



Global Wind Power Update

Steve Sawyer , Secretary General

Global Wind Energy Council

December 2nd 2011

C0 Members



C2 Members



Associations

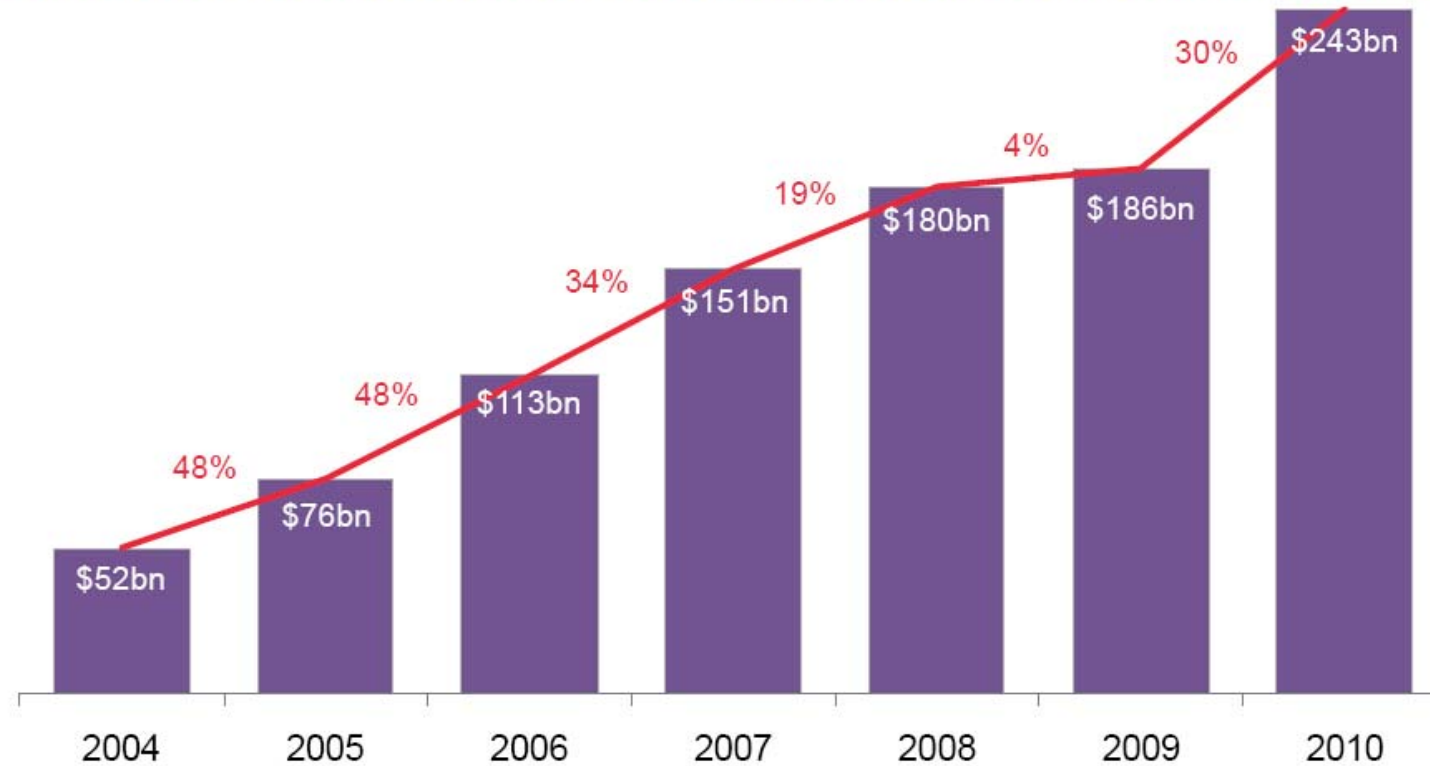


Outline

1. Global Investments
2. Summary of Global market status
3. Projections 2011-2015
4. Projections to 2020/2030
5. Climate regime, Carbon Markets
6. Key wind markets in Africa
7. Key wind markets in Asia Pacific
8. Key markets in Latin America
9. Conclusion

GLOBAL TOTAL NEW INVESTMENT IN CLEAN ENERGY

2004–10 (\$BN)

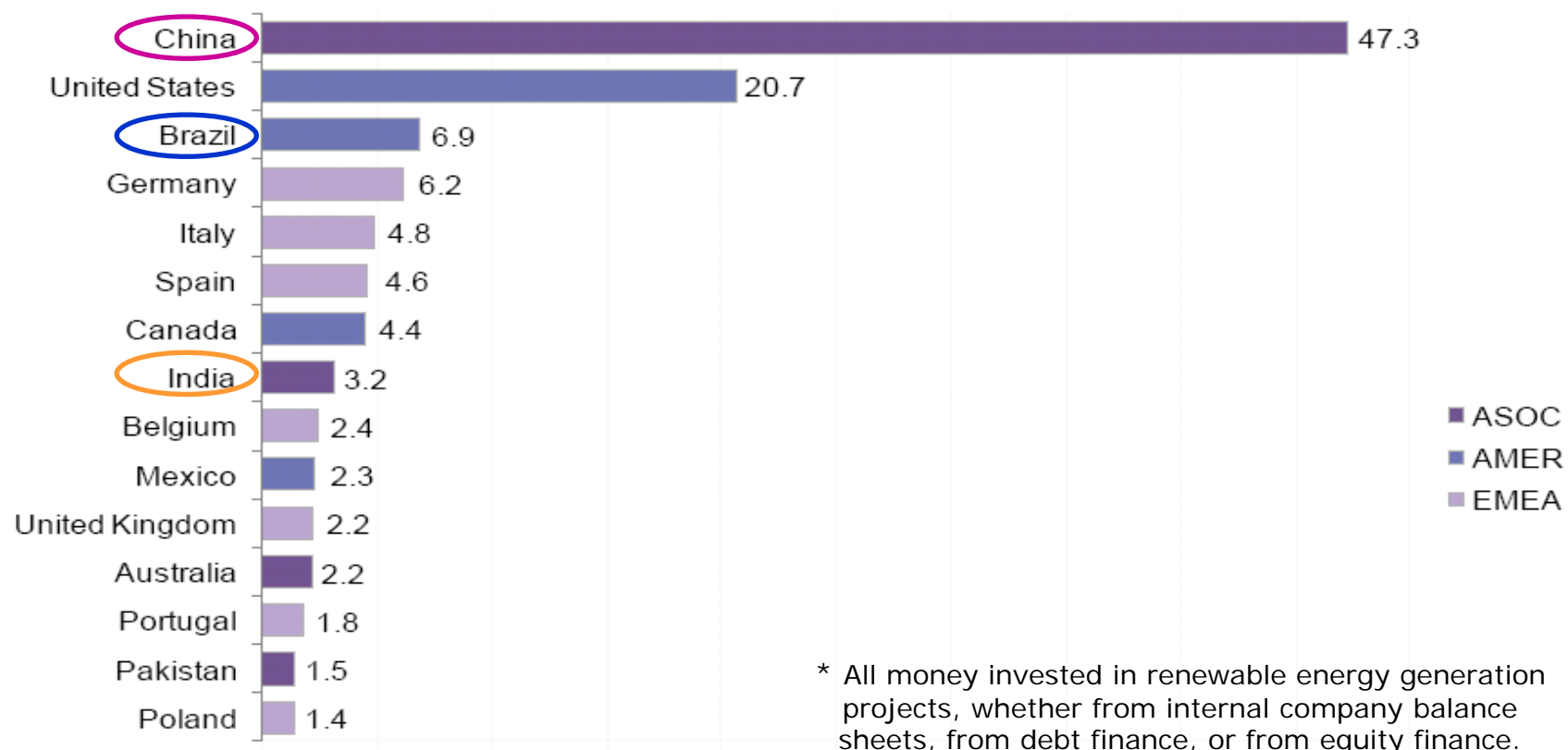


**\$96bn
in wind
power
(up by
31%)**

Note: Includes corporate and government R&D, and small distributed capacity. Adjusted for re-invested equity. Does not include proceeds from acquisition transactions

Source: Bloomberg New Energy Finance

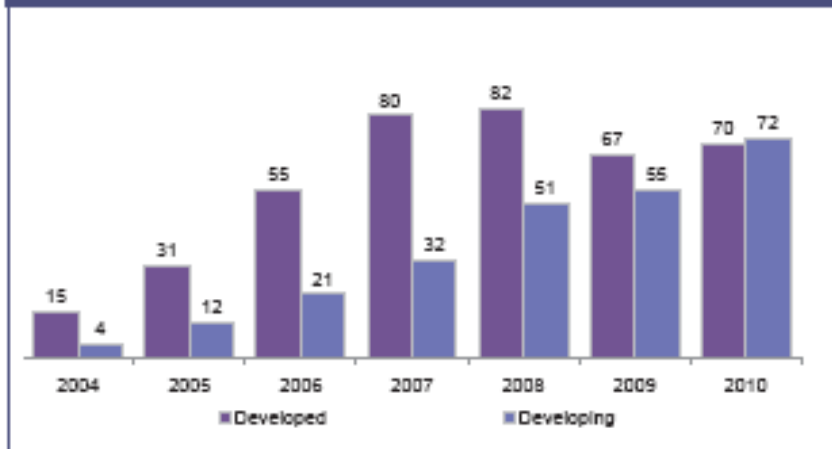
ASSET FINANCE FOR NEW BUILD CLEAN ENERGY – TOP 15 COUNTRIES, 2010 (\$BN) *



* All money invested in renewable energy generation projects, whether from internal company balance sheets, from debt finance, or from equity finance.

Moving East, and South

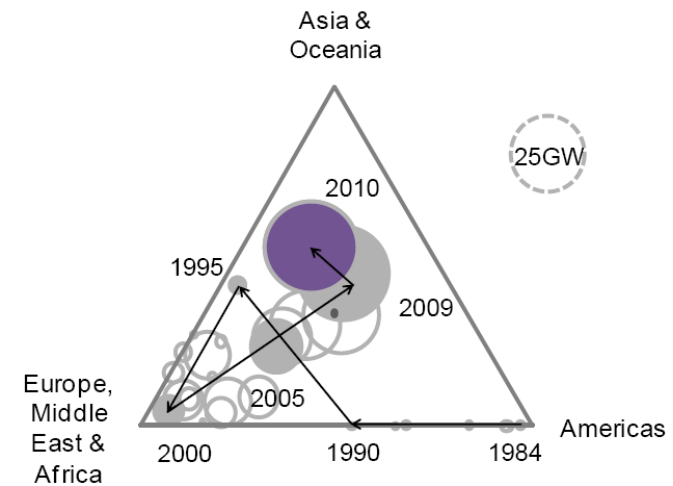
FIGURE 5: FINANCIAL NEW INVESTMENT IN RENEWABLE ENERGY: DEVELOPED V DEVELOPING COUNTRIES, 2004-2010



New investment volume adjusts for re-invested equity. Total values include estimates for undisclosed deals

Source: Bloomberg New Energy Finance, UNEP

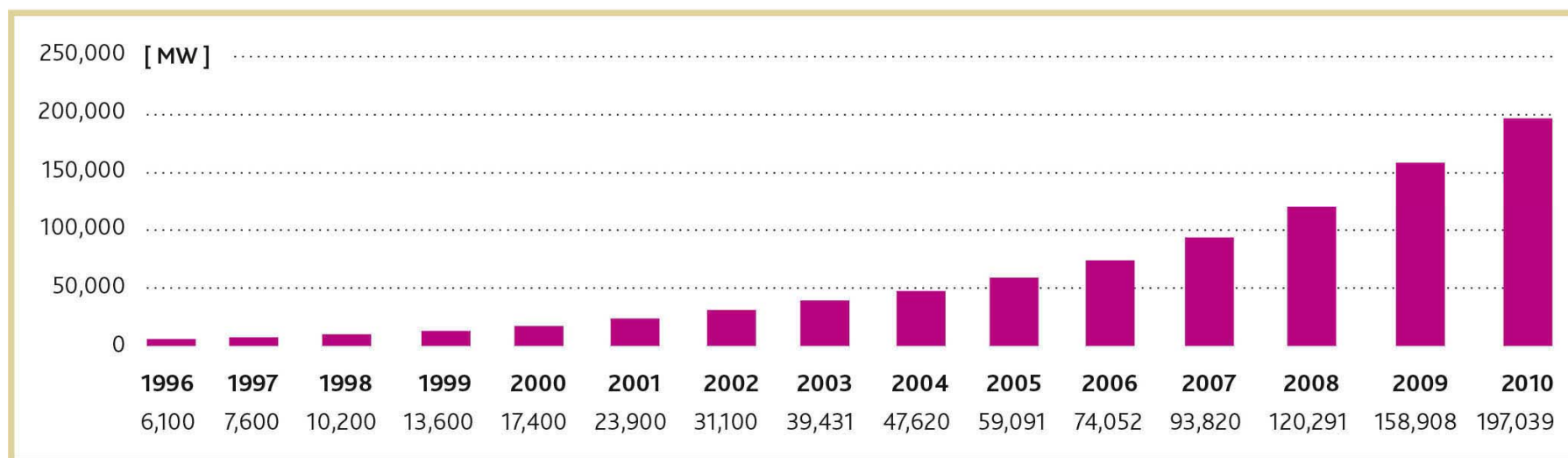
WIND-GENERATING CAPACITY NET ADDITIONS, 1984-2010 (GW)



Source: Bloomberg New Energy Finance

2010 growth: 24.1%

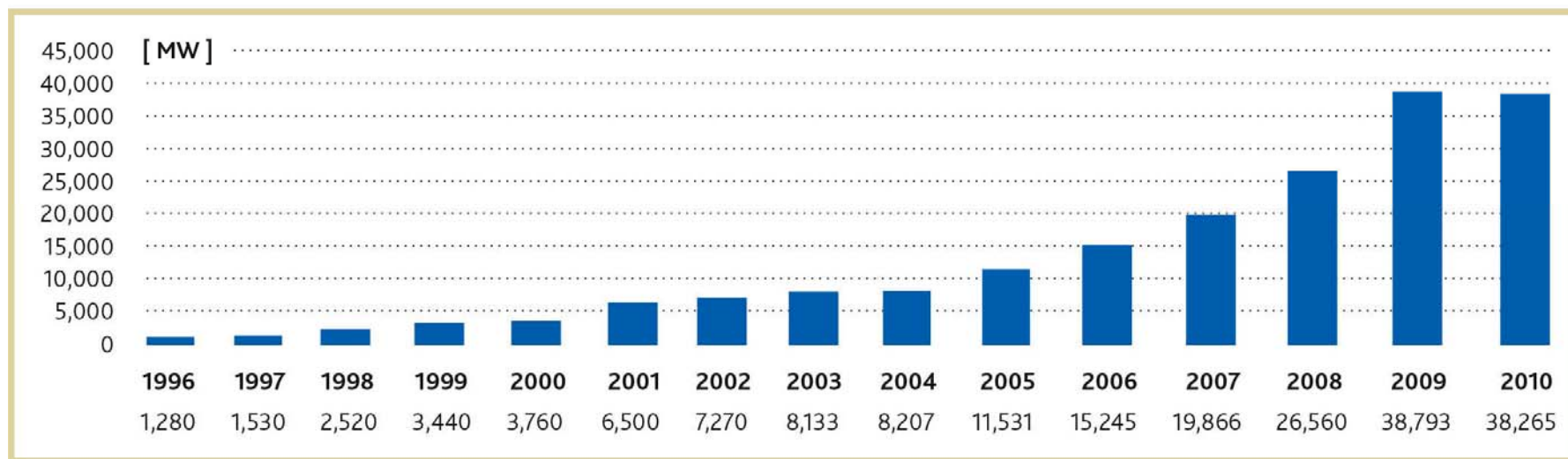
GLOBAL CUMULATIVE INSTALLED WIND CAPACITY 1996-2010



14 yr avg growth: 28.3%

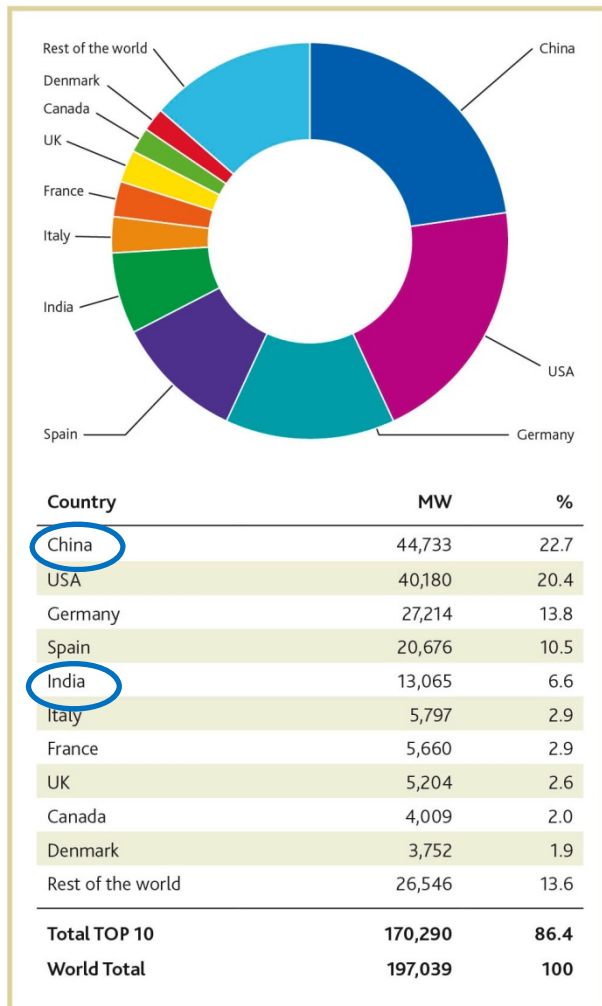
2010 growth: -0.5%

GLOBAL ANNUAL INSTALLED WIND CAPACITY 1996-2010

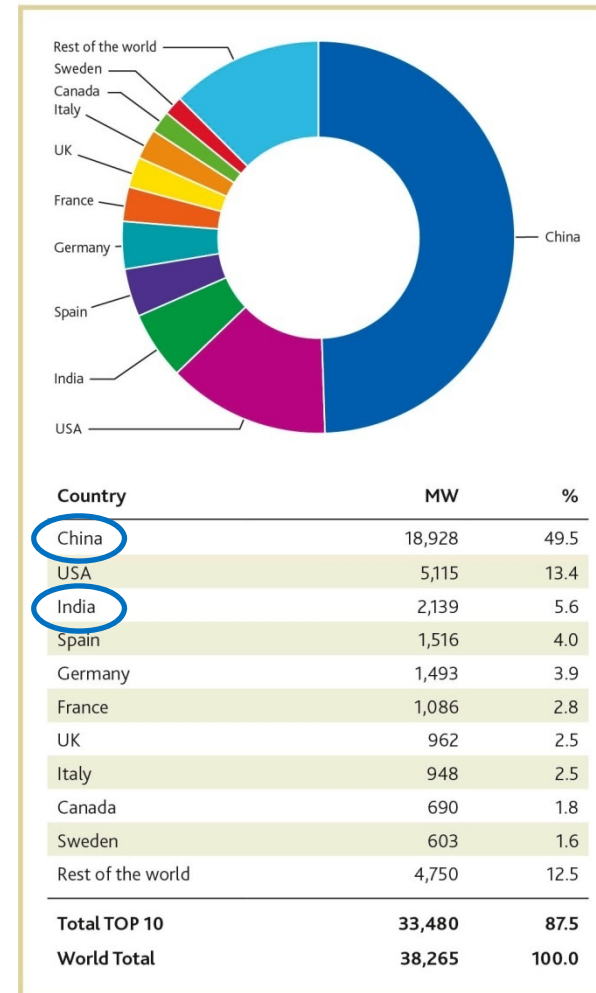


14 yr avg growth: 29.2%

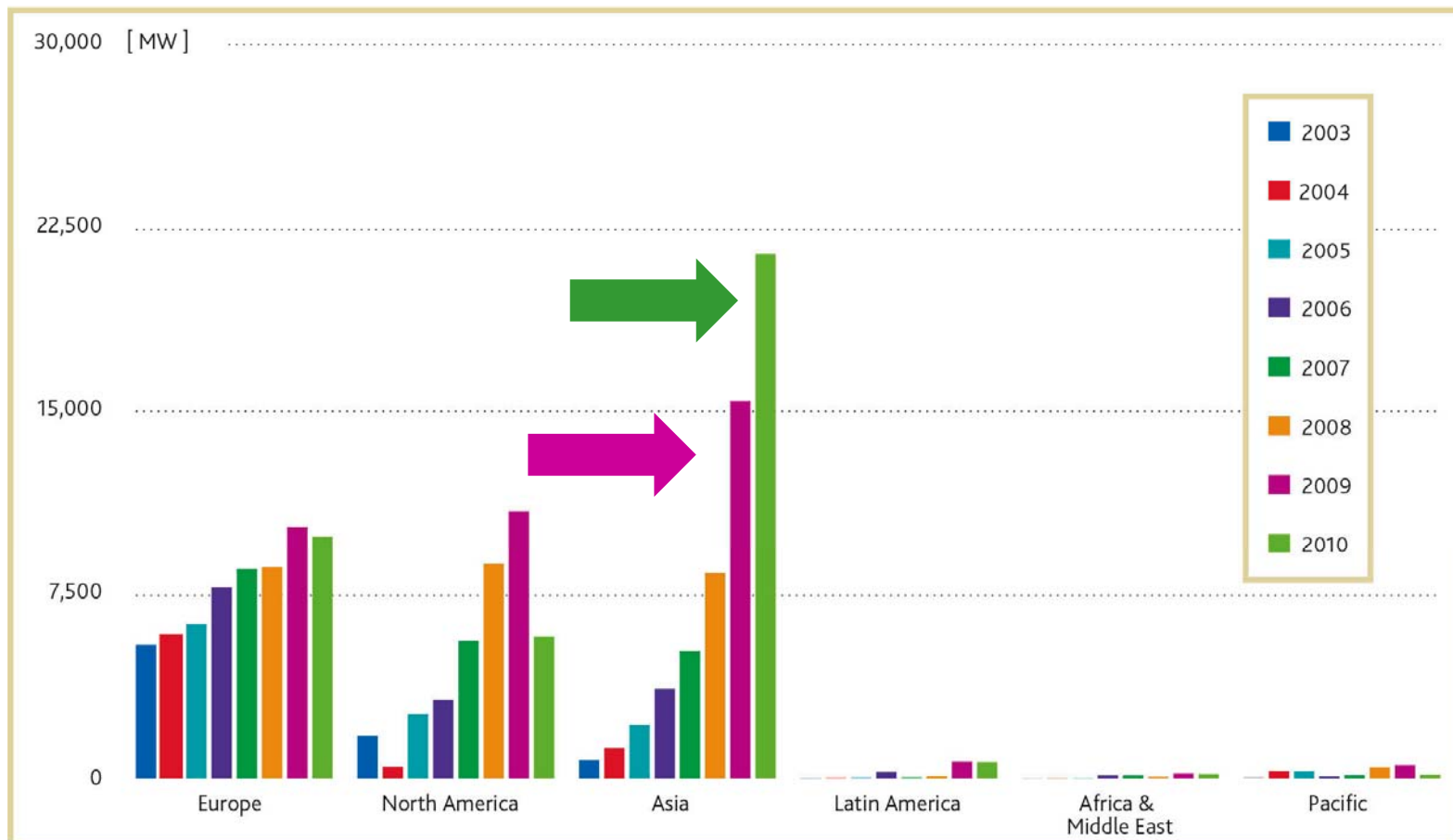
TOP 10 CUMULATIVE CAPACITY DEC 2010



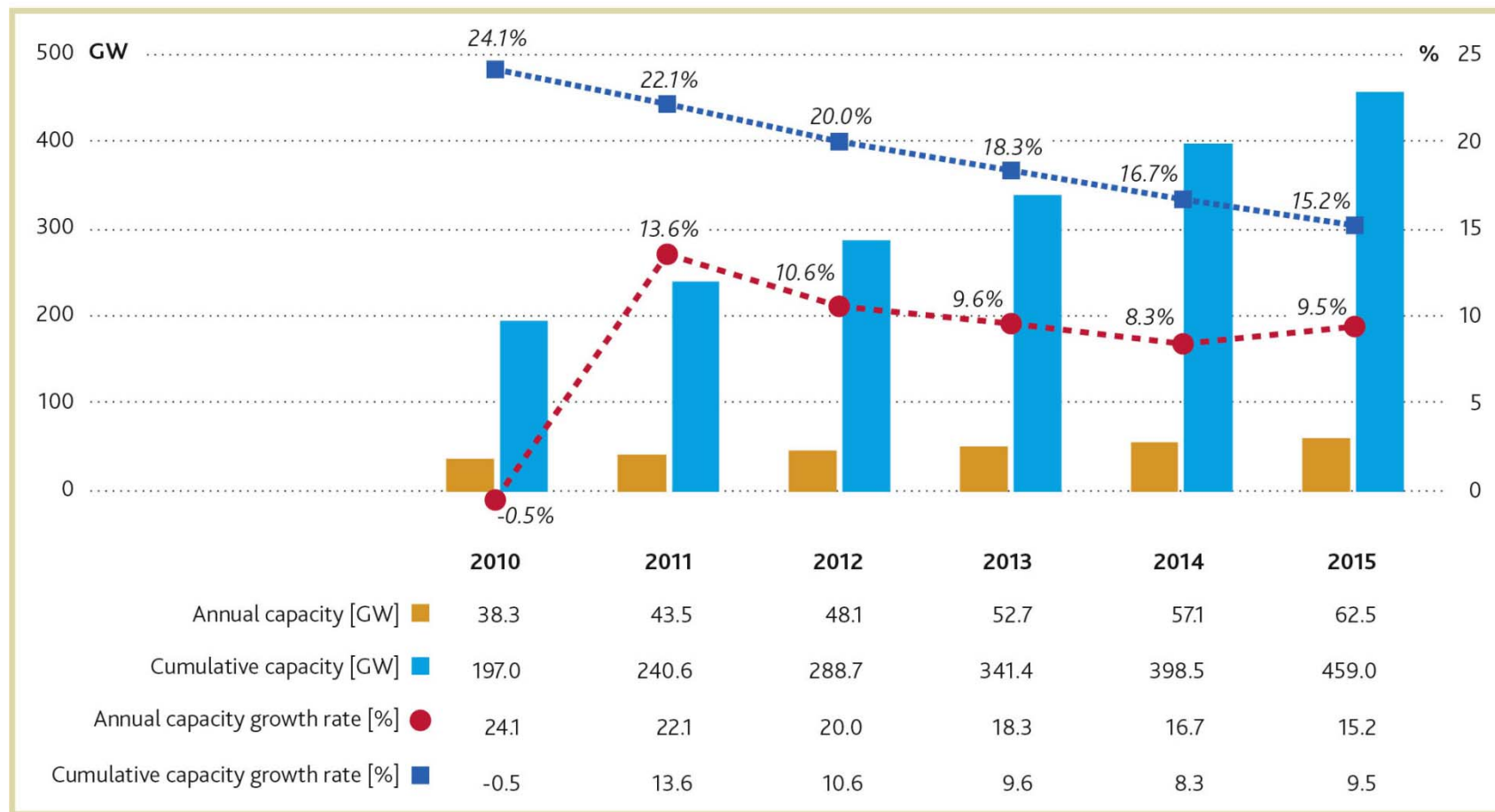
TOP 10 NEW INSTALLED CAPACITY JAN-DEC 2010



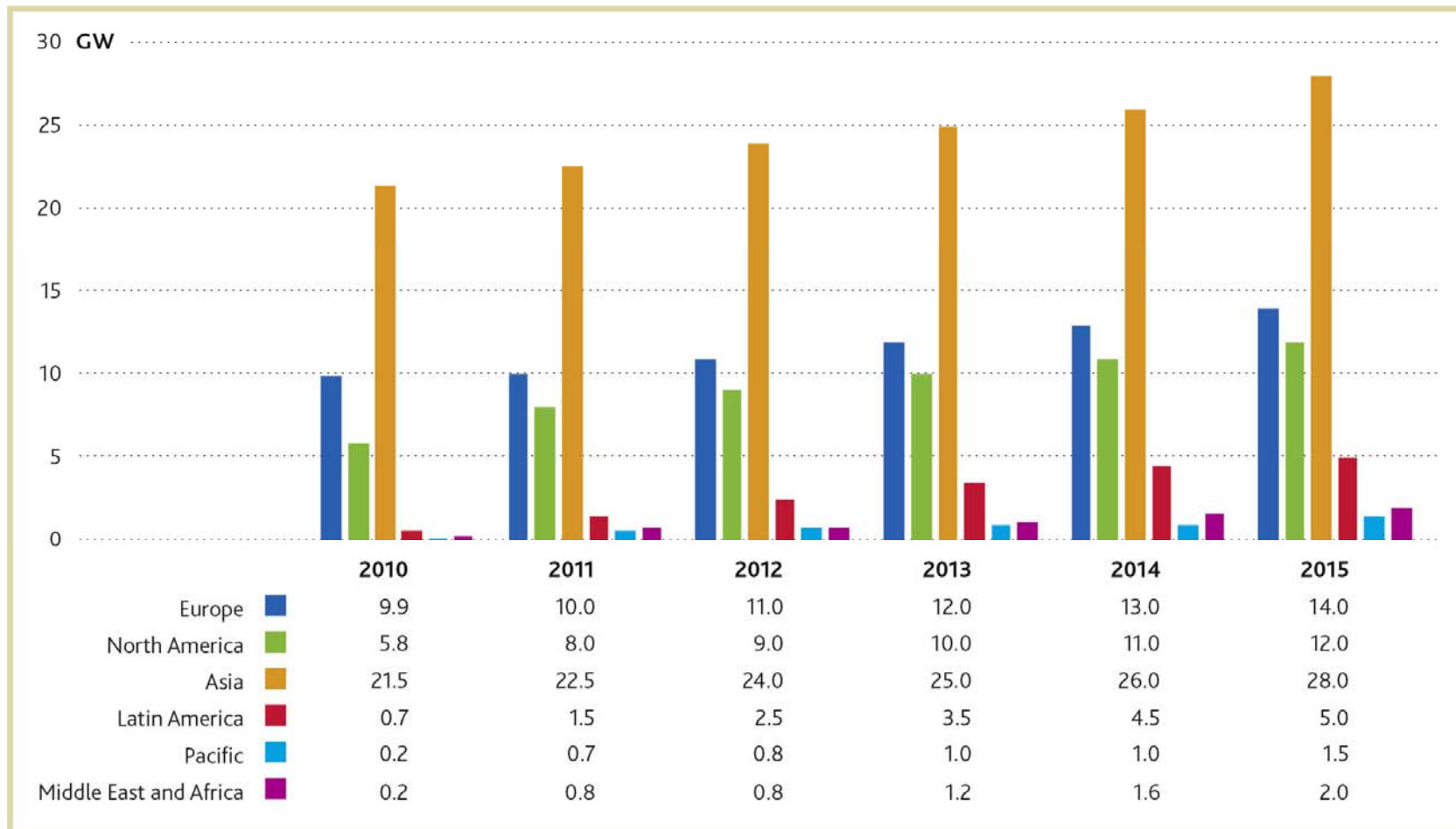
ANNUAL INSTALLED CAPACITY BY REGION 2003-2010



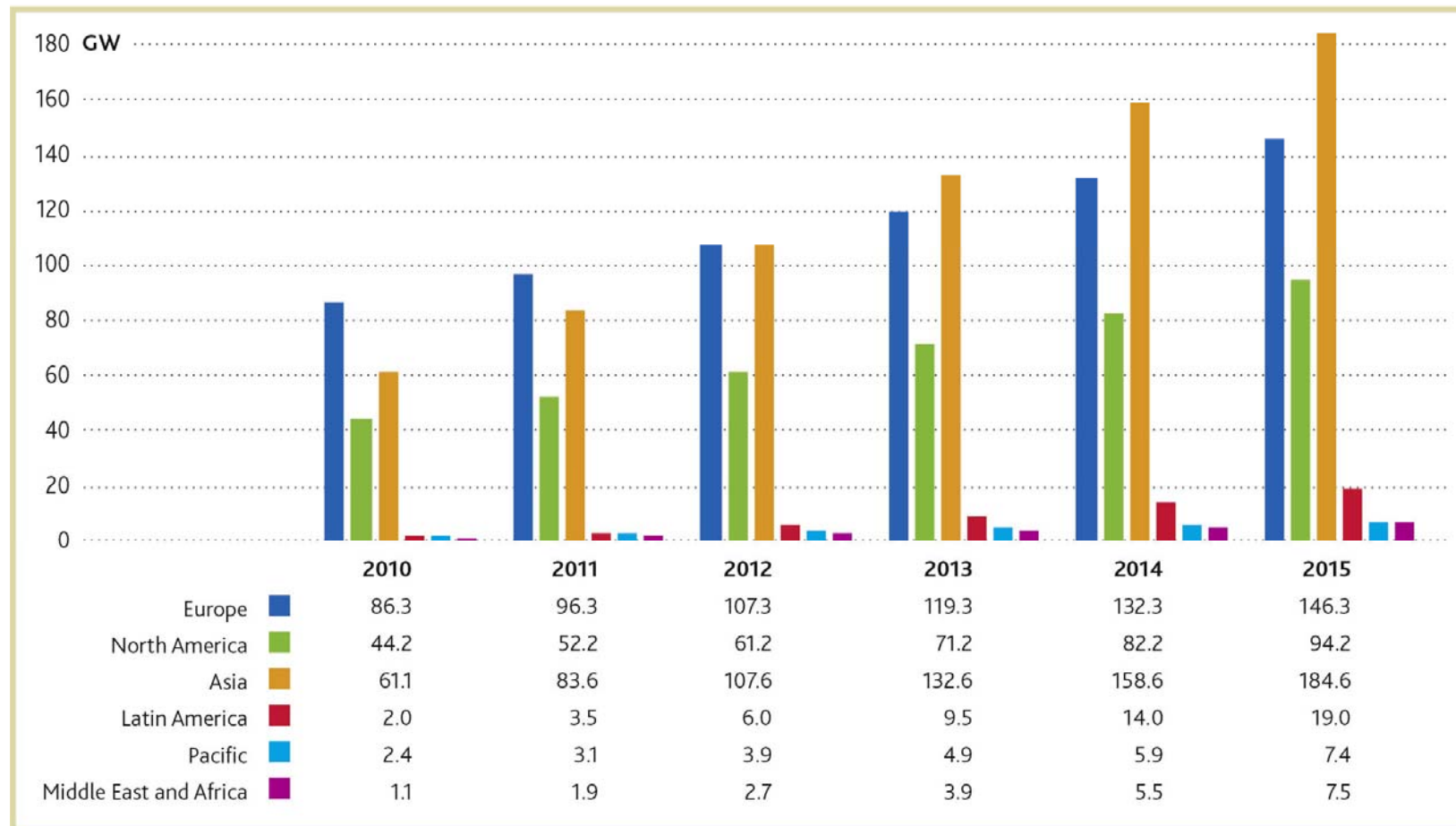
MARKET FORECAST 2011-2015



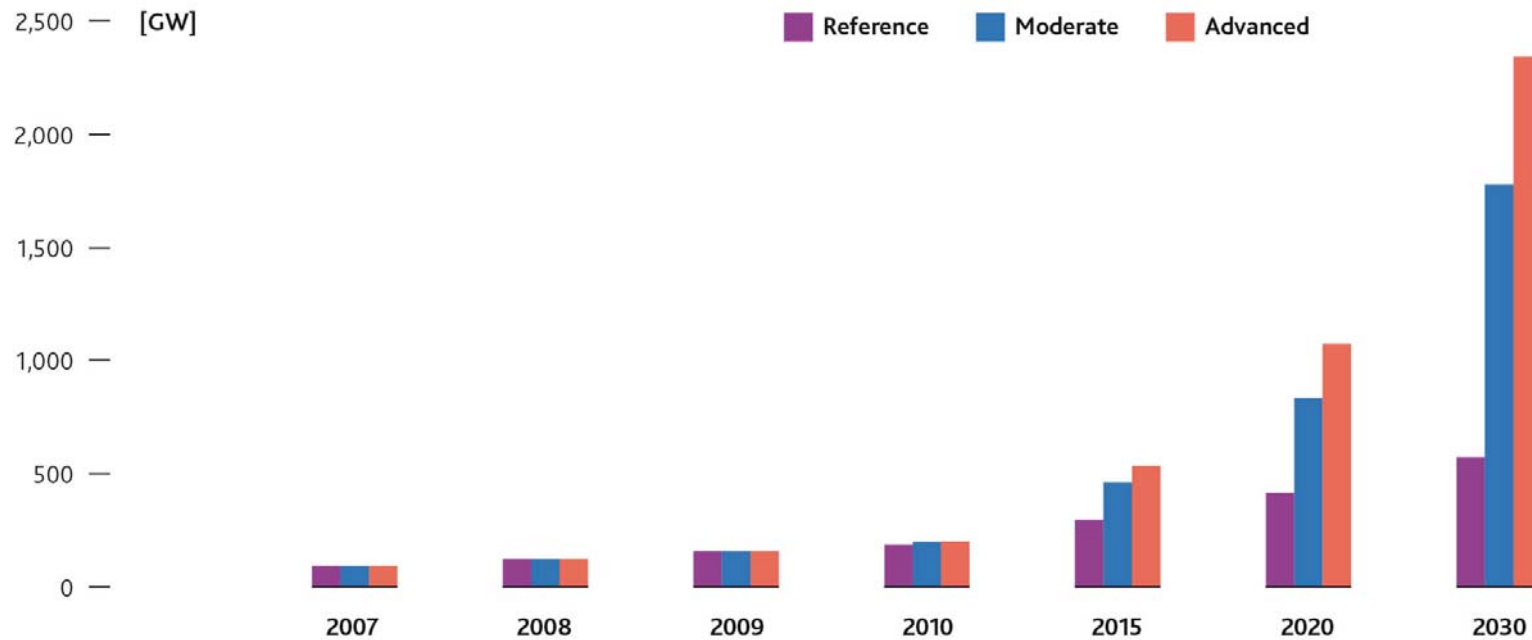
ANNUAL MARKET FORECAST BY REGION 2010-2015



CUMULATIVE MARKET FORECAST BY REGION 2010-2015



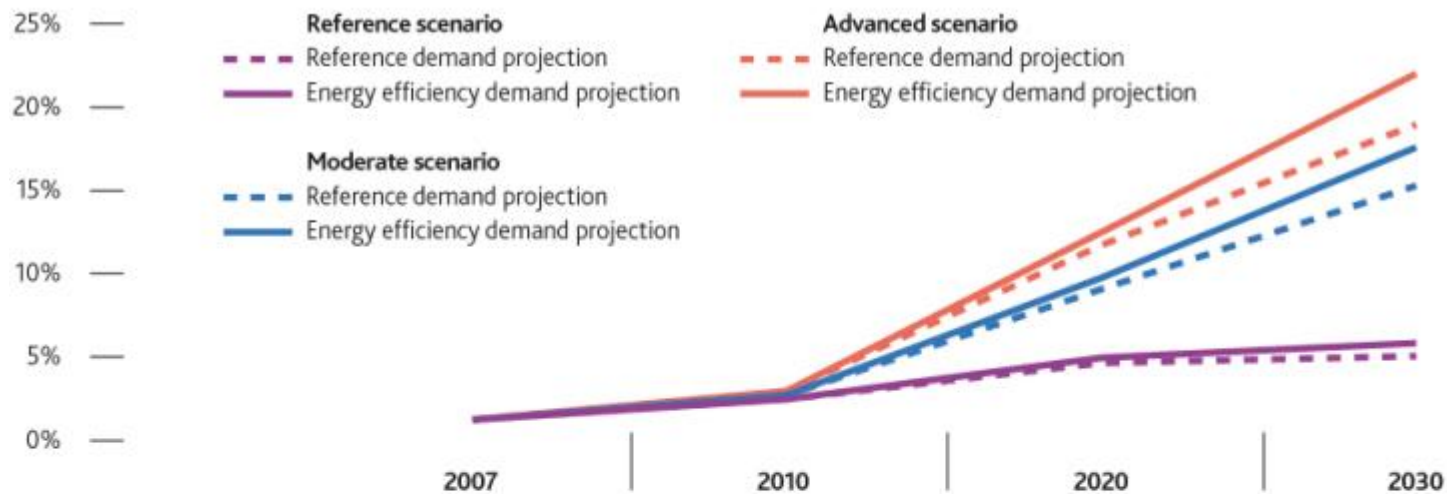
GLOBAL CUMULATIVE WIND POWER CAPACITY



	2007	2008	2009	2010	2015	2020	2030
Reference [MW]	93,864	120,297	158,505	185,258	295,783	415,433	572,733
[TWh]	206	263	347	406	725	1,019	1,405
Moderate [MW]	93,864	120,297	158,505	198,717	460,364	832,251	1,777,550
[TWh]	206	263	347	435	1,129	2,041	4,360
Advanced [MW]	93,864	120,297	158,505	201,657	533,233	1,071,415	2,341,984
[TWh]	206	263	347	442	1,308	2,628	5,429

% of global electricity supply

WIND POWER SHARE OF GLOBAL ELECTRICITY DEMAND



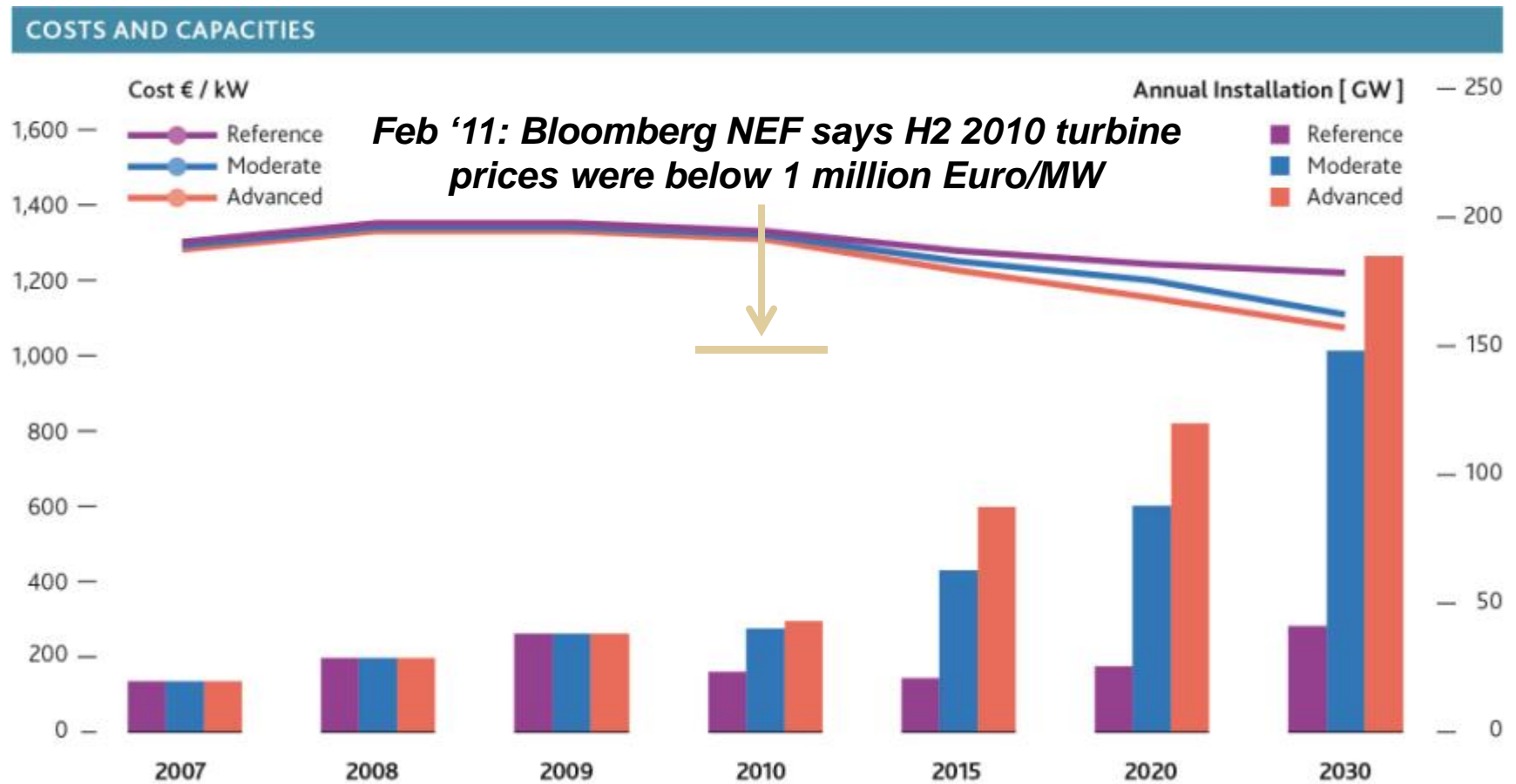
	2007	2010	2020	2030
Reference scenario				
Reference demand projection	1.1%	2.3%	4.5%	4.9%
Energy efficiency demand projection	1.1%	2.3%	4.8%	5.6%
Moderate scenario				
Reference demand projection	1.1%	2.4%	8.9%	15.1%
Energy efficiency demand projection	1.1%	2.5%	9.5%	17.5%
Advanced scenario				
Reference demand projection	1.1%	2.5%	11.5%	18.8%
Energy efficiency demand projection	1.1%	2.5%	12.3%	21.8%

INVESTMENT AND EMPLOYMENT

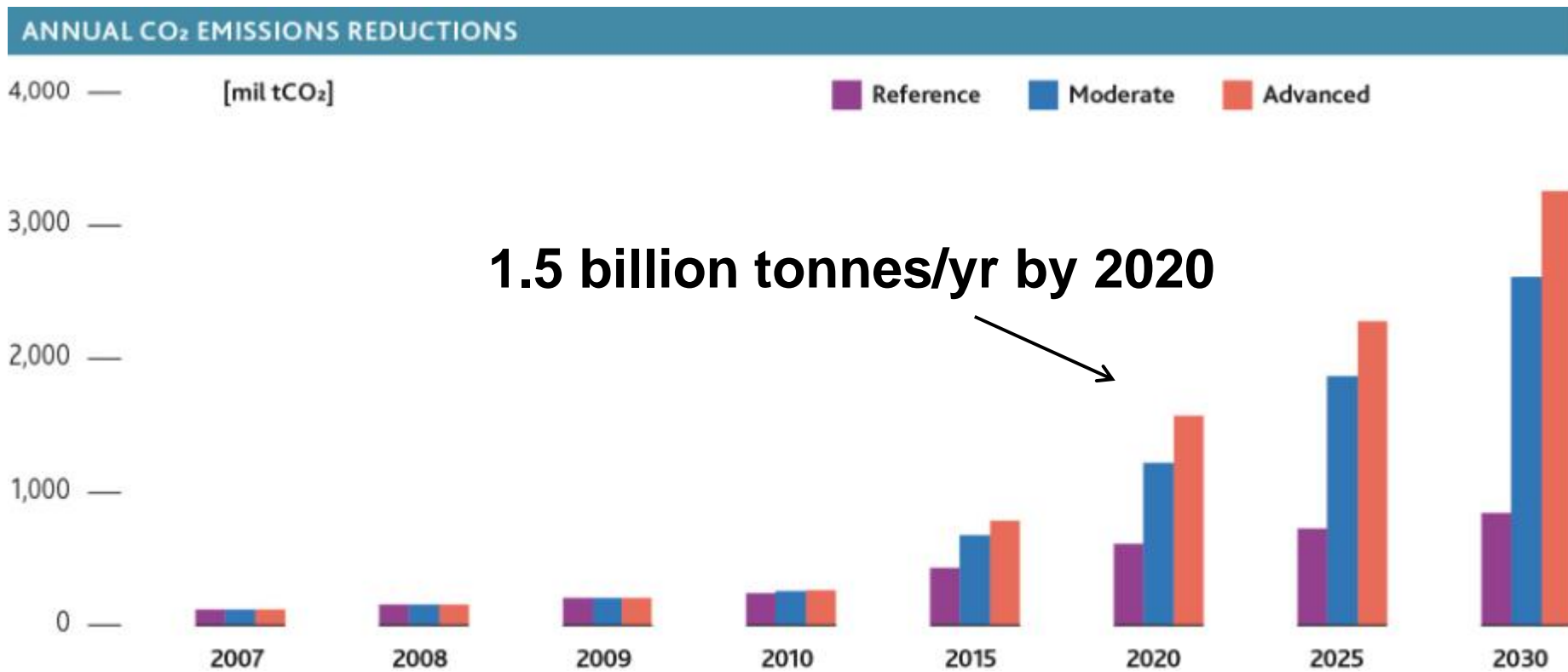
	2007	2008	2009	2010	2015	2020	2030
Reference							
Annual Installation [MW]	19,865	28,700	38,343	26,735	20,887	25,712	41,219
Cost [€ / kW]	1,300	1,350	1,350	1,327	1,276	1,240	1,216
Investment [€ million /year]	25,824	38,745	51,763	35,507	26,649	31,894	50,136
Employment [job year]	329,232	470,559	627,927	462,982	411,801	524,027	809,006
Moderate							
Annual Installation [MW]	19,865	28,700	38,343	40,212	62,887	88,133	148,416
Cost [€ / kW]	1,300	1,350	1,350	1,329	1,258	1,208	1,116
Investment [€ million /year]	25,824	38,745	51,763	53,459	79,109	106,504	165,691
Employment [job year]	329,232	470,559	627,927	629,137	1,033,721	1,422,874	2,372,911
Advanced							
Annual Installation [MW]	19,865	28,700	38,343	43,263	87,641	120,135	185,350
Cost [€ / kW]	1,300	1,350	1,350	1,328	1,245	1,172	1,093
Investment [€ million /year]	25,824	38,745	51,763	57,450	109,072	140,762	202,600
Employment [job year]	329,232	470,559	627,927	672,827	1,404,546	1,918,530	3,004,081

Source: <http://www.gwec.net/index.php?id=181>

Development of Costs



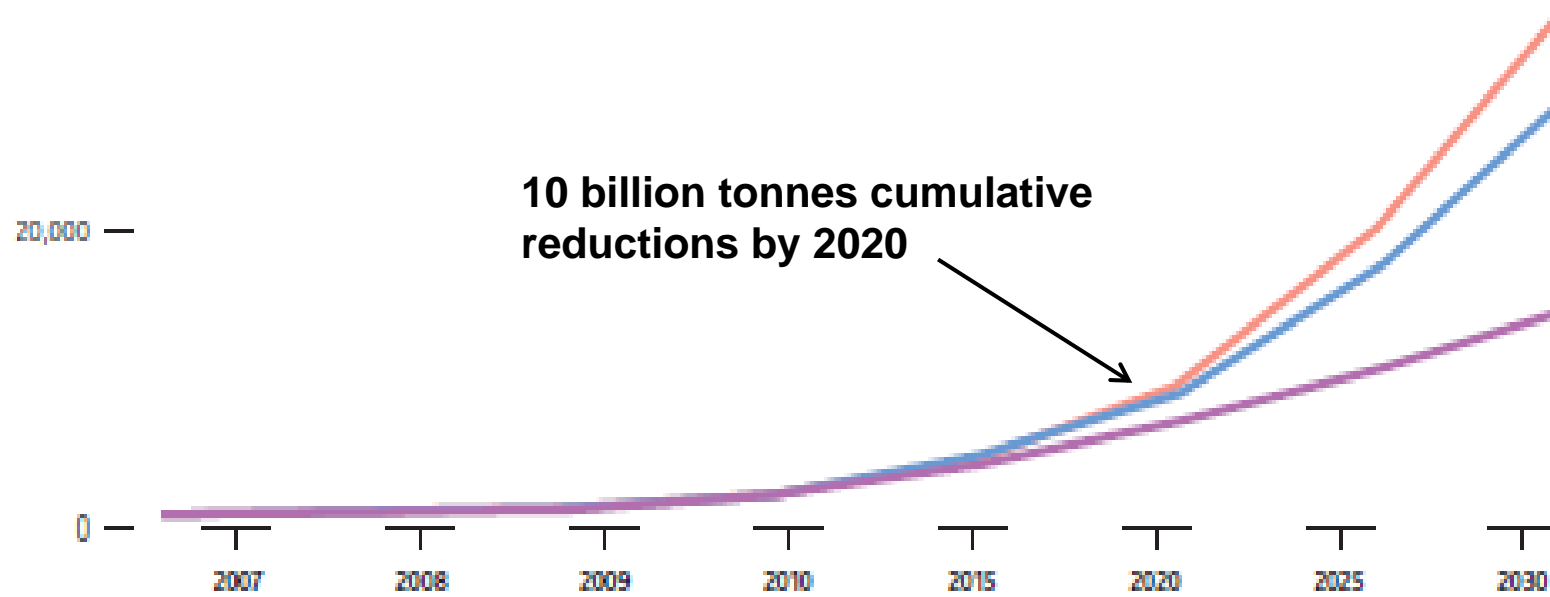
Climate Imperative



CUMULATIVE CO₂ EMISSIONS REDUCTIONS

40,000 — [mil tCO₂]

Reference Moderate Advanced



Current UNFCCC pledges including US =
aggregated Annex I pledges

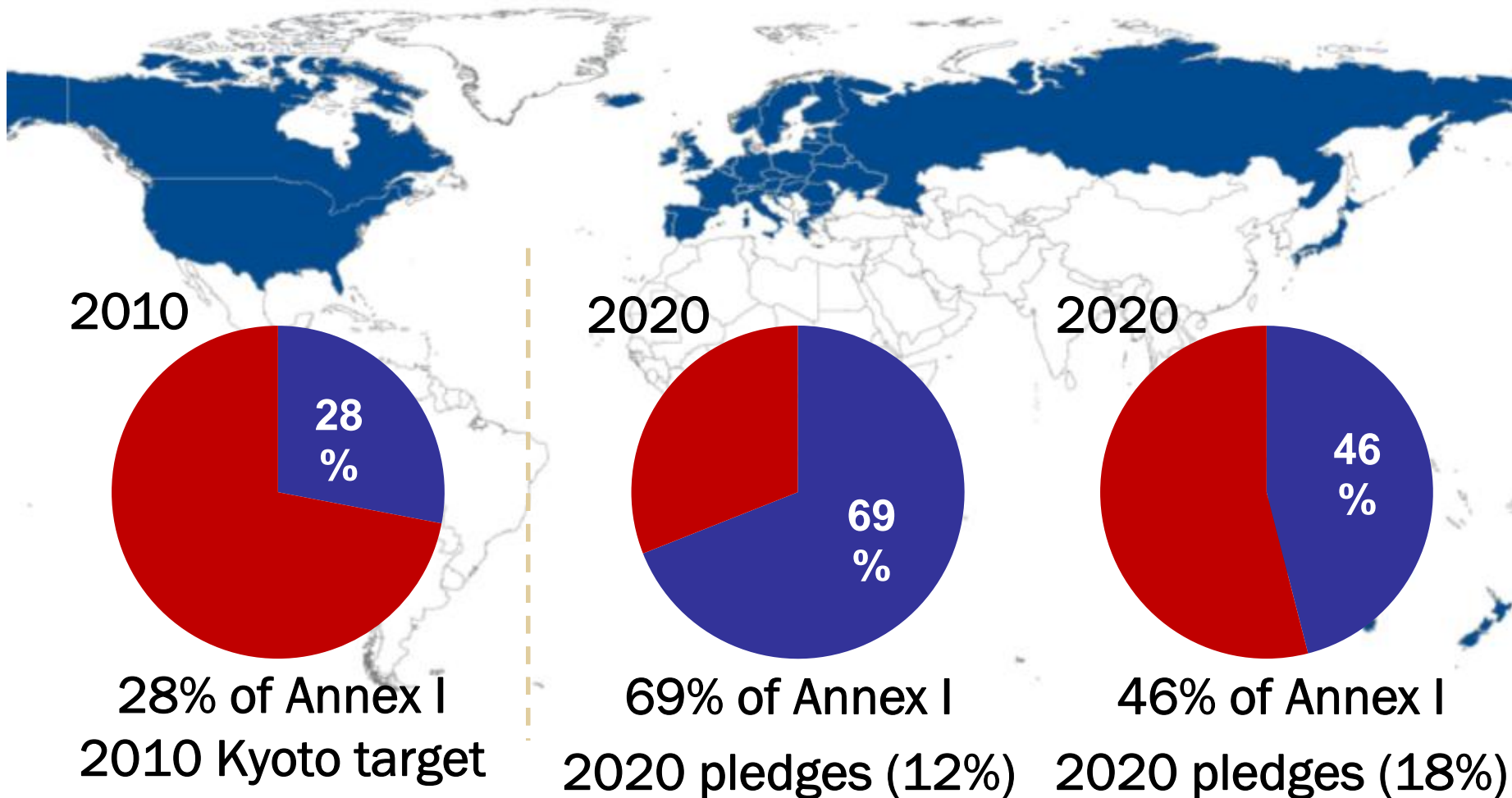
→ 12%-18% of 1990 emissions

Versus

Global Wind in 2020
1081 GW installed capacity
2650 TWh produced
→ 1591 Mt CO₂ avoided

Party	Information relating to possible QELROs	
	Range or single value by 2020, percentage	Reference year
Australia	-5% up to -15% or -25%	2000
Belarus	-5% to -10% ¹	1990
Canada	-20%	2006
European Union	-20 to -30%	1990
Iceland	-15%	1990
Japan	-15% ²	2005
Liechtenstein	-20 to -30%	1990
Monaco	-20%	1990
New Zealand	-10 to -20%	1990
Norway	-30%	1990
Russian Federation	-10 to -15%	1990
Switzerland	-20 to -30%	1990
Ukraine	-20%	1990

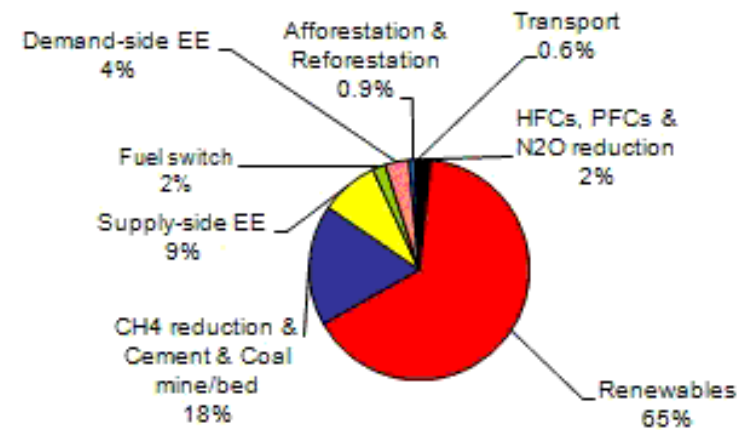
Cancun Annex I pledges = 12-18% reduction from 1990
Global Wind in 2020 will avoid...



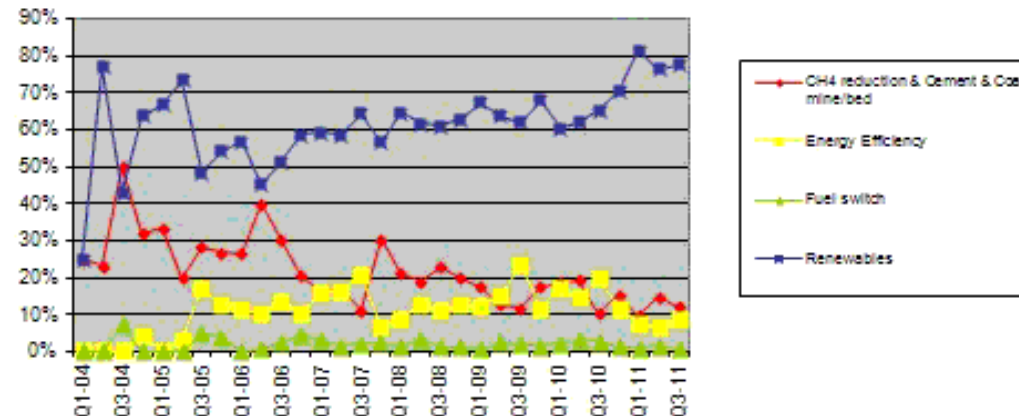
Number (%) of CDM projects in each category

Wind CDM projects		
Country	Projects	MW
India	640	9868
China	957	54022
Mexico	23	2623
Brazil	45	3062
South Korea	14	393
Chile	8	309
Morocco	7	584
Cyprus	5	241
Egypt	4	406
Dominican Republic	5	178
Uruguay	9	303
Costa Rica	3	82
South Africa	9	1501
Nicaragua	4	147
Sri Lanka	3	30
Serbia	3	396
Israel	2	34
Philippines	2	113
Ecuador	2	8
Thailand	4	269
Jamaica	2	39
Argentina	2	17
Kenya	3	375
Honduras	1	102
Azerbaijan	1	50
Panama	1	81
Mongolia	1	50
Senegal	1	125
Colombia	1	20
Tunisia	1	34
Vietnam	1	30
Cape Verde	1	28
Guatemala	1	21
Pakistan	1	50
Macedonia	1	37
Mauritius	1	18
Total	1769	75644

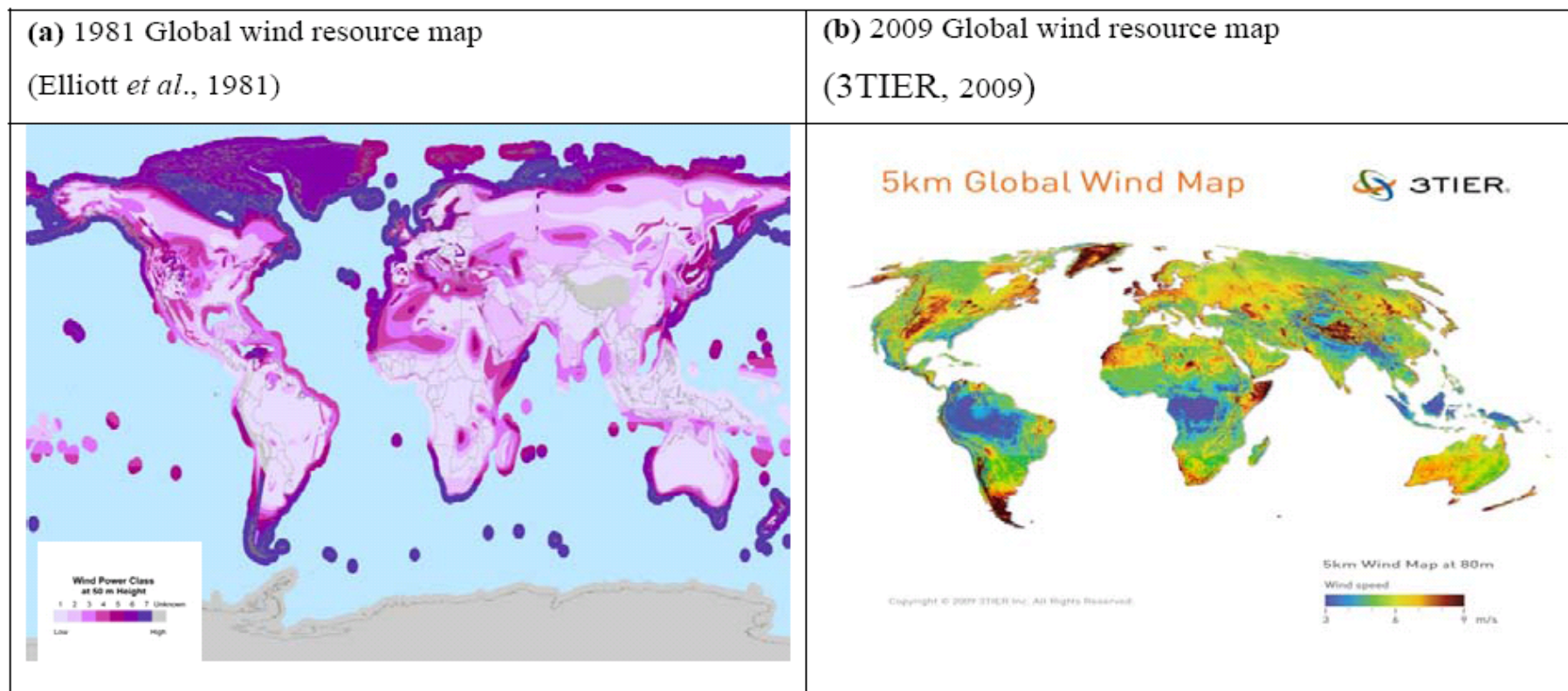
Source: <http://www.cdmpipeline.org>



CERs by Project type



Exploitable potential around 15 times current electricity demand ...one recent assessment has it at 50 X



Archer CL, Jacobson MZ. 2005. Evaluation of global wind power. *Journal of Geophysical Research* 110: D12110.

Lu X, McElroy MB, Kiviluoma J. 2009. Global potential for wind-generated electricity. *Proceedings of the National Academy of Sciences* 106: 10933.

Africa

- Wind energy could bring many benefits to Africa due to its scalability + low water and environmental footprint.
- Africa's best wind resource is around the coasts & in the eastern highlands
- 97% of the continent's total wind installations are located in the north across Egypt (> 550 MW), Morocco (> 286 MW) & Tunisia (> 114 MW)
- First sub-Saharan commercial project is in Kenya, Tanzania and Ethiopia to follow. South Africa.

Asia Pacific

- Asian markets installed more than 22 GW of wind power in 2010
- Asia's booming wind market is lead by China (> 50 GW) and India (> 15 GW) currently installed
- Other promising markets are Japan (> 2.3 GW), South Korea (> 400 MW) , Taiwan (> 500 MW), Philippines (>33 MW) and Sri Lanka (> 40 MW)
- China , South Korea and Japan now have offshore capacity
- China, India and South Korea are emerging as key manufacturing hubs for wind turbines
- Australia (> 1 GW) and New Zealand (> 500 MW) are two of the largest markets in the AP region

Potential in some Asian Countries

Country or area	Area >300w/m2 at 50 m	%of land area	Potential MW
East Areas of China	650,138	24.3%	3,250,690
Oaxaca Mexico	9,859	10.5%	49,295
Honduras	4,591	4.2%	22,955
Guatemala	3,446	3.2%	17,230
El Salvador	2,724	13.4%	13,620
Nicaragua	8,176	6.8%	40,880
Belise	737	3.2%	3,685
Costa Rica	1,647	3.3%	8,235
Ghana	1,135	0.5%	5,675
Sri Lanka	12,284	18.5%	61,420
Bangladesh	218	0.2%	1,090
Nepal	7,625	5.2%	38,125
Cuba	4,792	2.3%	23,960
Brazil	791,697	9.3%	3,958,485
Ethiopia	80,225	7.0%	401,125
Kenya	41,400	7.3%	207,000
Vietnam	128,340	39.5%	641,700
Cambodia	6,500	3.6%	32,500
Laos	45,563	19.8%	227,815
Thailand	38,098	7.4%	190,490
Armenia	2,205	7.8%	11,025
Pakistan	69,862	10.8%	349,310
Afghanistan	76,205	9.8%	381,025
Philippines	11,052	3.7%	55,260
Mongolia	160,641	40.0%	803,205
Dominican Republic	1,482	9.0%	7,410
	2,160,642	12.2%	10,803,210

Latin America

- Total installed capacity in the region grew by 50% during 2010
- More than 2,000 MW of wind power now operating across the region
- Brazil (>1 GW) Mexico (> 600 MW) & Chile (> 240 MW) are the key markets in the region
- Other interesting markets are Uruguay (>45 MW), Costa Rica (> 123 MW) , Honduras, Peru (under construction), Venezuela (under construction) and Argentina (great wind resource but policy vacuum)

Potential in Some Latin American countries

Country or area	Area >300 w/m ² at 50 metre	% of land area	Potential MW
Mexico (Oaxaca)	9,859	10.5%	49,295
Honduras	4,591	4.2%	22,955
Guatemala	3,446	3.2%	17,230
El Salvador	2,724	13.4%	13,620
Nicaragua	8,176	6.8%	40,880
Belise	737	3.2%	3,685
Costa Rica	1,647	3.3%	8,235
Cuba	4,792	2.3%	23,960
Brazil	791,697	9.3%	3,958,485
Dominican Republic	1,482	9.0%	7,410

Note on Latin America Potentials

- The gross potential from high quality resources (Class 4 and up) in the Latin American region as a whole is much larger than current electricity generation (1225 TWh in 2007).
- A relatively small fraction of the gross potential (perhaps 10-15% in most countries) can effectively be developed. However, even with this restriction, the potential is large relative to current total generation in the region. Less than 1% of high quality wind potential has been developed in the region till date.
- Argentina alone has the gross potential to supply Latin America several times over, no one else comes close.
- While there are large differences between countries, there appears to be enough high quality potential to make a significant contribution to electricity supply expansion over the next 20-25 years (say, more than 10%).

New Markets

Latin America: Brazil leading, followed by Mexico, Chile, Uruguay and others;

Africa: Morocco and Egypt; now Kenya, followed by Tanzania and Ethiopia. South Africa?

Asia: Mongolia, Viet Nam, Thailand, Sri Lanka. Japan?

Conclusions

Market conditions:

- Asian market driving global growth
- European market solid and steady
- North America uncertain and weak at the moment
- Hopeful signs in Latin America, Africa
- Downward price pressure continues
- Trade barriers/new protectionism?
- International commodity price volatility returns with economic recovery

Looking Ahead

A global climate agreement will be fundamental for wind power to achieve its maximum potential, but for the short term:

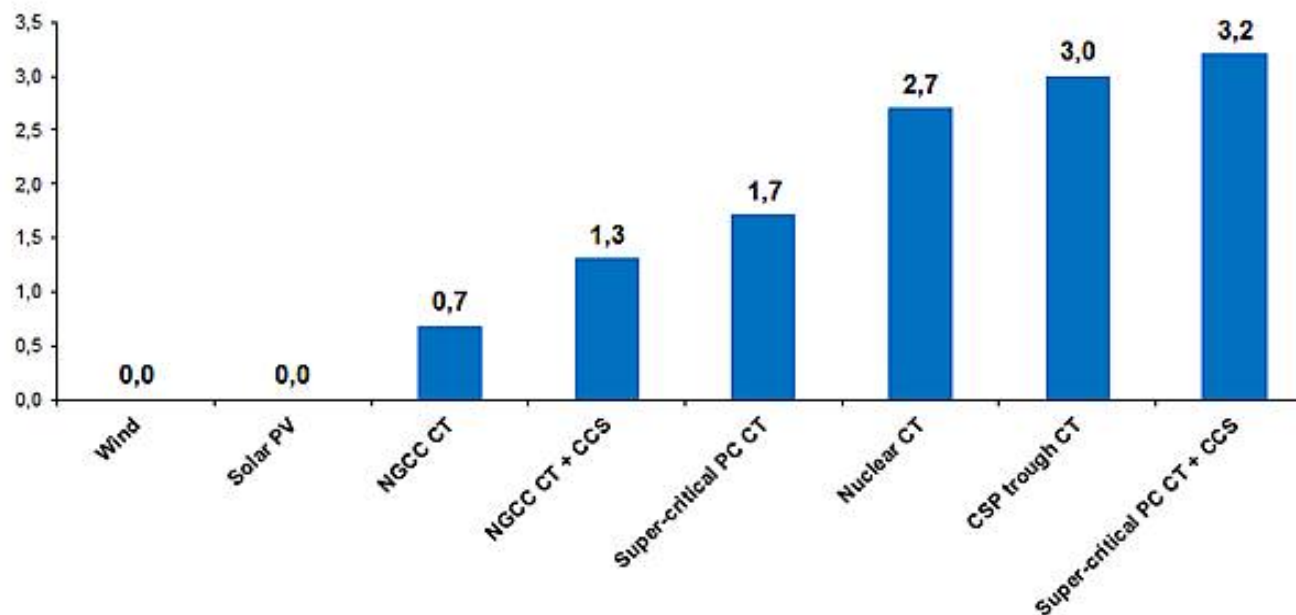
Uncertainty:

- in international political landscape
- in the future of the carbon markets
- in 'new' climate-related funds

Focus on national/regional legislation and markets

Market drivers all still in place, and increasingly prominent:
energy security; cost stability; macroeconomic security;
local economic development and job creation; local
environment and climate

Global Water Crisis



Water Intensities of Power Generation (m³/MWh)



Thank you

For more information:

Steve Sawyer
steve.sawyer@gwec.net

