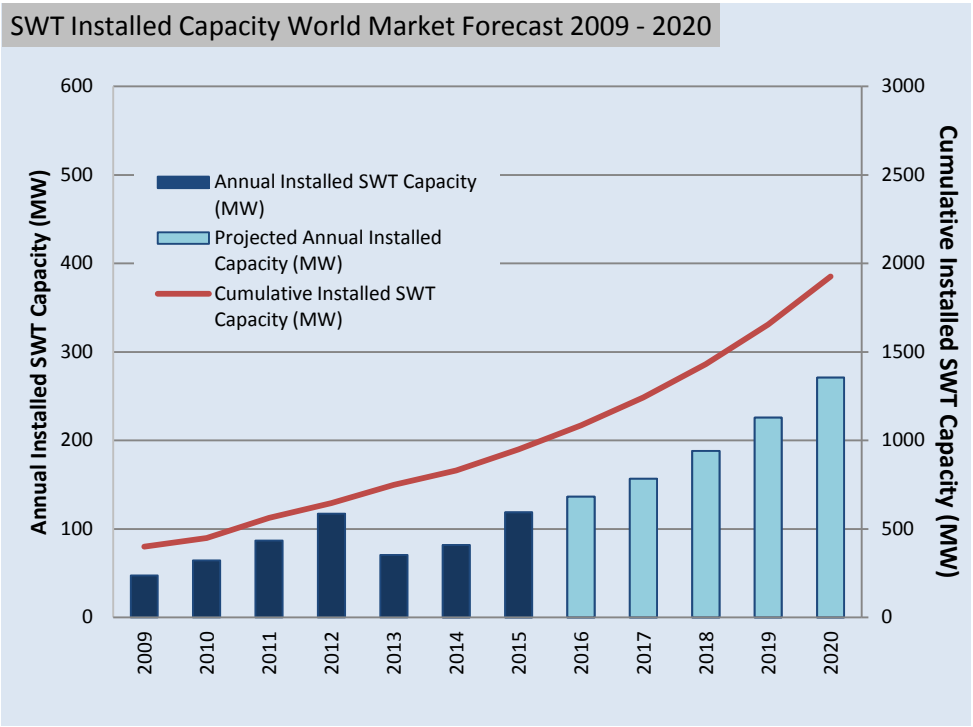
## Small Wind FiTs

***Table. Small Wind Feed-in Tariff Pricing Worldwide***

| Country/ Region | Size Limit | EUR/kWh | Country/ Region | Size Limit | EUR/kWh |
|---|---|---|---|---|---|
| **Canada** | | | **Japan** | < 20kW | 0,464 |
| **Nova Scotia** | < 50kW | 0,340 | | ≥ 20kW | 0,185 |
| | > 50kW | 0,089 | **Luxemburg** | | 0,091 |
| **China** | | 0,134-0,201 | **Portugal** | < 3,68kW | 0,432 |
| **Chinese Taipei** | 1-20kW | 0,237 | **Serbia** | | 0,092 |
| | > 20kW | 0,078 | **Slovenia** | < 1 MW | 0,095 |
| **Czech Republic** | | 0,071 | **Switzerland** | < 10MW | 0,179 |
| **Denmark** | < 10kW | 0,330 | **Switzerland** | < 10MW | 0,179 |
| | 10-25kW | 0,200 | **UK** | < 50kW | 0,097 |
| **Greece** | < 50kW | 0,250 | | <100kW | 0,0635 |
| **Italy** | < 1MW | 0,300 | **USA** | | |
| **Israel** | < 15kW | 0,250 | **Hawaii** | < 100kW | 0,110 |
| | 15-50kW | 0,320 | **Vermont** | < 15kW | 0,200 |

## World Market Forecast 2020

Even though the global small wind market slow growth during the last two years, it is expected that it will continue increasing. A minimum growth rate of 12% is anticipated to continue. The industry is forecasted to reach approximately 270MW of newly installed capacity added annually in 2020 and achieves a cumulative installed capacity of about 1,9GW by 2020.



## Definition of Small Wind

Technically, there are several definitions of small wind turbines: The most important international standardisation body, the IEC, defines SWTs in standard IEC 61400-2 as having a rotor swept area of less than 200 $m^2$, equating to a rated power of approximately 50 kW generating at a voltage below 1'000 V AC or 1'500 V DC. In addition to this standard, several countries have set up their own definition of small wind. The discrepancy of the upper capacity limit of small wind ranges between 15 kW to 100 kW for the five largest small wind countries. The major pattern of today`s upper limit capacity leans towards 100 kW. This is largely caused by the leading role of the North American and European market. Over the past decades, a growing average size of the small wind capacity has been observed. This pattern is largely caused by the increasing interest in larger grid-connected systems and a comparatively diminishing market of standalone systems. Nevertheless, in order to create a standardised and healthy small wind market share, an agreeable definition of small wind should be agreed upon.

This report intends to bring forward the discussion on the definition of small wind and aims to create eventually a unanimous international classification system of small wind accepted by all parties of the industry. For the purpose of generating comparable graphs, figures and charts in this report, 100 kW is chosen as the temporary reference point. The definition, however, requires further discussion until a globally harmonised agreement is reached.

In practise, the major pattern of today's upper limit capacity leans towards 100 kW, although the IEC defines a limit of equivalent to 50 kW. In order to create a standardised and healthy small wind market share, an agreeable definition of small wind should be agreed upon. This report intends to bring forward the discussion on the definition of small wind and aims to create eventually a unanimous international classification system of small wind accepted by all parties of the industry. For the purpose of generating comparable graphs, figures and charts in this report, 100 kW is chosen as the temporary reference point. The definition, however, requires further discussion, until a globally harmonised agreement is reached.

## Bergey Windpower

www.bergey.com

Products type: HAWT
Products size (kW): 1/6/ 7,5/ 10
Applications: GC/SA
Presence: USA, Worldwide

Bergey Windpower is the oldest and most experienced manufacturer of residential-sized wind turbines in the world.

Thirty years ago Bergey pioneered the radically-simple "Bergey design" that has proven to provide the best reliability, performance, service life, and value of all of the hundreds of competitive products that have come and gone in that time. With only three moving parts and no scheduled maintenance necessary, the Bergey 10 kW has compiled a service record that no other wind turbine can match. We back it up with the longest warranty in the industry.

## City Windmills

www.city-windmills.com

Products type: VAWT
Products size (kW): 0,5/1/2
Applications: GC/SA
Presence: UK, Switzerland, USA

City Windmills has the objective to become the world leader in small wind turbines for factories, office buildings and households. The path to achieve such an objective is to provide clients with a suite of windmill products which can produce energy and optionally be used for advertisement for commercial users.

City Windmills is headquartered in the UK with operational centers also in Switzerland and USA.

## dibu Wind

www.dibu-energie.de

Products type: HAWT
Products size (kW): 5,5,/7,5/15
Applications: GC/SA/HB
Presence: Germany

dibu Wind production GmbH sells windturbines from 5 to 15kW. The inovative design allows most extensive maintenance, low noise, and high efficiency. In addition, dibu is a competent partner for the planning and construction of photovoltaic systems.

## Envergate

*www.envergate.com*

envergate
SWISS WIND TURBINES

Products type: VAWT
Products size (kW): 20/100
Applications: GC
Presence: Switzerland, Worldwide

Envergate Energie AG develops, manufactures and sells wind turbines. Are you thinking about a classical rotor? Think vertically! Do wind turbines have to look like they usually do? They don't have to. There's a different way. More intelligent. We're convinced of it.

Our wind turbines guarantee high wind yield and above average efficiency. We research and further develop our innovative technology. Progress and growth - a dynamic process. We stay in motion. Like the wind that shows us the direction.

Clean. Lean. Intelligent.

## Eocycle

*www.eocycle.com*

EOCYCLE
TECHNOLOGIES

Products type: HAWT
Products size (kW): 25
Applications: GC, SA
Presence: Canada


Eocycle Technologies Inc. develops, manufactures and commercializes worldwide the EOCYCLE 25, a state-of-the-art 25 kW direct-drive wind turbine for distributed wind energy applications.

Capitalizing on more than 12 years of internal R&D and prototyping, Eocycle Technologies stands out from its peers by being an integrated technology and manufacturing company.

Eocycle Technologies holds all intellectual property and commercial rights for every key component of its wind turbine, including Eocycle's patented Transverse Flux Permanent Magnet (TFPM) generator technology, which is capable of achieving – in a smaller and lighter package – much higher torque and power at lower rotational speeds than competing technologies.

## Ghrepower

*www.ghrepower.com*

GHREPOWER
Powering Your Future

Products type: HAWT
Products size (kW): 0,3/0,5/2/3/5/10/30/50/100
Applications: GC/SA
Presence: China, Belgium, France, Italy, UK, USA

GHREPOWER is a leading wind turbines manufacturer which specializes in R&D and manufacture in China.

We have an integrated design, production, installation, commissioning, sale and after-sale service, and our products are widely applied for mobile communication, military, maritime monitor, home use, commercial business and remote area etc.

Our products export to all over the world, such as Germany, UK, France, Italy, Korea etc. The company's wind and solar hybrid energy system installed base also exceeds 10'000 units.

## HY Energy

*www.hyenergy.com.cn*

Products type: HAWT
Products size (kW): 0,3/0,4/0,6/1/1,5
Applications: GC/SA/HB
Presence: China

HY Energy Co., Ltd is a high-tech enterprise engaged in designing, manufacturing, marketing and severing in wind-solar hybrid power system integration technique.

HY Energy Co., Ltd has made tremendous contributions to improve national wind generator manufacturing level under the breakthrough technique on wind turbine design conception and production craft since 2001.

## Kingspan Wind

*www.kingspanwind.com*

Products type: HAWT
Products size (kW): 3/6/15
Applications: GC/SA/HB
Presence: UK, Worldwide

Born as the result of over 30 years innovation, our urbines have surpassed all expectations when it comes to delivering clean, green electricity for farms, land owners, schools, businesses and community projects.

Installed on every continent, our turbines have been delivering efficient, reliable and affordable on-site generation for customers in over 70 countries. Designed, tested, certified and manufactured in Great Britain – complemented with our specialist in-house wind team with over 25 years' experience in the International Small Wind Industry.

## KLiUX energies

*www.kliux.com*

Products type: VAWT
Products size (kW): 1,8/3,6
Applications: GC/HB
Presence: Spain

**Kliux Energies** is a Spanish company, with international presence, that specializes in DISTRIBUTED ENERGY SOLUTIONS based on renewable sources. Kliux has worldwide exclusivity rights to manufacture and sell the GEO1800 VERTICAL AXIS WIND TURBINE, developed by Geolica Innovations which also integrate into hybrid system with solar photovoltaic technology. Its unique aerodynamic design results in a noiseless, energy generating turbine that also performs extremely good in architectural integration and visual impact. THE TRULY URBAN WIND TURBINE.

## Superwind

*www.superwind.com*

Products type: HAWT
Products size (kW): 0,350
Applications: GC/SA/HB
Presence: Germany, Worldwide


The Superwind 350 is a small wind generator for professional use, which even under extreme conditions works autonomously and automaticly. It is often used on sites where there is no grid available. The electric power generated by Superwind charges batteries and can be used directly for 12V- or 24 V-appliances.

Ideal fields of application for example are navigational aids, traffic control systems, environmental monitoring stations or transmitters, but also sailing yachts, campers, summer cottages and mountain shelters. Concerning the rural electrification in remote areas of developing countries, Superwind generators provide electric power for whole families.

## Tuge Energia

*www.tuge.ee*

Products type: HAWT
Products size (kW): 10/20
Applications: GC/SA
Presence: Estonia

TUGE Energia manufactures and develops small wind turbines under TUGE® trademark. Turbine model TUGE®10 and TUGE® 20 are in serial production. TUGE® 2.5, TUGE® 10 with larger rotor area and TUGE® 50 are under development.

TUGE® is a registered trademark of TUGE Energia and turbine design has European certificate for design for harmonization in the internal markets.

## Viking Wind

*viking-wind.energy*

Products type: HAWT
Products size (kW): 25
Applications: GC, SA
Presence: Denmark

The Viking household wind turbine is based on the robust and well-known Danish concept – which has created success for the wind turbine industry in Denmark. The turbines are type approved in Denmark and meet the international standards. The turbines are delivered with a 2 year warranty on all components

The turbine design is functional which makes the installation and maintenance easy and cheap. With the three blades design, the turbines have the same majestic look as the large MW turbines.

The first Viking wind turbine was constructed in 2009 and is the household wind turbine in its class which has been tested during the longest period of time. This makes the Viking wind turbine strong, aesthetic and dependable.

## Gresa Group

*www.ggc.com.ua*

Products type: HAWT
Products size (kW): 0.8, 1.6, 4, 20, 45
Applications: GC/SA
Presence: Ukraine

The company operates since 1991, continuously evolving and constantly expanding range of services and equipment, as detailed in the section " OUR COMPANY ".

Initially 90 company is one of the first supply and install for the banking system of Ukraine and enterprises - uninterruptible power supply (UPS), which allowed a fragile power system to maintain a constant running mode servers banks and enterprises in Ukraine.

Company occupies a special place in the market of heat supply, heating, water, air, electricity, renewable energy, thermal insulation of buildings.

## Zhejiang Huaying Wind

*www.huayingwindpower.com*

Products type: HAWT
Products size (kW): 2/5/10/30
Applications: GC/SA/DH/PP
Presence: China

Zhejiang Huaying Wind Power Generator Co.,Ltd, a member of Tongkun group--china's leading industrial conglomerate, is a high tech startup company specialized in research, production and marketing of small and middle sized wind turbine system. Located 120km away from Shanghai, the company enjoys excellent traffic convenience.

The company has made a pioneering step in the development of a brand new series of downwind- variable blade pitch wind turbines. ISO9001 quality system established and CERoHs certified, the company has a complete series of strict testing and quality guarantee methods for all of the wind turbine and system.

## ZKEnergy Technology

*www.zkenergy.com*

Products type: HAWT
Products size (kW): 0.4/0.6/1
Applications: GC/SA/HB
Presence: China

In ZKEnergy Technology Co., Ltd. is a professional high-tech enterprise engaged in the development, production and application in the field of clean energy, small and medium-sized wind power and solar integrated application systems.

Innovation, cooperation, responsibility and integrity are our core values.

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# Membership Application

**To join simply fill in and return this form by fax +49 228 369 4084, or sign up online at www.wwindea.org**

## We/I agree to the five WWEA principles* and join WWEA as

** Available at www.wwindea.org*

☐ **Ordinary member (association)**

Membership fee: 1 % of the wind energy related annual budget based on the preceding year. The minimum fee is 100 €, the maximum 15'000 €

☐ **Scientific member (scientific institutions)**

Membership fee: If headquartered in a non-OECD country 100 €; in an OECD country 500 €

☐ **Corporate member (commercial enterprise, public/governmental body)**

Membership fee: Corporate members have to pay 0,1 % of their wind energy related annual turnover based on the preceding year. The minimum fee is 100 € (if headquartered in a non-OECD country); in an OECD country 1'000 €. The maximum fee is 15'000 €. Public bodies and similar organisations might apply for special regulations.

*Small* wind companies with an annual turnover up to 100'000 € pay 150 €; up to 500'000 €: 300 €; up to 1 Mio. €: 500 €, more than 1 Mio. €: 1'000 € respectively 0,1 % of their annual turnover.

☐ **Individual member**

Membership fee: 80 € ** / 50 € for students

*** Does not apply to individuals related to the wind energy sector.*

**Membership fee = _____ €**

Name/Organisation:

_____

Website:

_____

Address:

_____

_____

E-Mail:

_____

Tel.: _____ Fax: _____

**Place, Date: _____ Signature: _____**