Wind power in cold climate in the global energy landscape

Bonn, 23 January 2017

Stefan Gsänger

World Wind Energy Association

World Wind Energy Association

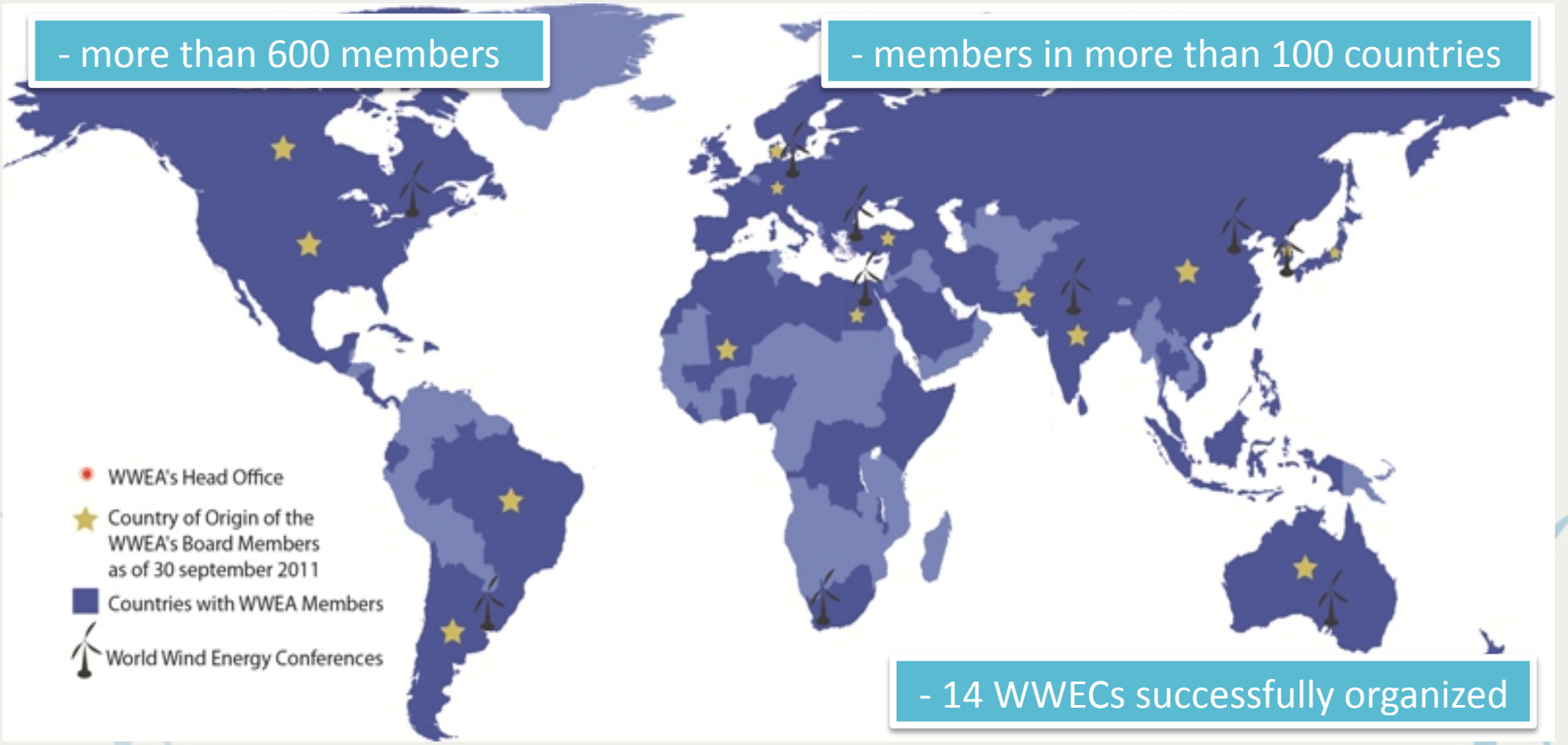
- Founded in July 2001 in Copenhagen, Denmark
- Head Office since July 2003 in Bonn, Germany

- <u>Our Members:</u>

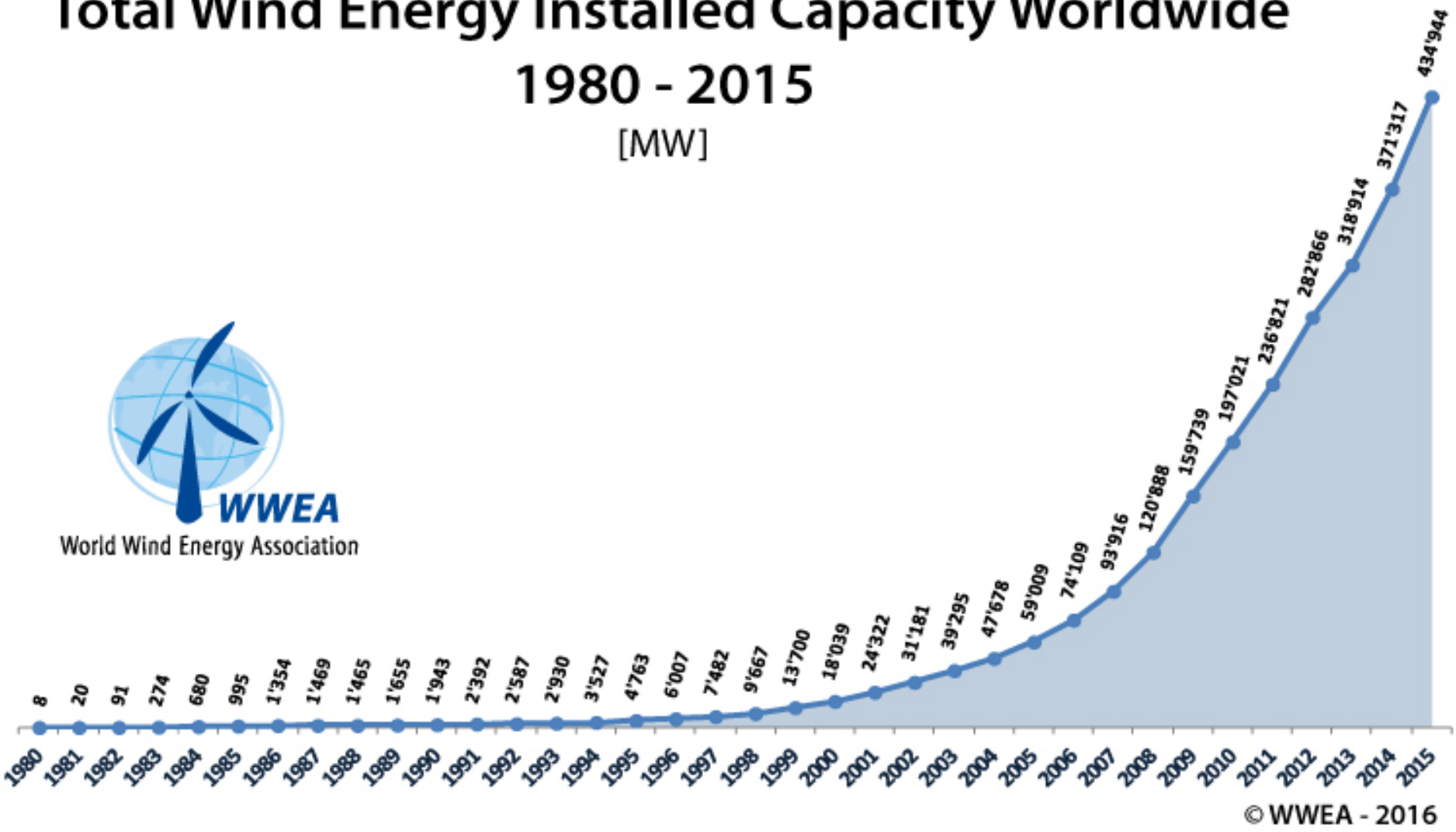
  National and regional associations and NGOs
  Universities and scientific institutes
  Companies and public bodies
  Individuals

- Ordinary members
- Scientific members
- Corporate members
- Individual members

The World Wind Energy Association

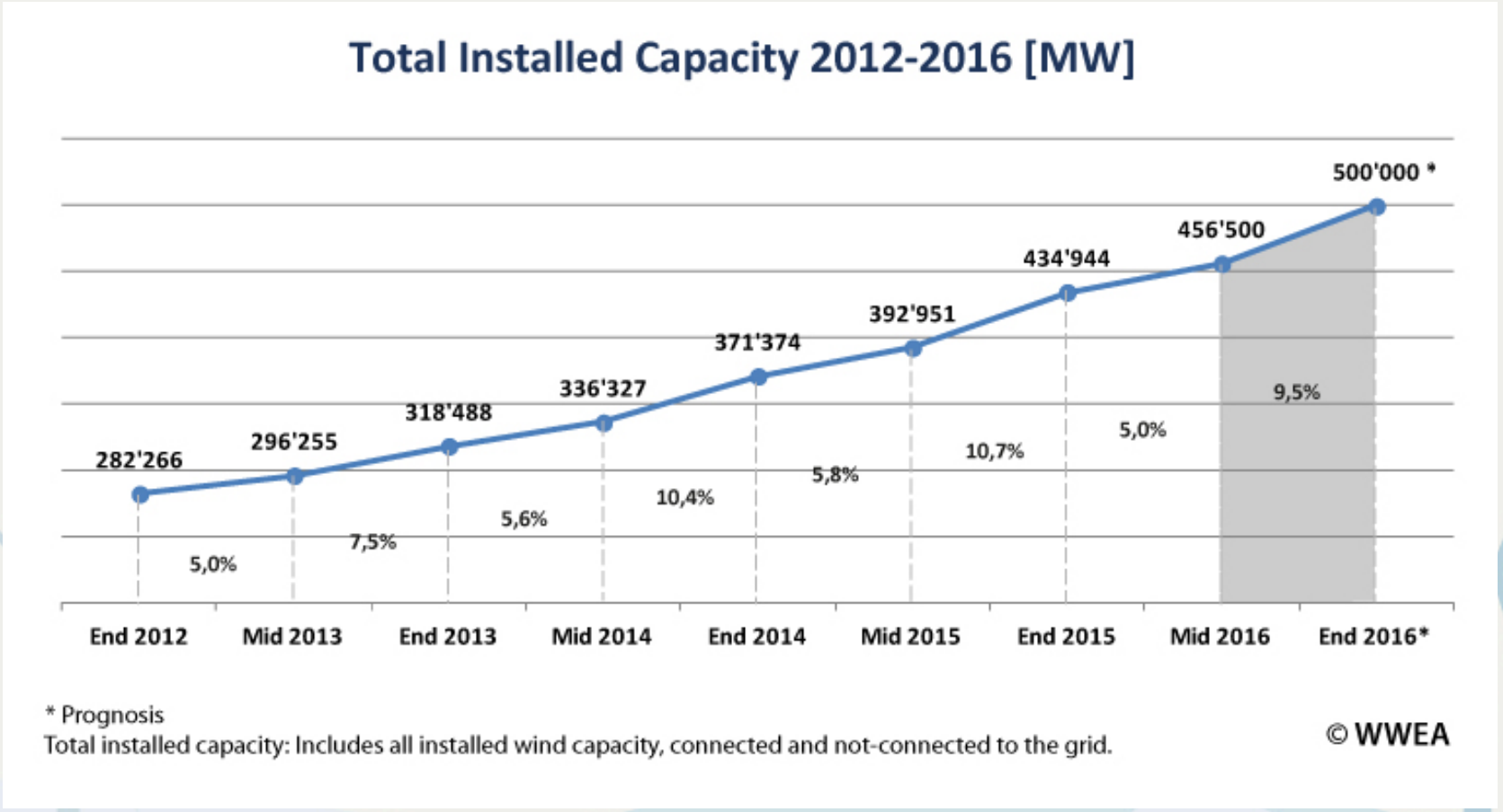


Total Wind Energy Installed Capacity Worldwide
1980 - 2015
[MW]



World Wind Market Status

By the end of June 2016:

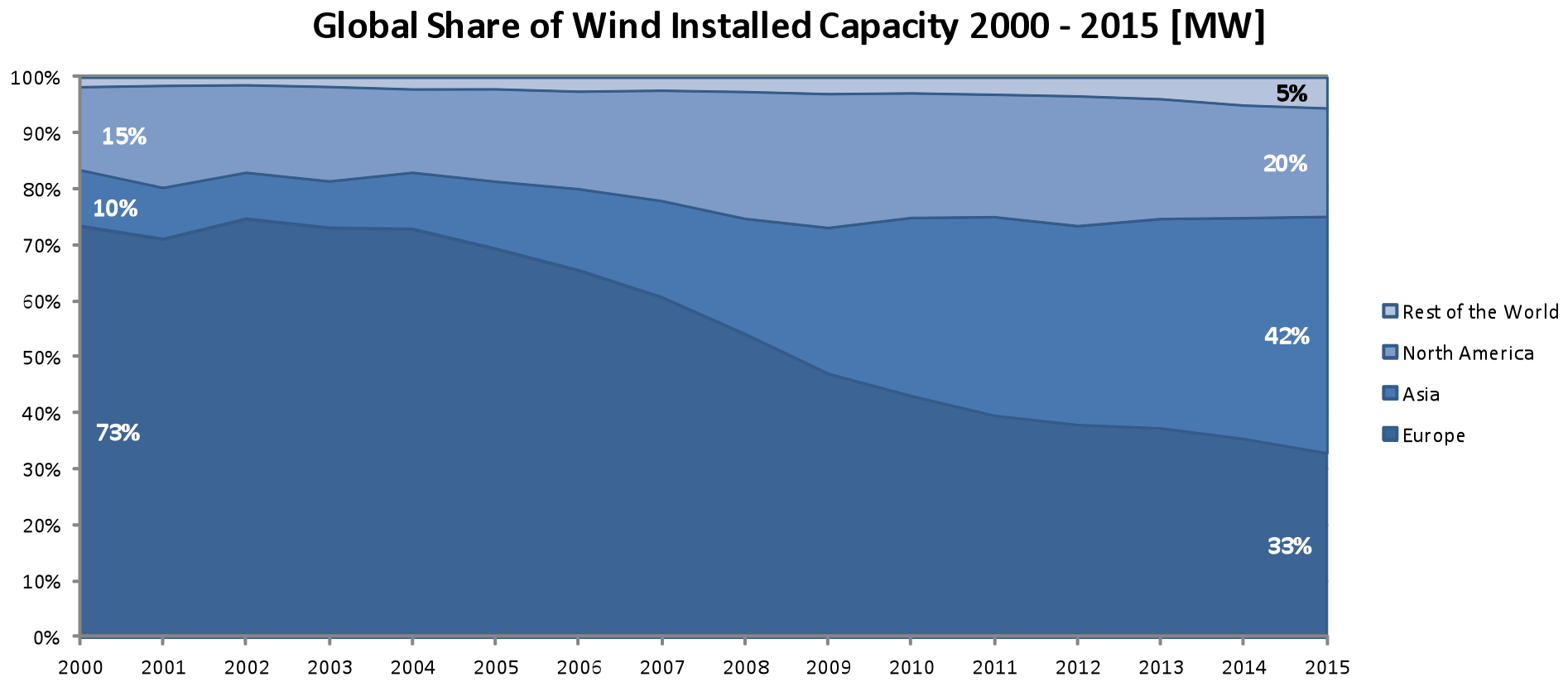


World Wind Market Status

Position	Country/Region	Total capacity June 2016 [MW]	Added capacity H1 2016 [MW]	Total capacity end 2015 [MW]	Added capacity H1 2015 [MW]	Total capacity end 2014 [MW]	Added capacity H1 2014 [MW]	Total capacity end 2013 [MW]	Total capacity June 2013 [MW]
1	China	158'000	10'000	148'000	10'101	114'763	7'175	91'324	80'827
2	United States	74'696	830	73'867	1'994	65'754	835	61'108	59'884
3	Germany	47'420	2'389	45'192	1'991	40'468	1'830	34'660	32'458
4	India	27'151	2'392	24'759	1'297	22'465	1'112	20'150	19'564
5	Spain	22'987	-	22'987	-	22'987	-	22'959	22'918
6	United Kingdom	13'940	320	13'614	872	12'440	649	10'711	9'776
7	Canada	11'298	109	11'205	510	9'694	723	7'698	6'578
8	France	10'861	568	10'293	523	9'296	338	8'254	7'697
9	Brazil	9'810	1'095	8'715	838	5'962	1'301	3'466	2'788
10	Italy	9'101	143	8'958	124	8'663	30	8'551	8'417
11	Sweden	6'338	309	6'029	157	5'425	354	4'470	4'271
12	Poland***	5'300	200	5'100	283	3'834	337	3'390	2'798
13	Turkey	5'146	428	4'718	431	3'763	466	2'959	2'619
14	Denmark*	5'089	25	5'064	76	4'883	83	4'772	4'578
15	Portugal**	5'040	6	5'034	-	4'953	105	4'724	4'547
	Rest of the World***	44'309	2'900	41'409	2'600	35'968	2'275	29'718	26'861
	Total	**456'486**	**21'714**	**434'944**	**21'678**	**371'317**	**17'613**	**318'914**	**296'581**

* end of May 2016 ** end of April 2016 *** own estimation

Installed Wind Capacity Worldwide



Wind Power Worldwide

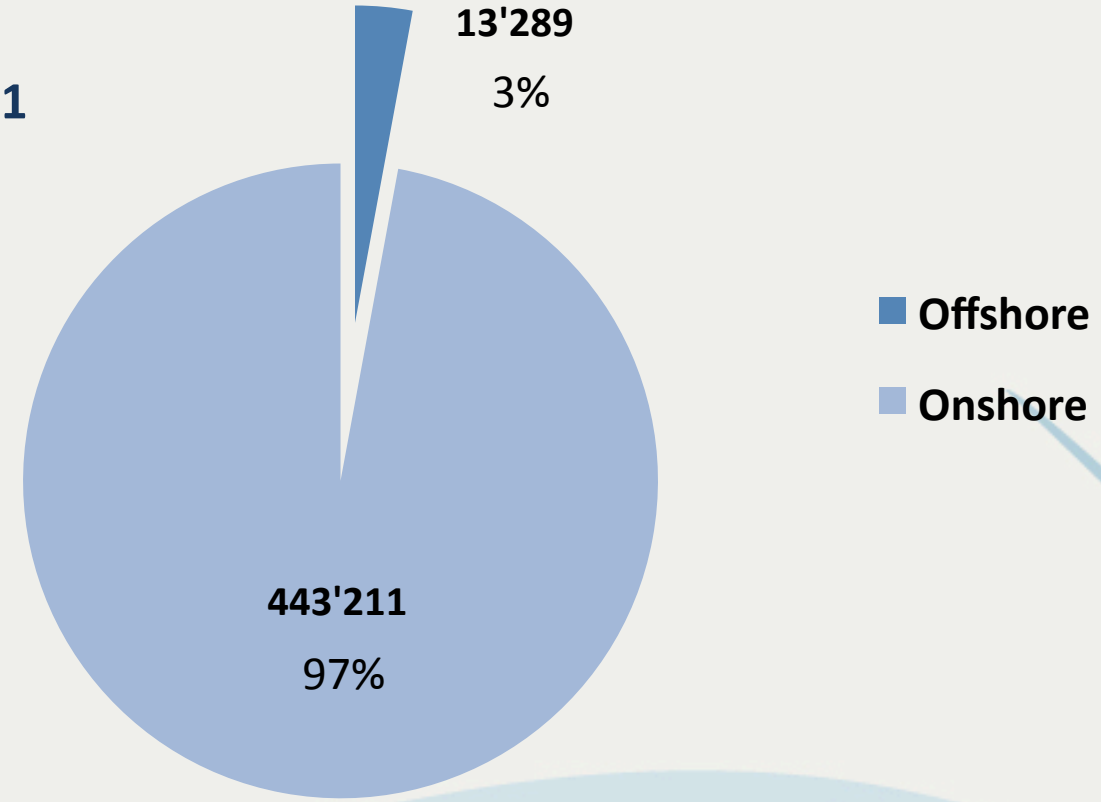
- Electricity generated: ~ 1000 TWh
- Share in global electricity demand: ~ 5 %
- Countries with high wind shares:

Denmark	> 40 %	Scotland	41 %
Spain	21 %	Portugal	> 20 %
Uruguay	18 %	Ireland	16 %
Germany	13 %	United Kingdom	11 %

World Wind Market Status: Offshore

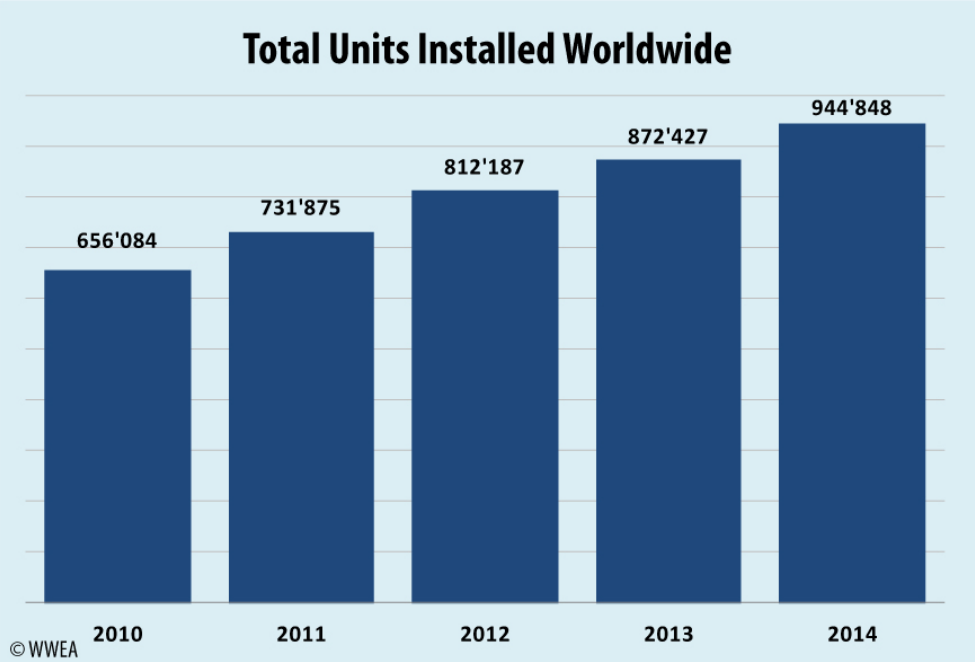
By the end of June 2016:

More than 900 MW offshore added in H1 2016

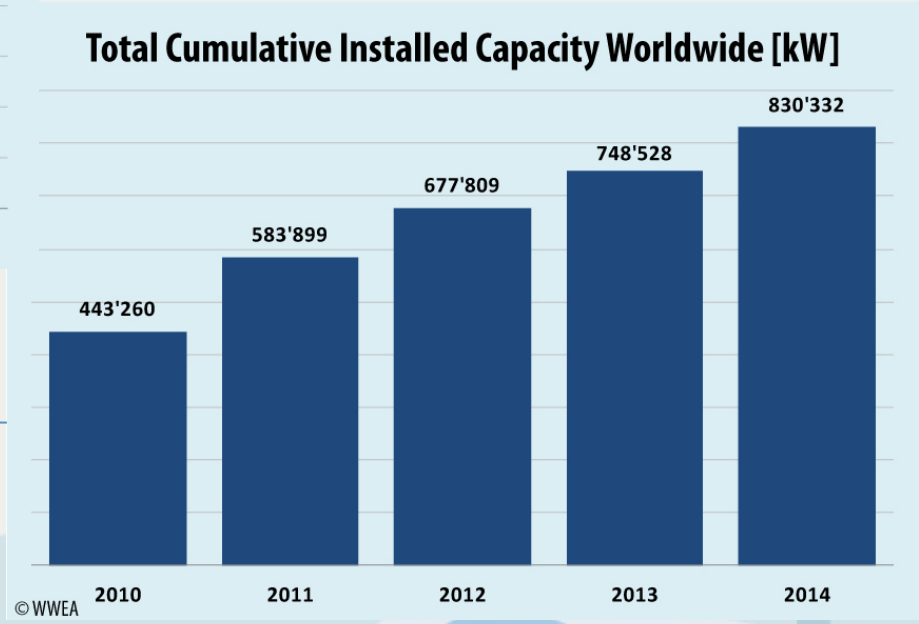


World Wind Market Status: Small Wind

By the end of 2014:



New installations: 74’400 units
Growth rate: 8,3%



New capacity: 81’800 kW
Growth rate: 10,9%

World Wind Market Status: Cold Climate

According to estimates, 25-30% of global installed capacity: > 100 GW

Biggest technical potential: Canada and Russia

Emerging markets!

WWEA market study Russia:
major barriers to overcome for grid connected
as well as offgrid sector

A Global Paradigm Shift:

COP21 in Paris has in fact defined
100 % Renewable Energies as the New Normal!

At COP22, 48 governments adopted a 100% RE target!

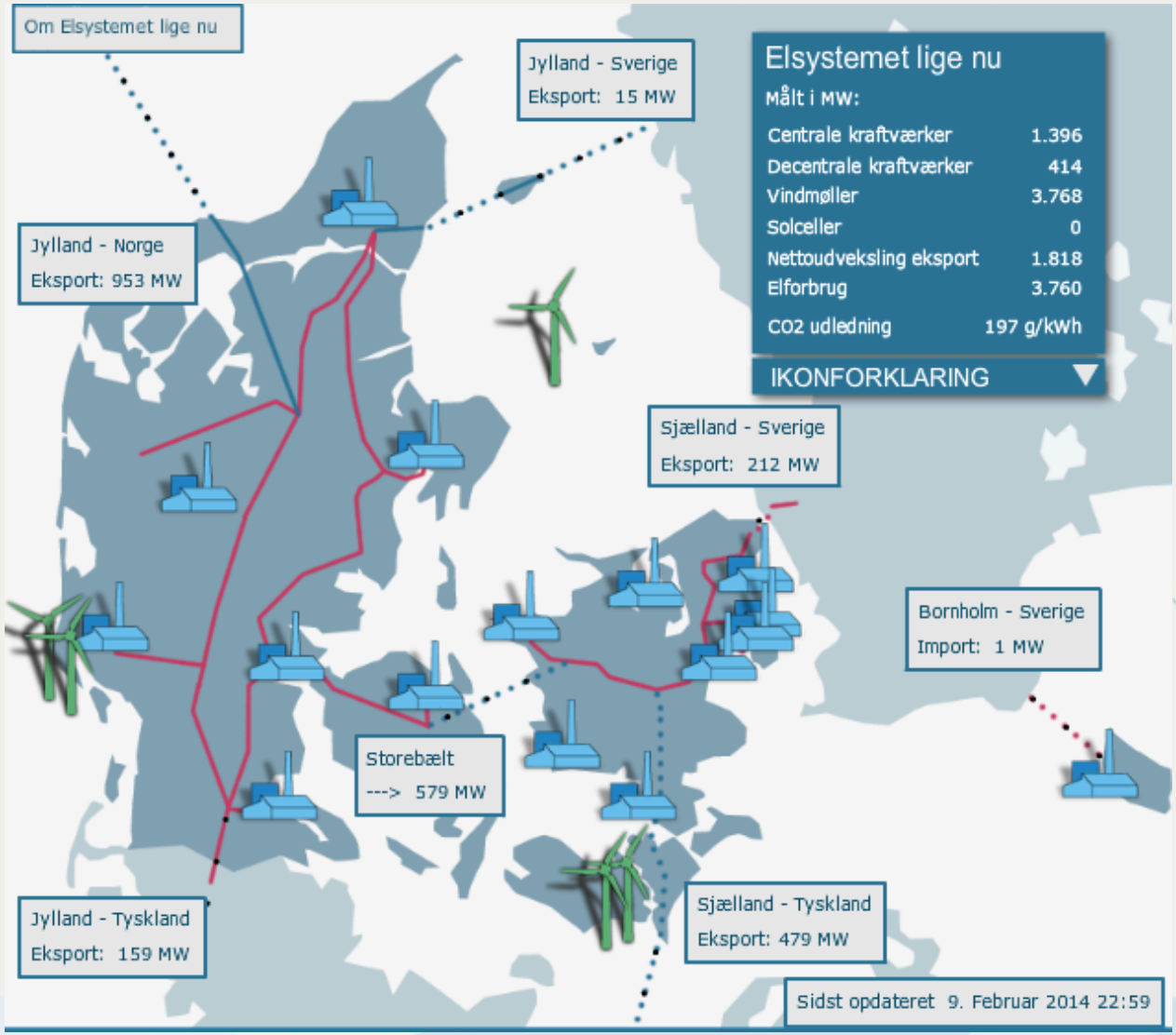
Symphony of the Renewables: Inspire Change

The Challenges:

Identifying suitable integrated solutions, based on best practise, including:

- Technologies
- Policies
- Business models

The Solutions: Large-scale Integration



The Solutions: Wind-hybrid systems

La Caldera upper reservoir
(380k m3)

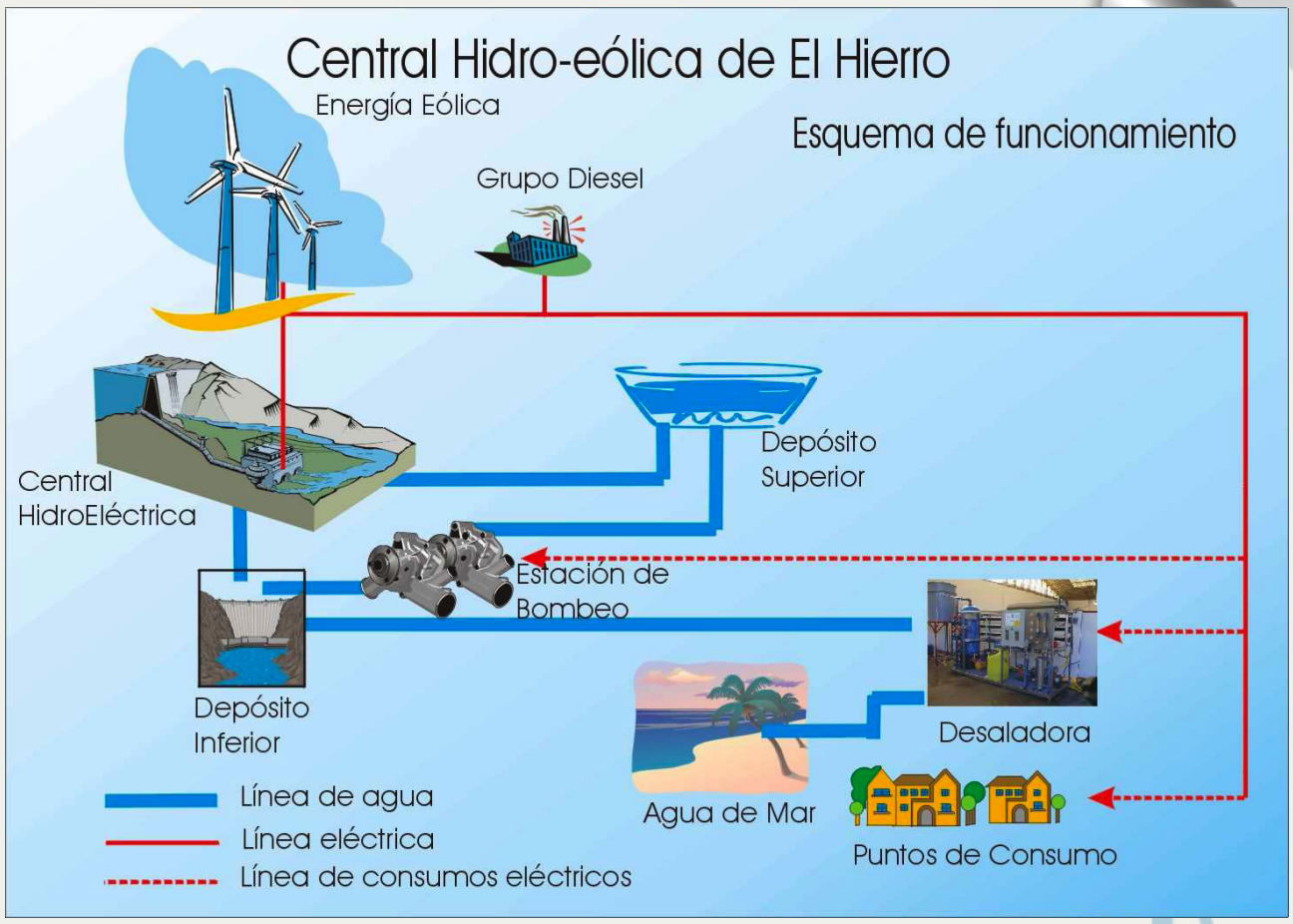
Llanos Blancos lower reservoir
(150k m3)

11,3 MW turbines

When wind energy:

> demand, water is pumped to La Caldera

< demand, water is turbined from La Caldera to produce power



Rural Electrification in Senegal

- The project «Micro Power 30»
  - Electrification of 30 villages in Senegal until 2014
  - Providing access to reliable power supply to 30‘000 rural citizens

- Technical set-up:
  - 5 to 10 kWp PV / 5 kW wind turbine / 10 kW backup diesel generator
  - 60 kWh battery bank / 15 kW battery inverters

- Project partners:
  - INENSUS West Africa (associates INENSUS GmbH & CSI MATFORCE)
  - Public funding by the Daey Ouwends Fond, capital borrowed from FMO

Source:
www.inensus.de

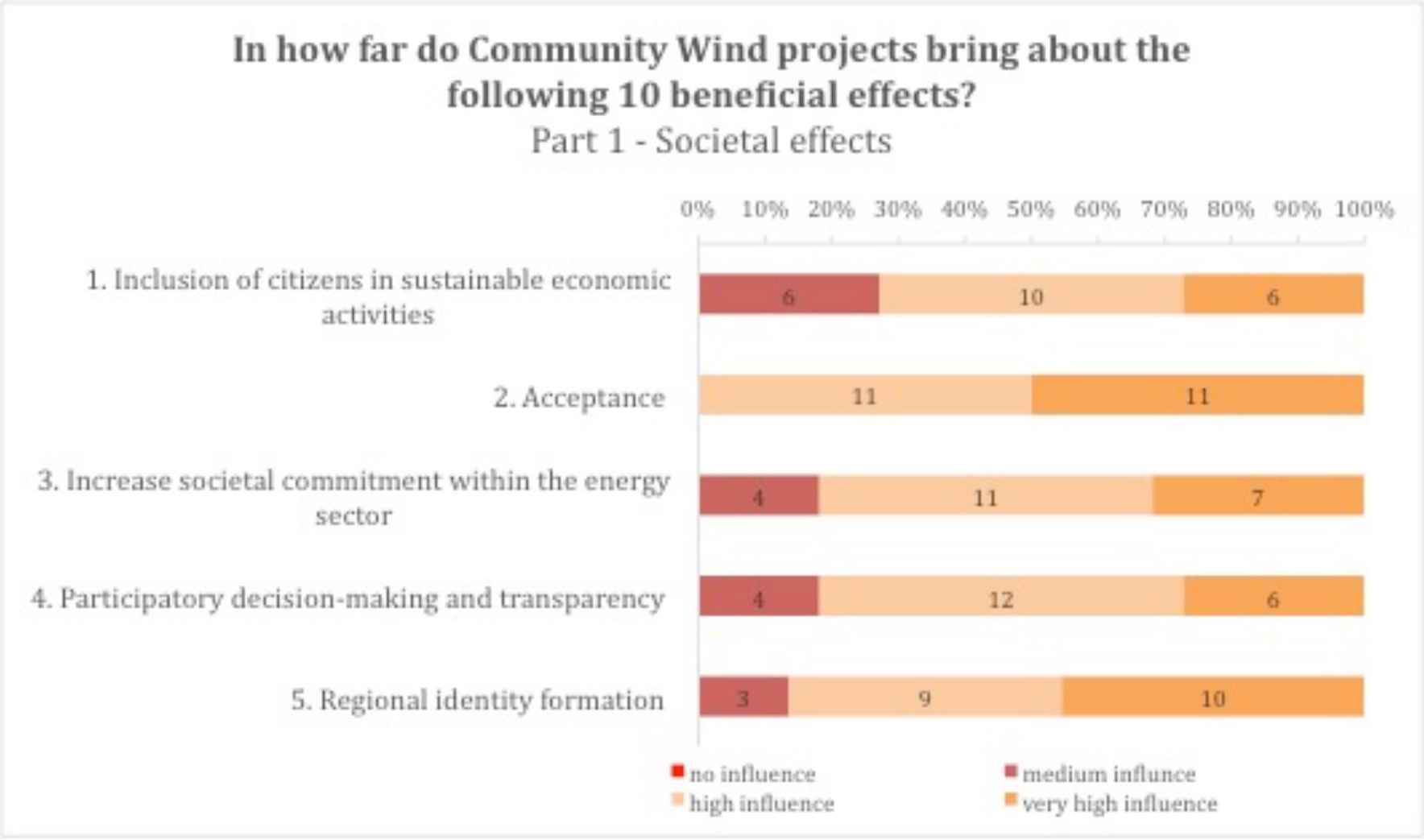
Community Power = Local Ownership

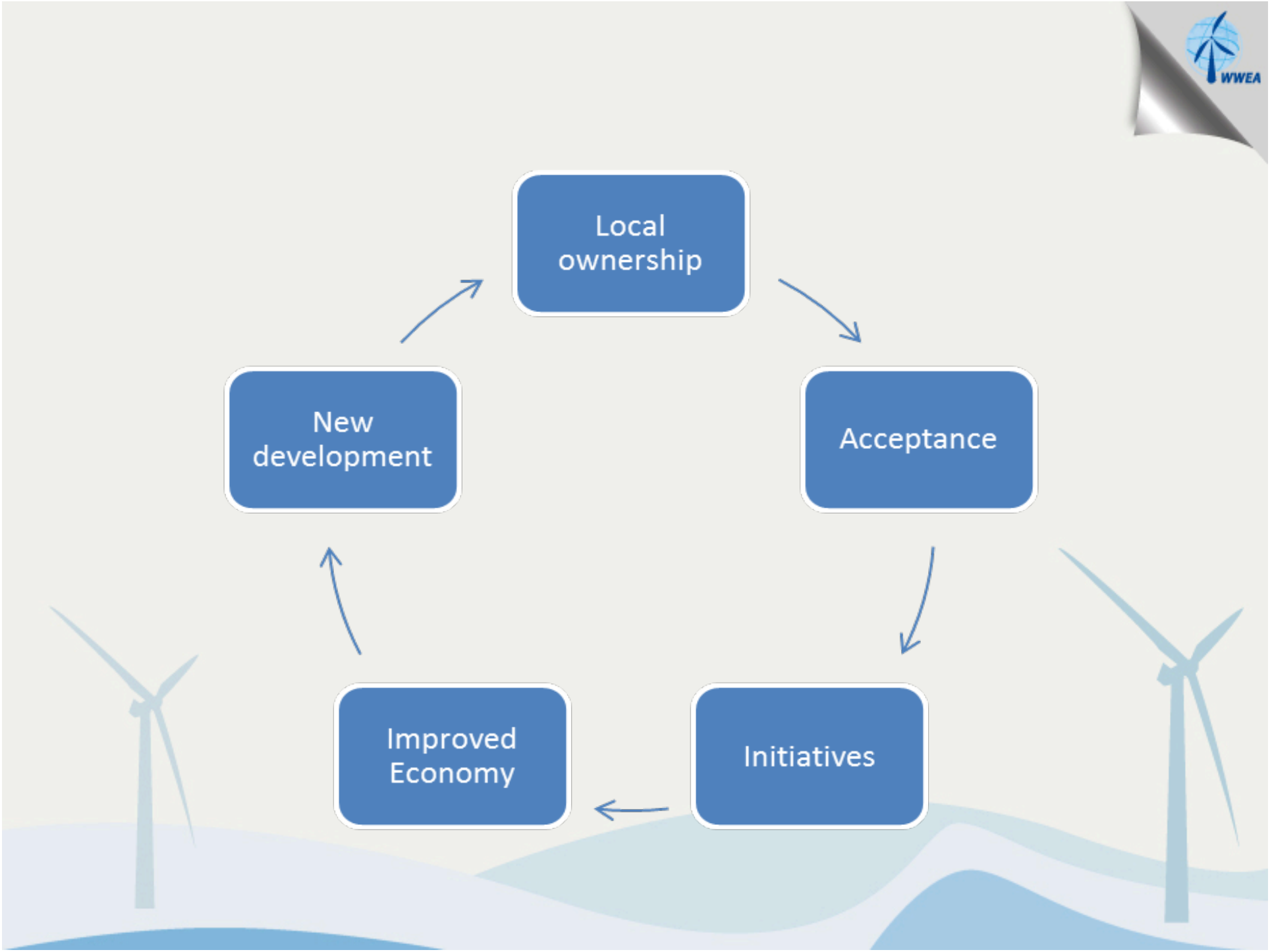
Renewable Energy and Community Power –
a Key in Industrialised as well as in Developing Countries

As concluded at the 1st World Community Power Conference
in Fukushima, 3-4 November

„Fukushima Community Power Declaration“

Regional and Global Community Wind Perspectives




Local ownership
Acceptance
Initiatives
Improved Economy
New development

Which policies are supportive and inclusive?

FITs have proven to be non-discriminatory but under pressure

Quota based systems?

Auctions?

How to incentives integrated solutions?

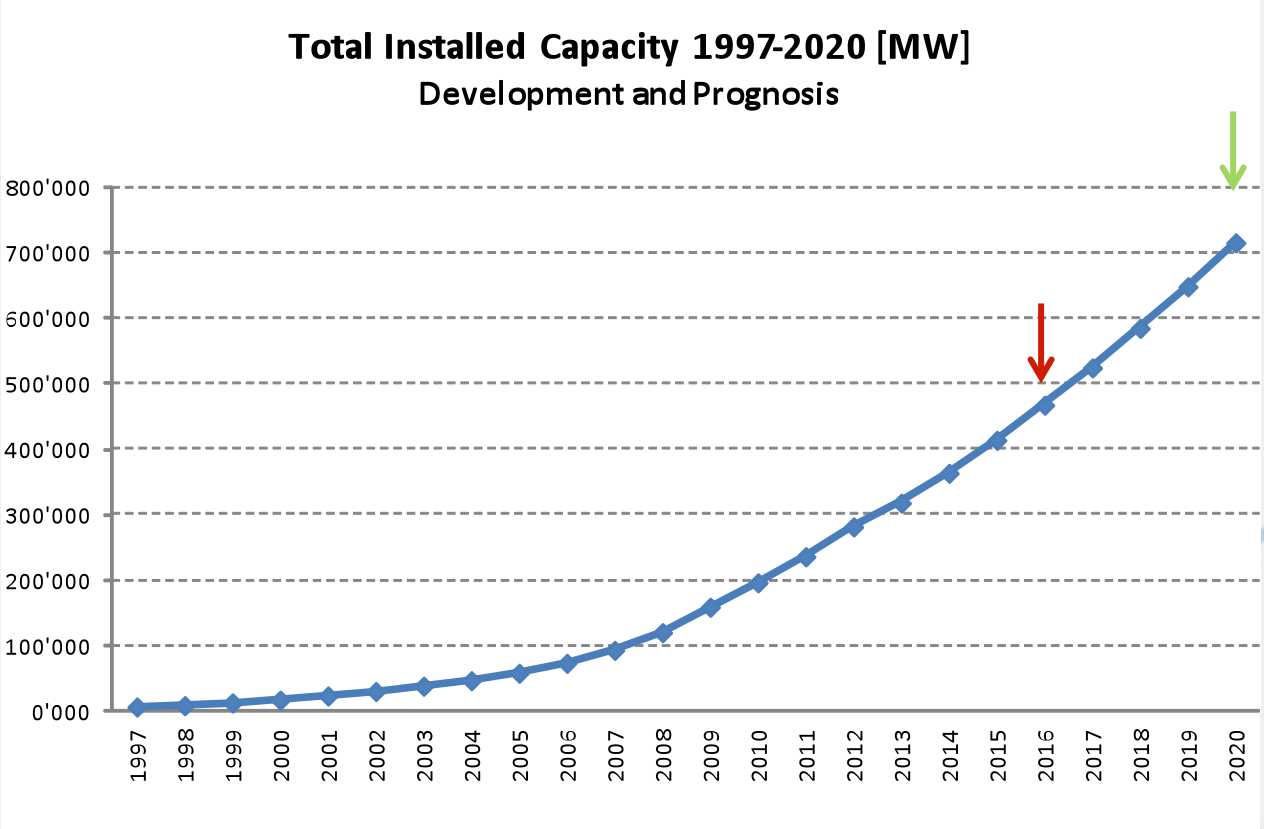
World Wind Market Future

What do we expect in the future?

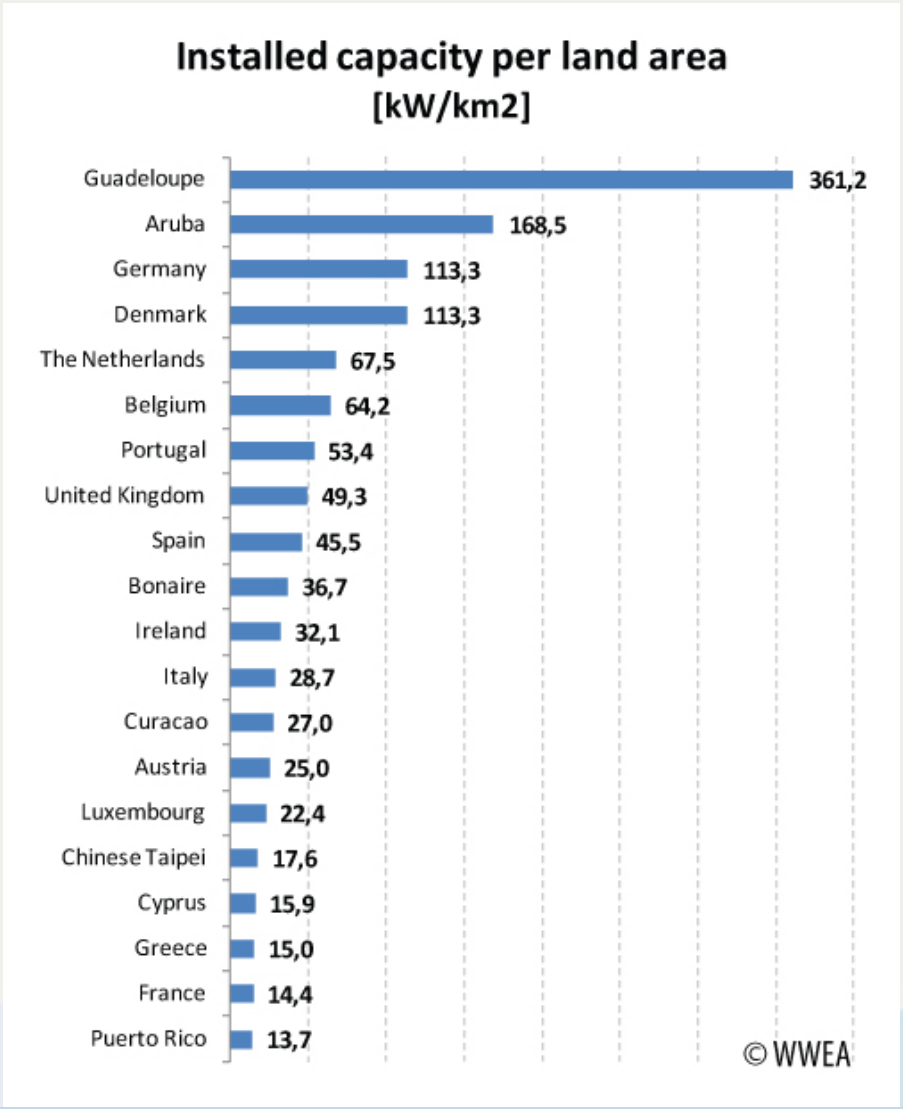
End of 2016: 500 GW

End of 2020: + 800 GW

End of 2030: + 2’000 GW



Prospects of Wind Power



If the world follows Denmark or Germany:

- 12‘000‘000 MW wind capacity

„Popular and Participatory Wind Power“

Malmö, 12-15 June 2017

www.wwec2017.com

Thank you very much for your attention!

www.wwec2017.com

www.WWindEA.org

www.small-wind.org

www.wind.community

www.go100re.net