

Making the business case for small wind turbines

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Opportunities for small wind turbines in urban areas

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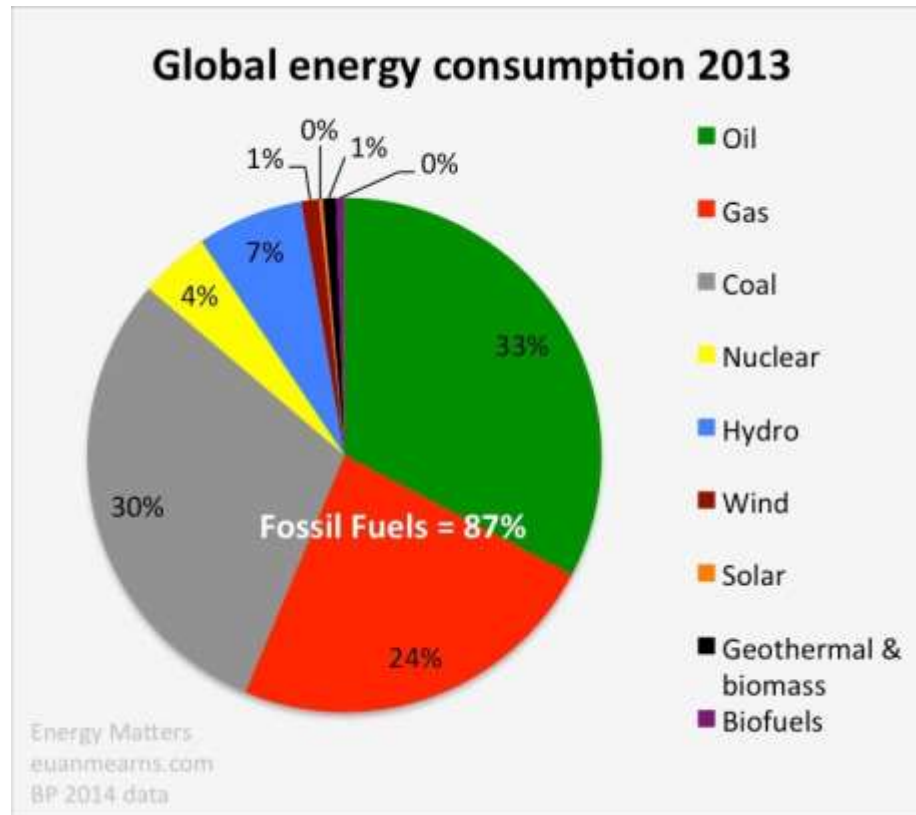
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Energy, Renewable Energy and Wind Energy

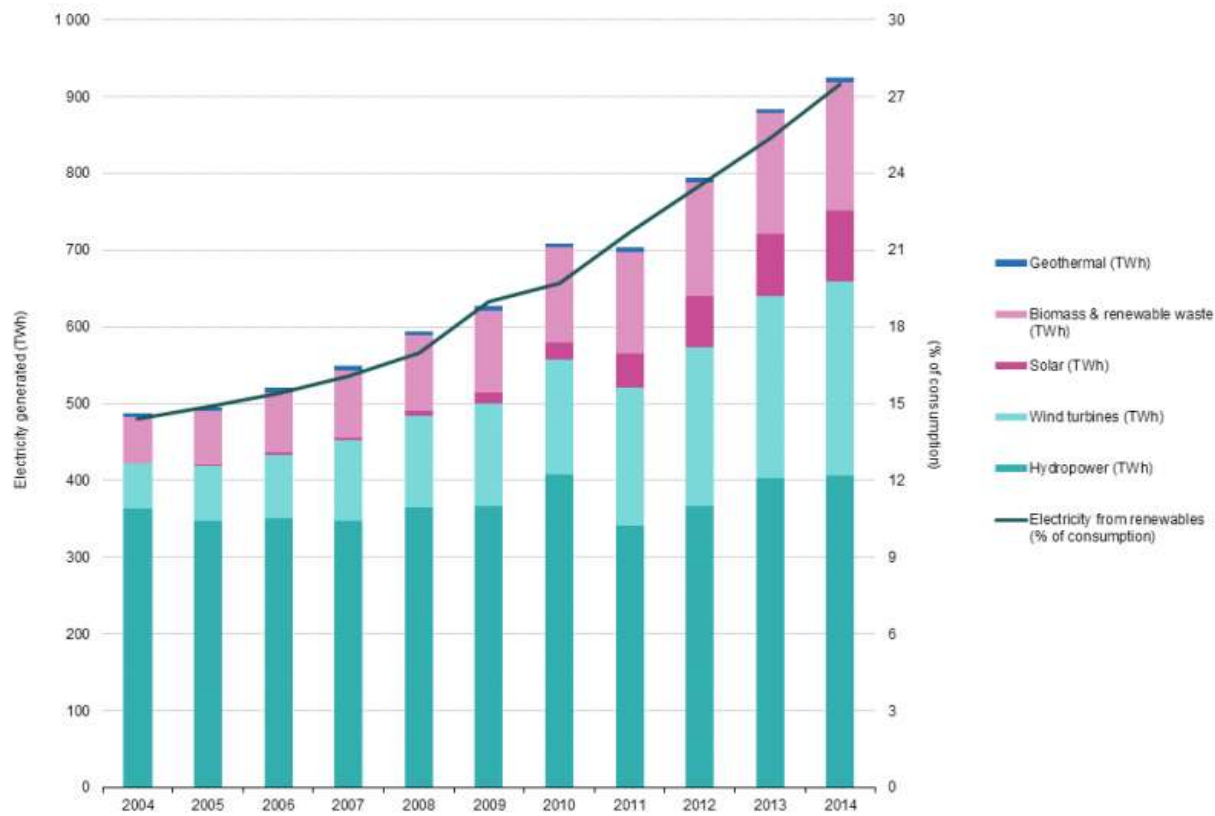
- Small Wind Statistics
- Is Small Wind a market?
- What is its perspective?

Global Energy Consumption 2013



Electricity generated from renewable energy sources, EU-28, 2004–14

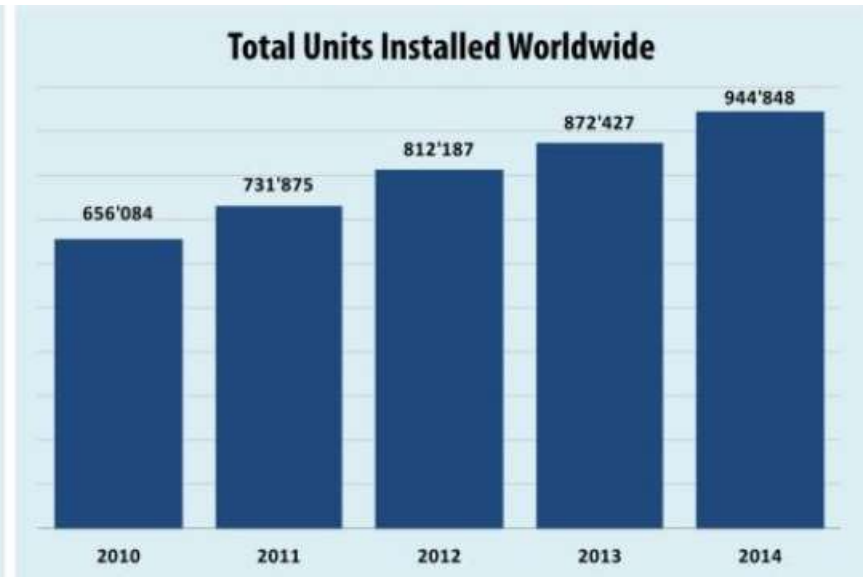
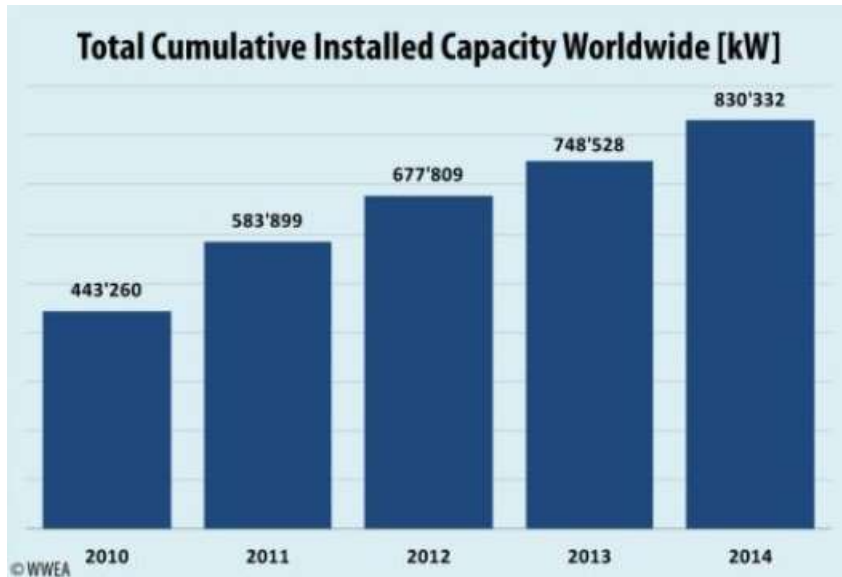
Wind energy 2014 circa 250 TWh (20% of RE)
Main producers RE: Europe and Brazil



Source: Eurostat (online data codes: nrg_105a and tsdcc330)

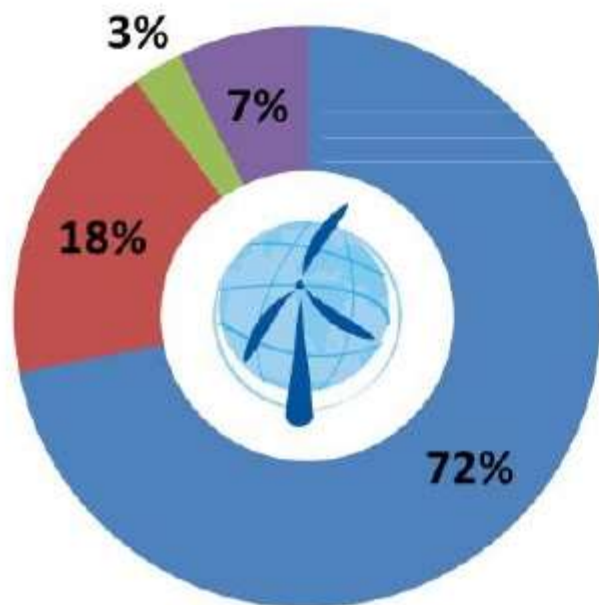
Installed SWT units and capacity (worldwide)

- Small Wind Turbines: 1 – 100 kW

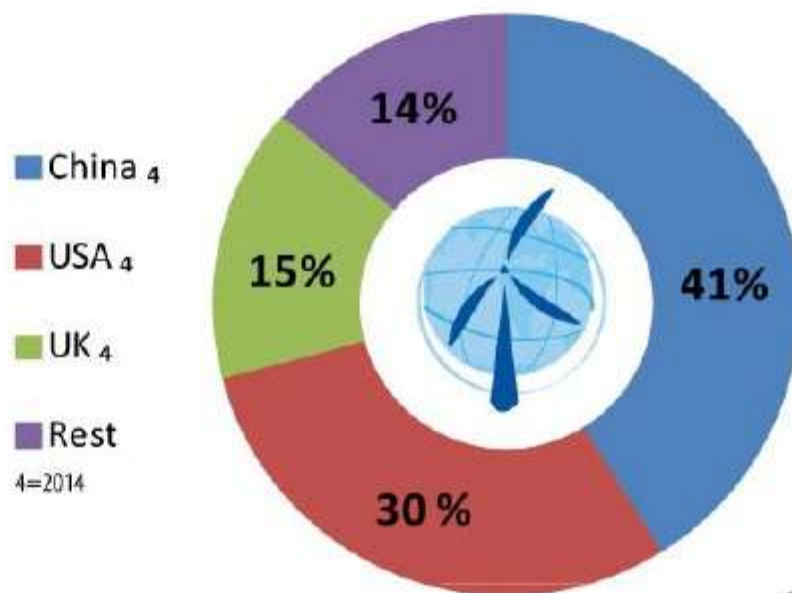


Distribution of installed units and capacity

Share of Total Installed Units



Share of Total Installed Capacity



- China 4
 - USA 4
 - UK 4
 - Rest 4
- 4=2014

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Conclusions

- Small Wind is a market
 - A niche
 - Wind Energy generated in EU 2016: 300 TWh
 - Small wind: Global installed capacity: 1 GW
 - Total installed units: 1.1 million
 - Expected growth per year till 2020: 20%



Barriers to overcome

- Negative image from the past
 - Underperformance: technical and energy generation
 - Greenwashing
- Cost reduction (produce, operate, maintain)
 - Declining prices from PV (main competitor)
- Incentive programs that favour PV over Small Wind

- Objectives SWIP are essential
 - 40% reduction maintenance cost
 - 9% increase of energy performance



Average price development SWTs

■ SWT (kW)	<2,5	2,5 – 10	10 – 100
■ US(\$)	8.200	7.200	6.000
■ UK(\$)		6.200	4.900
■ China(\$)	Average 1.720		

■ Production companies:

- A shake out due to crisis.
- Professionalising: 5 companies manufacture 50% of units
- Smaller ones: develop with big companies like Siemens, buy/manufacture in China and assemble.



Drivers for Small Wind

■ Primary buyers SWTs

- Owners comm., agricultural, residential properties looking for increased energy independence
- Developers of micro-grids and remote systems to bring power to rural areas

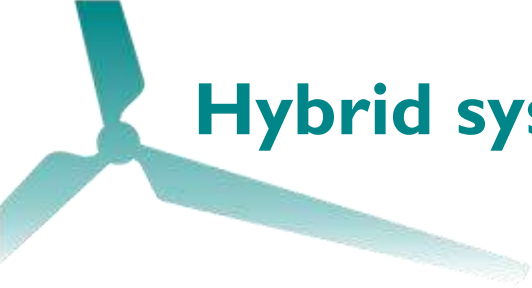
■ Incentives – Feed-in-tariffs (Fit)

- Decline in UK, US and China (to a lesser degree)
- Increase: Japan: Fit - \$ 0.47/kWh, <2.5kW.
 - Denmark: Fit - \$ 0.37/kWh, <10kW
 - Italy: Fit - \$ 0.32/kWh, 1-20 kW
 - Fit - \$ 0.29/kWh, 20-200 kW

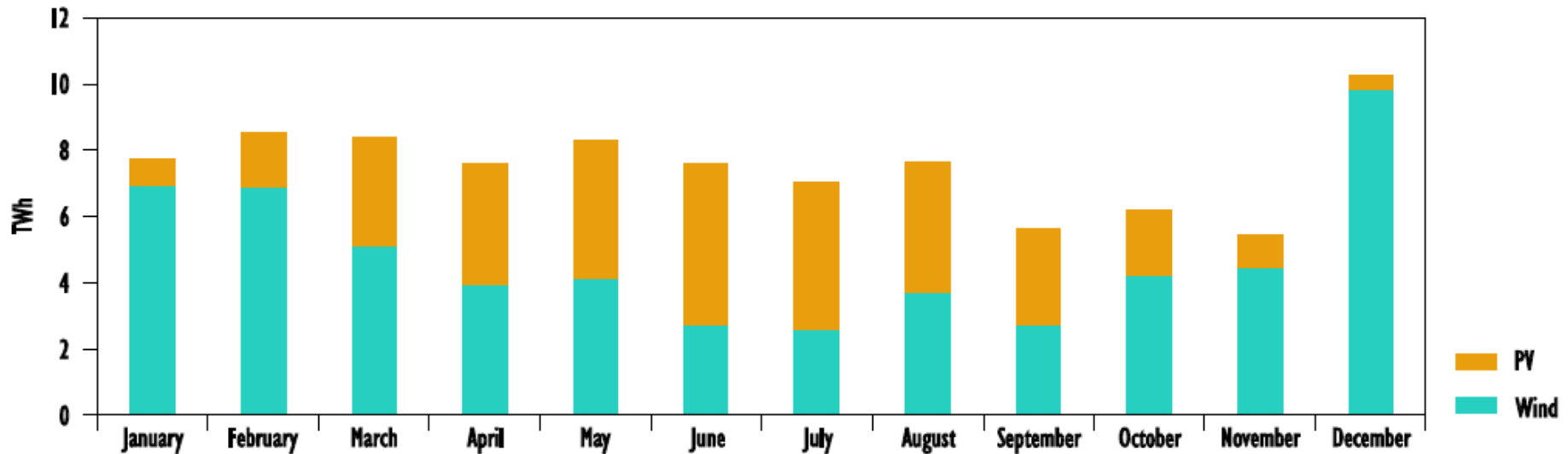


Challenges

- Find markets to build on the strengths
 - Off grid (micro-grid), rural, remote
 - Enough wind, limited solar
- Professionalise installation, operation and maintenance
 - Wind resource assessment: right places to install, wind harvest assessment in the future
- Economies of scale / cost reduction
 - Level playing field for incentives
 - Support permitting process
- Business models
 - Financing: wind lease schemes, peakshaving high initial investments
 - Cooperatives: with citizen involvement (increase acceptance)
 - Energy storage systems
- Hybrid systems



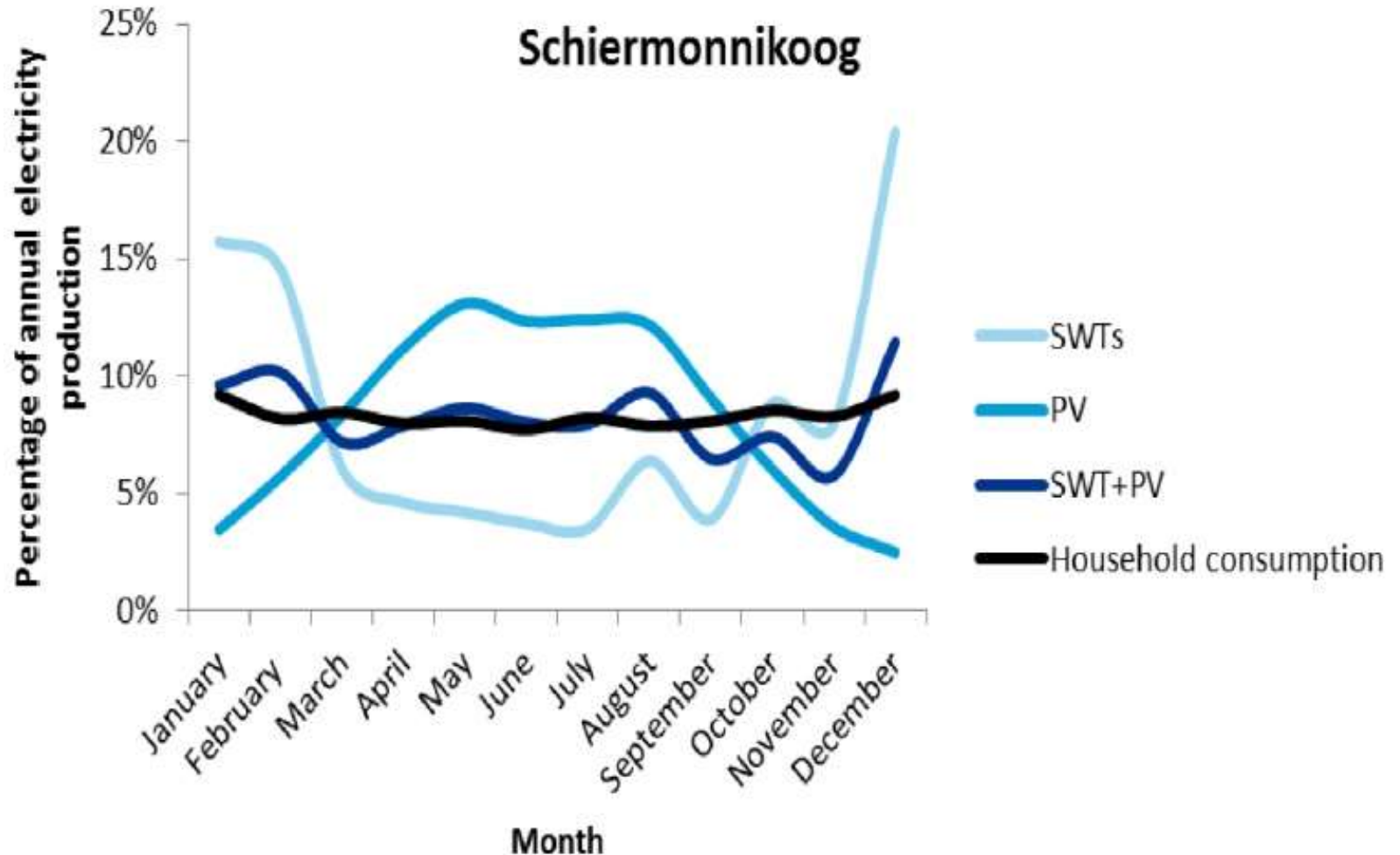
Hybrid systems: SWT + PV



Note: TWh = terawatt hour.

Source: Adapted from Fraunhofer ISE (2016), "Monthly electricity generation in Germany in 2016", energy chart, www.energy-charts.de/energy.htm.

Hybrid systems: energy autarky by synergy of SWT + PV





Urban and peri-urban areas

- Focus on increasing the numbers of installed units
- Deliver a good product
- Develop a positive image of Small Wind

- A flourishing SWT industry will develop
- And penetration to urban and peri-urban areas will start to happen

- Thank You!