



**EWEA**

THE EUROPEAN WIND ENERGY ASSOCIATION



# Wind in power

2012 European statistics

February 2013

## Contents

<b><u>Executive summary</u></b> .....	3
<b><u>2012 annual installations</u></b> .....	5
Wind power capacity installations .....	5
Power capacity installations .....	6
Renewable power installations .....	7
<b><u>Trends and cumulative installations</u></b> .....	7
Renewable power installations .....	7
Net changes in EU installed power capacity 2000-2012 .....	8
Total installed power capacity .....	8
<b><u>A closer look at wind power installations</u></b> .....	9
Total installed power capacity .....	9
National breakdown of wind power installations .....	9
Onshore and offshore annual markets .....	10
Cumulative wind power installations .....	10
Estimated wind energy production .....	11
<b><u>Wind power targets</u></b> .....	12

## Contributors

Justin Wilkes (Policy Director, EWEA)

Jacopo Moccia (Head of Policy Analysis, EWEA)

## Data sources

Platts PowerVision, January 2013

EWEA, wind energy data and ocean energy data

EPIA, solar PV data

ESTELA, CSP data

## Special thanks to:

IGWindkraft (AT) - EDORA and VWEA (BE) - APEE and BGWEA (BG) - Suisse Eole (CH) - CWEA (CY) - CSVE (CZ), BWE and VDMA (DE) - DWIA (DK) - Tuulenergia (EE) - HWEA (EL) - AEE (ES) - IWEA (IE) - Suomen Tuulivoimayhdistys ry and Technology industries of Finland (FI) - Ademe (FR) - Energy Institute Hrvoje Pozar (HR) - MSZET and MSZIT (HU) - ANEV (IT) - LWPA (LT) - Ministère de l'économie et du commerce extérieur (LU) - Baltic Wind Park (LV) - NWEA (NL) - NorWEA (NO) - TÜREB (TK) - PWEA (PL) - APREN (PT) - Svenskwindenergi (SE) - UWEA (UA) - RenewableUK (UK).

Photo cover: Wolfram Bradac

## Executive summary

---

### 2012 annual installations

- 11,895 MW of wind power capacity (worth between €12.8bn and €17.2bn) was installed in the EU during 2012.
- The National Renewable Energy Action Plans forecast a net increase in 2012 of 11,360 MW, 328 MW less than the actual net annual increase of 11,688 MW.
- EU wind power installations for 2012 do not show the significantly negative impact of market, regulatory and political uncertainty sweeping across Europe since the beginning of 2011. The turbines installed during 2012 were generally permitted, financed and ordered prior to the crisis feeding through to a destabilisation of legislative frameworks for wind energy. The stress being felt in many markets across Europe throughout the wind industry's value chain should become apparent in a reduced level of installations in 2013, possibly continuing well into 2014.
- Wind power accounted for 26.5% of total 2012 power capacity installations.
- Renewable power installations accounted for 70% of new installations during 2012: 31.3 GW of a total 44.9 GW of new power capacity, down 4% on 2011.

### Trends and cumulative installations

- The EU's total installed power capacity increased by 29.2 GW net to 931.9 GW, with wind power increasing by 11.7 GW and reaching a share of total installed generation capacity of 11.4%, up from 10.5% the previous year.
- The 106 GW of installed wind power capacity is 1.6 GW (1.5%) below the installed capacity outlined in the 27 National Renewable Energy Action Plans (NREAPs) of 107.6 GW. Onshore there are 101 GW of installed capacity instead of 101.7 GW foreseen by the NREAPs (-1%). Offshore there are 4,993 MW of installed capacity instead of 5,829 foreseen by the NREAPs (-14%).
- Since 2000, 27.7% of new capacity installed has been wind power, 51.2% renewables and 91.2% renewables and gas combined.
- The EU power sector continues its move away from fuel oil, coal and nuclear, with each technology continuing to decommission more than it installs.

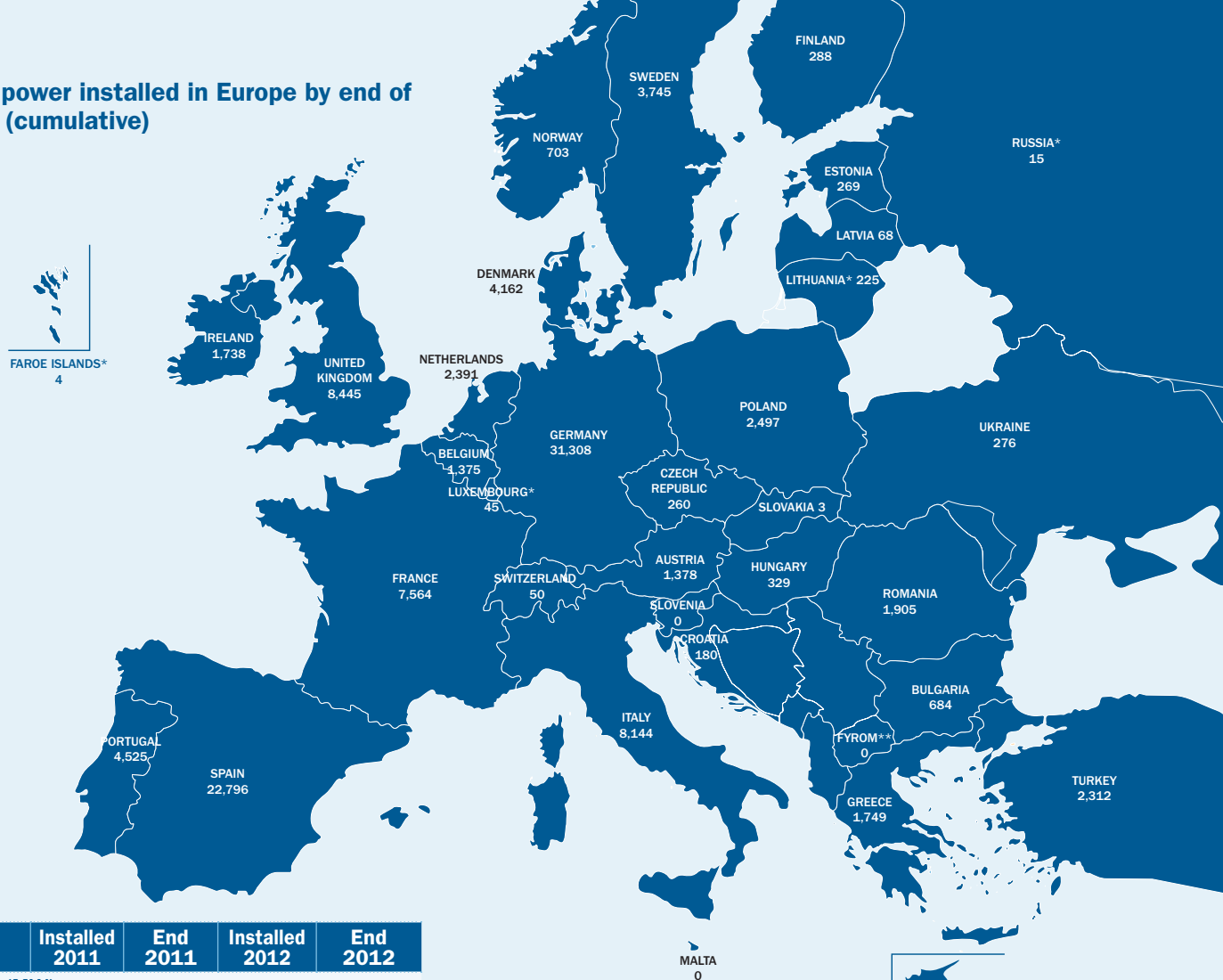
### Wind power installations

- Annual installations of wind power have increased steadily over the last 12 years, from 3.2 GW in 2000 to 11.9 GW in 2012, a compound annual growth rate of over 11.6%.
- A total of 106 GW is now installed in the European Union, an increase in installed cumulative capacity of 12.6% compared to the previous year.
- Germany remains the EU country with the largest installed capacity followed by Spain, the UK and Italy. 15 Member States have more than 1 GW of installed capacity, including two newer Member States, Poland and Romania.
- There was generalised growth in wind energy installations across Europe, although it is expected that a number of large markets, such as Italy and Spain, and certain previously fast growing emerging markets, such as Bulgaria, may slow down significantly over the coming years.
- Offshore saw a record growth in 2012, and the trend is expected to continue in 2013 and 2014.
- The wind power capacity installed by the end of 2012 would, in a normal wind year, produce 231 TWh of electricity, enough to cover 7% of the EU's electricity consumption – up from 6.3% the year before.

### Wind power targets

- Overall the EU is lagging by 1.6 GW (-1.5%) behind its 27 National Renewable energy Action Plan forecasts.
- Eighteen Member States are falling behind on their wind power capacity trajectories, most notably Slovakia, Greece, Czech Republic, Hungary, France and Portugal.
- Nine Member States are above their trajectory.
- Compared to EWEA's 2009 forecast, onshore installations are 3 GW above expectations (+3%). Offshore installations are below EWEA's expectations by 307 MW (-6%).

## Wind power installed in Europe by end of 2012 (cumulative)



	Installed 2011	End 2011	Installed 2012	End 2012
<b>EU Capacity (MW)</b>				
Austria	73	1084	296	1,378
Belgium	191	1,078	297	1,375
Bulgaria	28	516	168	684
Cyprus	52	134	13	147
Czech Republic	2	217	44	260
Denmark	211	3,956	217	4,162
Estonia	35	184	86	269
Finland	2	199	89	288
France	830	6,807	757	7,564
Germany	2,100	29,071	2,415	31,308
Greece	316	1,634	117	1,749
Hungary	34	329	0	329
Ireland	208	1,614	125	1,738
Italy	1,090	6,878	1,273	8,144
Latvia	17	48	21	68
Lithuania*	16	179	46	225
Luxembourg*	0	45	0	45
Malta	0	0	0	0
Netherlands	59	2,272	119	2,391
Poland	436	1,616	880	2,497
Portugal	341	4,379	145	4,525
Romania	520	982	923	1,905
Slovakia	0	3	0	3
Slovenia	0	0	0	0
Spain	1,050	21,674	1,122	22,796
Sweden	754	2,899	846	3,745
United Kingdom	1,298	6,556	1,897	8,445
<b>Total EU-27</b>	<b>9,664</b>	<b>94,352</b>	<b>11,895</b>	<b>106,040</b>
<b>Total EU-15</b>	<b>8,524</b>	<b>90,145</b>	<b>9,714</b>	<b>99,652</b>
<b>Total EU-12</b>	<b>1,140</b>	<b>4,207</b>	<b>2,181</b>	<b>6,388</b>

European Union: 105,040 MW  
Candidate Countries: 2,492 MW  
EFTA: 753 MW  
Total Europe: 109,581 MW

	Installed 2011	End 2011	Installed 2012	End 2012
<b>Candidate Countries (MW)</b>				
Croatia	52	131	48	180
FYROM**	0	0	0	0
Serbia	0	0	0	0
Turkey	477	1,806	506	2,312
<b>Total</b>	<b>529</b>	<b>1,937</b>	<b>554</b>	<b>2,492</b>
<b>EFTA (MW)</b>				
Iceland	0	0	0	0
Liechtenstein	0	0	0	0
Norway	99	537	166	703
Switzerland	3	46	4	50
<b>Total</b>	<b>88</b>	<b>583</b>	<b>170</b>	<b>753</b>
<b>Other (MW)</b>				
Faroe Islands*	0	4	0	4
Ukraine	66	151	125	276
Russia*	0	15	0	15
<b>Total</b>	<b>66</b>	<b>171</b>	<b>125</b>	<b>296</b>
<b>Total Europe</b>	<b>10,361</b>	<b>97,043</b>	<b>12,744</b>	<b>109,581</b>

\* Provisional data or estimate.

\*\* Former Yugoslav Republic of Macedonia

Note: due to previous year adjustments, 207 MW of project de-commissioning, re-powering and rounding of figures, the total 2012 end-of-year cumulative capacity is not exactly equivalent to the sum of the 2011 end-of-year total plus the 2012 additions.

# 2012 annual installations

## Wind power capacity installations

During 2012, 12,744 MW of wind power was installed across Europe, of which 11,895 MW was in the European Union.

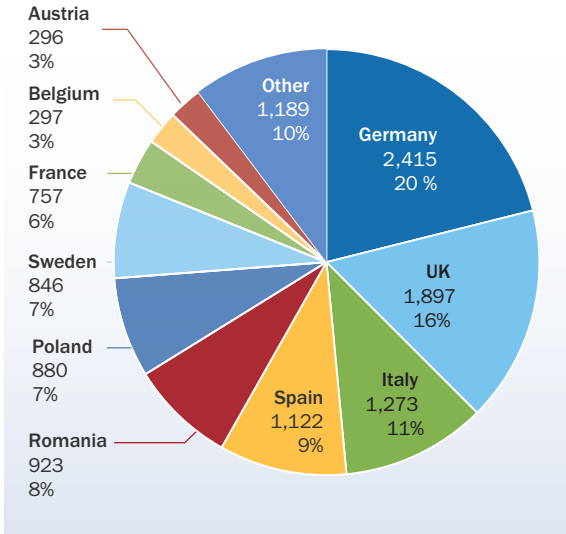
Of the 11,895 MW installed in the EU, 10,729 MW was onshore and 1,166 MW offshore. Investment in EU wind farms was between €12.8bn and €17.2bn. Onshore wind farms attracted €9.4bn to €12.5bn, while offshore wind farms accounted for €3.4bn to €4.7bn.

In terms of annual installations, Germany was the largest market in 2012, installing 2,415 MW of new capacity, 80 MW of which (3.3%) offshore. The UK came in second with 1,897 MW, 854 MW of which (45%) offshore, followed by Italy with 1,273 MW, Spain (1,122 MW), Romania (923 MW), Poland (880 MW), Sweden (845 MW) and France (757 MW).

Among the emerging markets of Central and Eastern Europe, Romania and Poland both had record years - both installing around 7.5% of the EU's total annual capacity. Both markets are now consistently in the top ten in the EU for annual installations.

It is also important to note the amount of installations in the UK, Italy and Sweden. These three markets

**FIGURE 1.1 EU MEMBER STATE MARKET SHARES FOR NEW CAPACITY INSTALLED DURING 2012 IN MW. TOTAL 11,566 MW**



represent respectively 16%, 11% and 7% of total EU installations in 2012.

Offshore accounted for 10% of total EU wind power installations in 2012, one percentage point more than in 2011.



Photo: Siemens AG Energy Sector

### Power capacity installations

Wind power accounted for 26.5% of new installations in 2012, the second biggest share after solar PV (37%) and before gas (23%).

Solar PV installed 16 GW (37% of total capacity), followed by wind with 11.9 GW (26.5%), and gas with 10.5 GW (23%).

No other technologies compare to wind, PV and gas in terms of new installations. Coal installed 3 GW (7% of total installations), biomass 1.3 GW (3%), CSP 833 MW (2%), hydro 424 MW (1%), waste 50 MW, Nuclear 22 MW, fuel oil 7 MW, ocean technologies 6 MW <sup>(4)</sup> and geothermal 5 MW.

FIGURE 1.2 SHARE OF NEW POWER CAPACITY INSTALLATIONS IN EU. TOTAL 44,601 MW

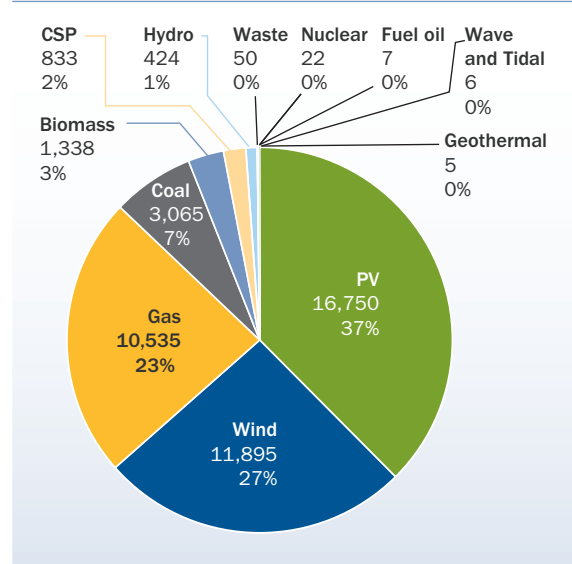
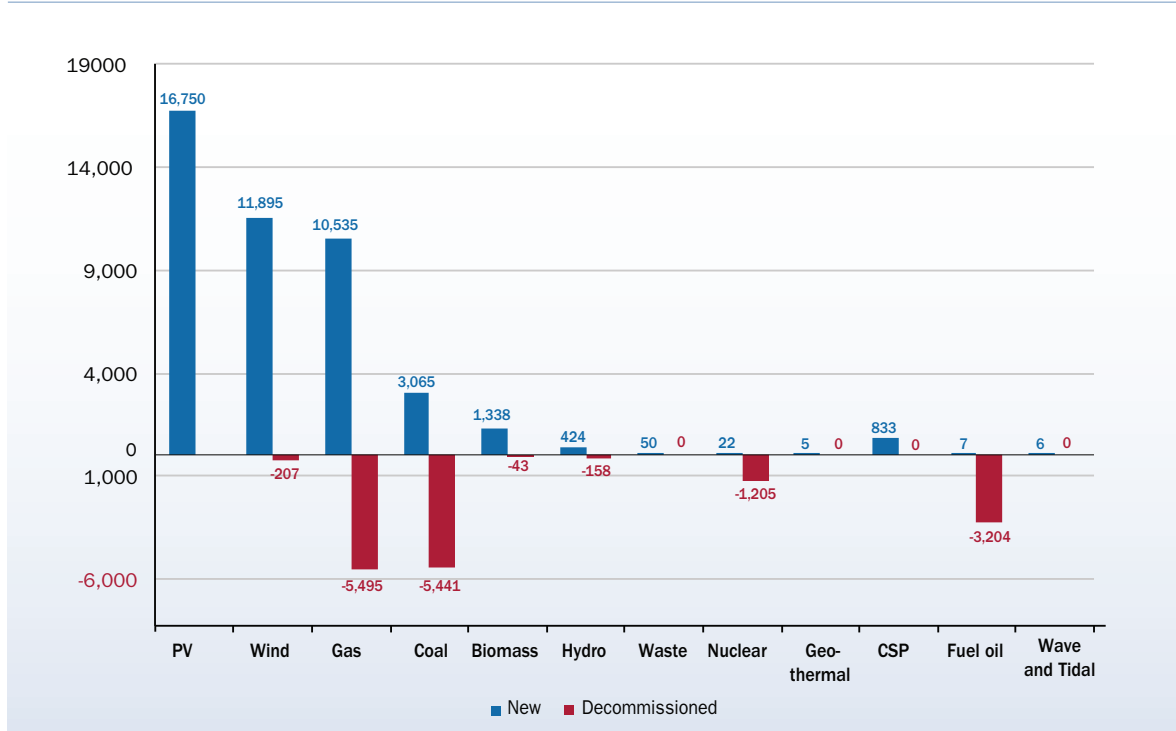


FIGURE 1.3 NEW INSTALLED POWER CAPACITY AND DECOMMISSIONED POWER CAPACITY IN MW



Overall, during 2012, 44.9 GW of new power generating capacity was installed in the EU, 1.7 GW less than in 2011, which was a record year for new power capacity installations.

During 2012, 5.5 GW of gas capacity was decommissioned, as were 5.4 GW of coal, 3.2 GW of fuel oil and 1.2 GW of nuclear capacity.

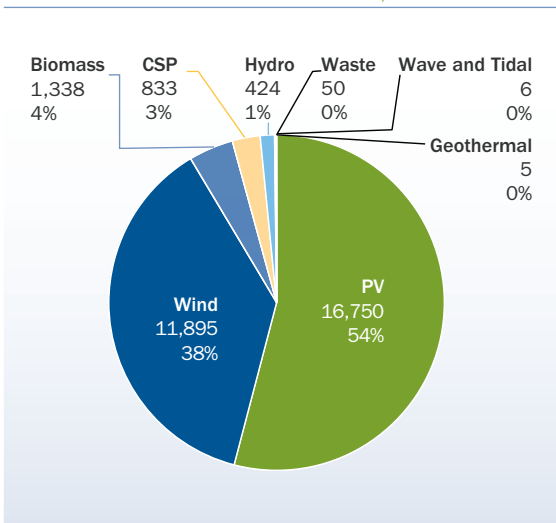
After two years of installing more capacity than it decommissioned, coal power installations reduced by almost 2.4 GW in 2012.

<sup>(4)</sup> Provisional data.

## Renewable power capacity installations

In 2012, a total of 31 GW of renewable power capacity was installed. Almost 70% of all new installed capacity in the EU was renewable. It was, furthermore, the fifth year running that over 55% of all new power capacity in the EU was renewable.

FIGURE 1.4 2012 SHARE OF NEW RENEWABLE POWER CAPACITY INSTALLATIONS IN MW. TOTAL 30,968 MW



## Trends & cumulative installations

### Renewable power capacity installations

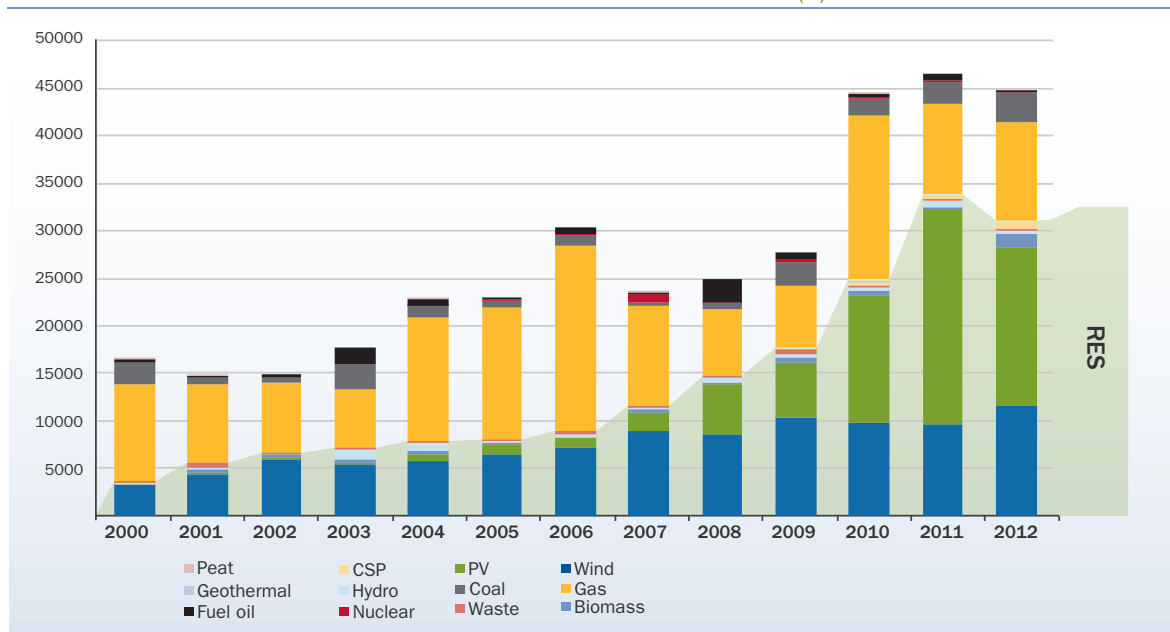
In 2000, new renewable power capacity installations totalled a mere 3.5 GW. Since 2010, annual renewable capacity additions have been between 24.5 GW and 33.7 GW, seven to eight times higher than at the turn of the century.

The share of renewables in total new power capacity additions has also grown. In 2000, the 3.5 GW

represented 20.7% of new power capacity installations, increasing to 31.3 GW representing 70% in 2012.

353 GW of new power capacity has been installed in the EU since 2000. Of this, almost 28% has been wind power, 51% renewables and 91% renewables and gas combined.

FIGURE 2.1 INSTALLED POWER GENERATING CAPACITY PER YEAR IN MW AND RES SHARE (%)

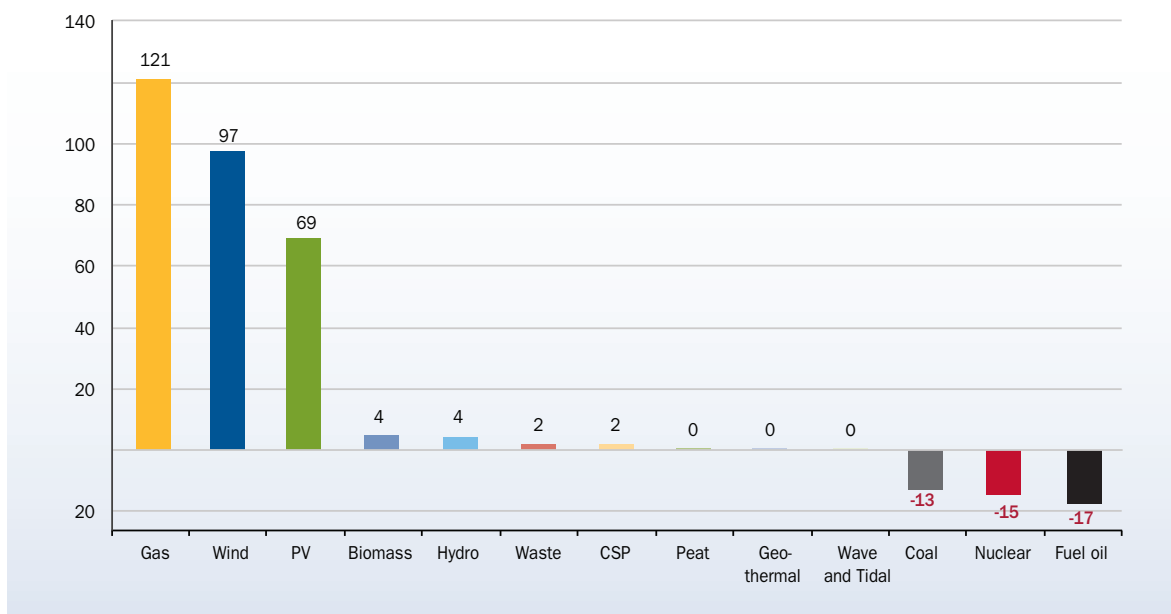


### Net changes in EU installed power capacity 2000-2012

The net growth since 2000 of gas power (121 GW), wind (96.7 GW) and solar PV (69 GW) was at the expense of fuel oil (down 17.4 GW), nuclear (down 14.7 GW) and coal (down 12.7 GW). The other renewable technologies (hydro, biomass, waste, CSP, geothermal and ocean energies) have also been increasing their installed capacity over the past decade, albeit more slowly than wind and solar PV.

The EU's power sector continues to move away from fuel oil, coal and nuclear while increasing its total installed generating capacity with gas, wind, solar PV and other renewables.

FIGURE 2.2 NET ELECTRICITY GENERATING INSTALLATIONS IN THE EU 2000-2012 (GW)



### Total installed power capacity

Wind power's share of total installed power capacity has increased five-fold since 2000; from 2.2% in 2000 to 11.4% in 2012. Over the same period, renewable

capacity increased by 51% from 22.5% of total power capacity in 2000 to 33.9% in 2012.

FIGURE 2.3 EU POWER MIX 2000

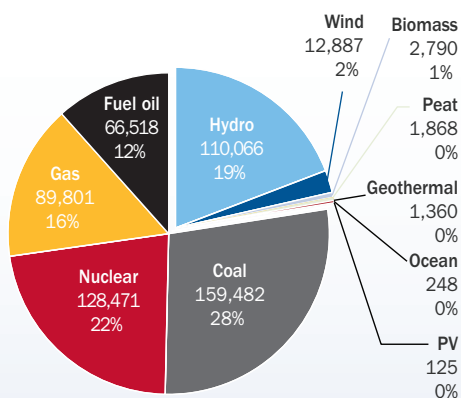
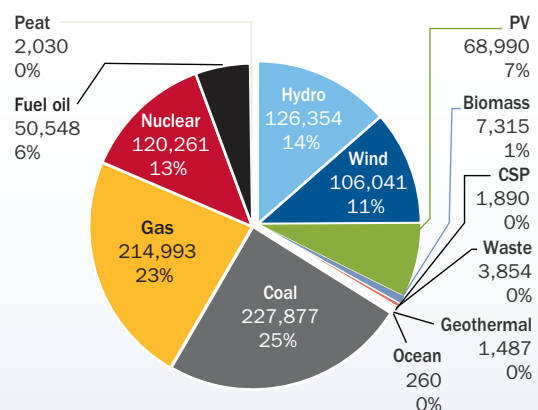


FIGURE 2.4 EU POWER MIX 2012



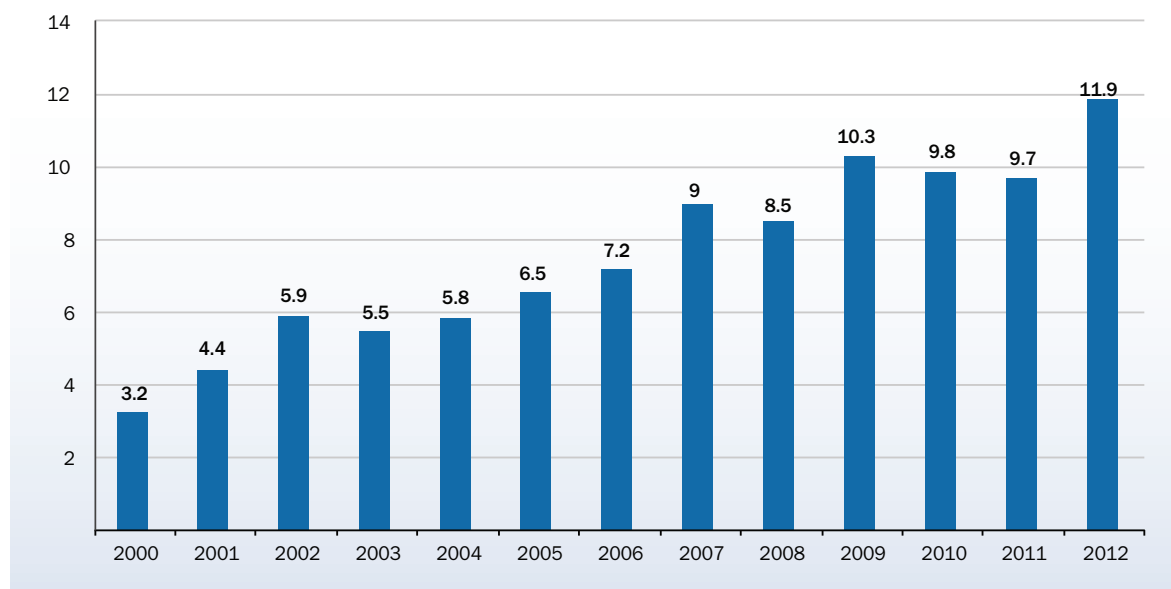


## A closer look at wind power installations

### Total installed power capacity

Annual wind power installations in the EU have increased steadily over the past 12 years from 3.2 GW in 2000 to 11.9 GW in 2012, a compound annual growth rate of over 11%.

FIGURE 3.1 ANNUAL WIND POWER INSTALLATIONS IN EU (GW)

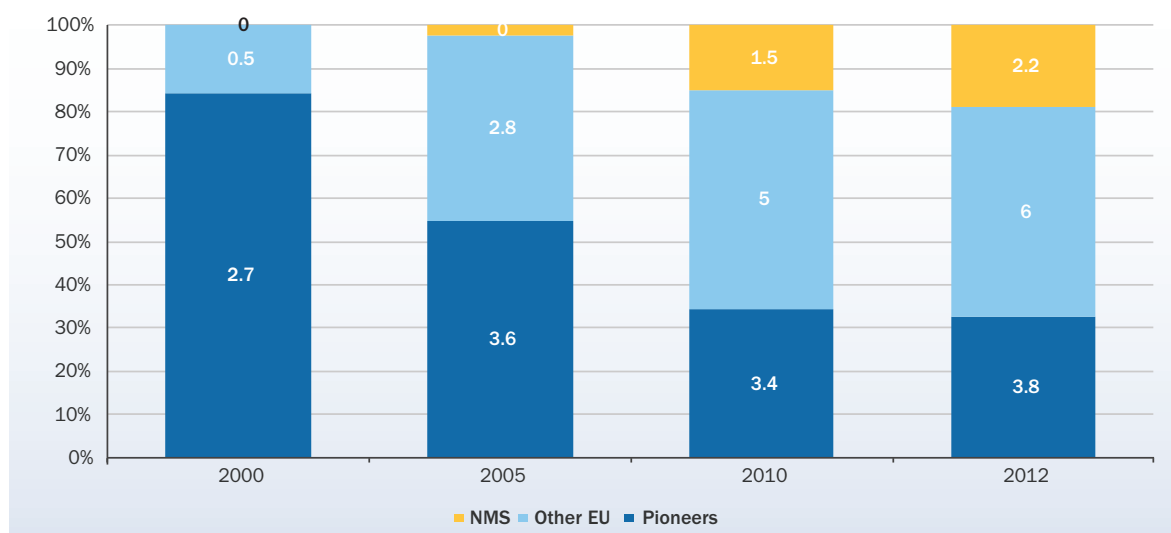


### National breakdown of wind power installations

In 2000, the annual wind power installations of the three pioneering countries – Denmark, Germany and Spain – represented 85% of all EU wind capacity additions. In 2012, this share had decreased to 32%.

Moreover, in 2000, the countries that make up, today, the 12 newer EU Member States<sup>(2)</sup> had no wind energy; in 2012, they represented 18% of the EU's total market.

FIGURE 3.2 DENMARK, GERMANY AND SPAIN'S SHARE OF EU WIND POWER MARKET (GW)

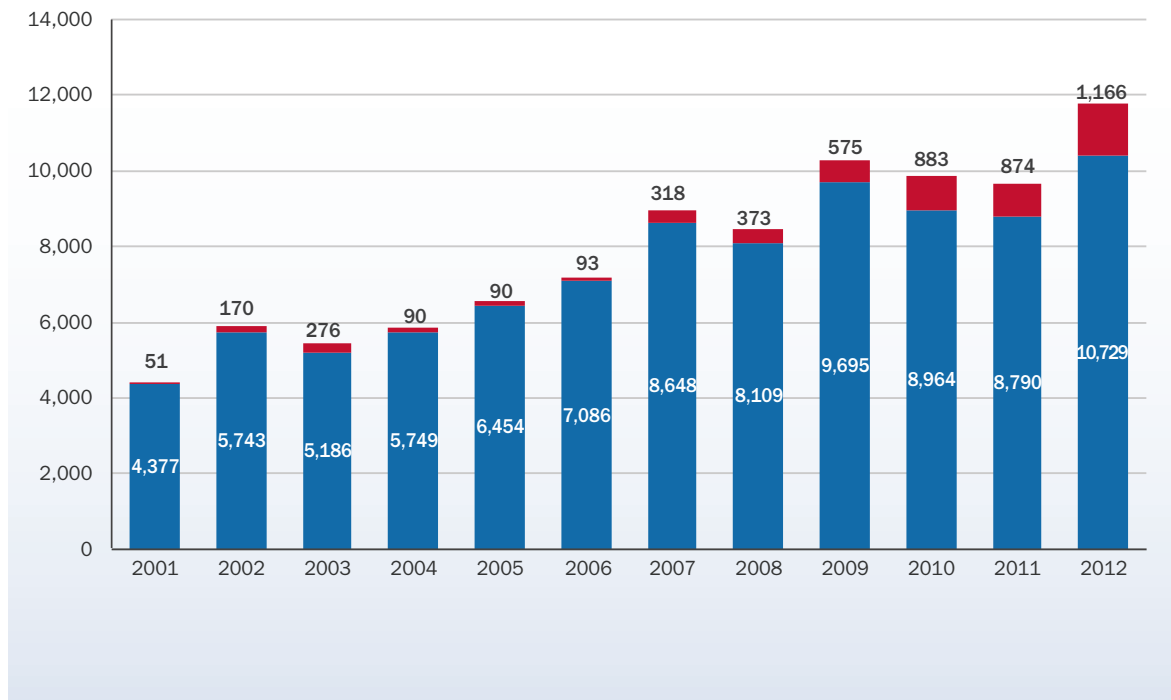


<sup>(2)</sup> Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia.

### Onshore and offshore annual markets

2012 was a record year for offshore installations, with 1,166 MW of new capacity grid connected. Offshore wind power installations represent 10% of the annual EU wind energy market, up from 9% in 2011.

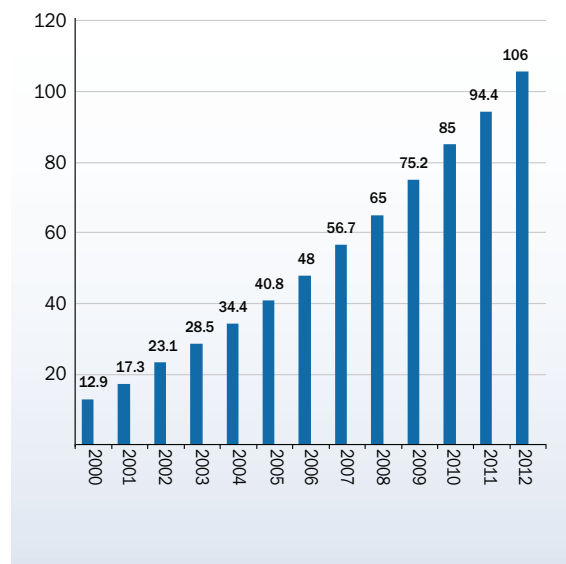
FIGURE 3.3 ANNUAL ONSHORE AND OFFSHORE INSTALLATIONS (MW)



### Cumulative wind power installations

A total of 106 GW is now installed in the European Union, a growth of 12.6% on the previous year and similar to the growth recorded in 2011. Germany remains the EU country with the largest installed capacity, followed by Spain, Italy, the UK and France. Ten other EU countries have over 1 GW of installed capacity: Austria, Belgium, Denmark, Greece, Ireland, The Netherlands, Poland, Portugal, Romania and Sweden

FIGURE 3.4 CUMULATIVE WIND POWER INSTALLATIONS IN THE EU (GW)



Germany (31.3 GW) and Spain (22.8 GW) have the largest cumulative installed wind energy capacity in Europe. Together they represent 52% of total EU capacity. The UK, Italy and France follow with, respectively, 8.4 GW (8% of total EU capacity), 8.1 GW (8%) and 7.6 GW (7%). Amongst the newer Member States, Poland, with 2.5 GW of cumulative capacity, is now in the top 10, in front of the Netherlands, and Romania is eleventh with 1.9 GW (1.8%).

### Estimated wind energy production

The wind capacity installed at end 2012 will, in a normal wind year, produce 231 TWh of electricity, representing 7% of the EU's gross final consumption<sup>(3)</sup>.

According to this methodology Denmark remains the country with the highest penetration of wind power in electricity consumption (27.1%), followed by Portugal (16.8%), Spain (16.3%), Ireland (12.7%) and Germany (10.8%). Of the newer Member States, Romania has the highest wind energy penetration (6.9%).

FIGURE 3.5 EU MEMBER STATE MARKET SHARES FOR TOTAL INSTALLED CAPACITY. TOTAL 105.7 GW

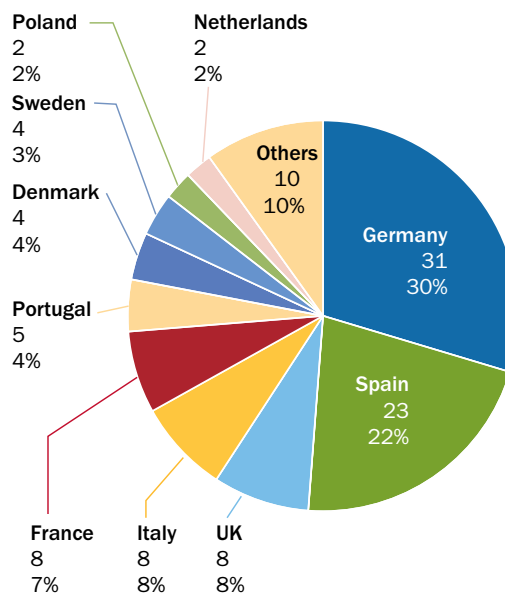
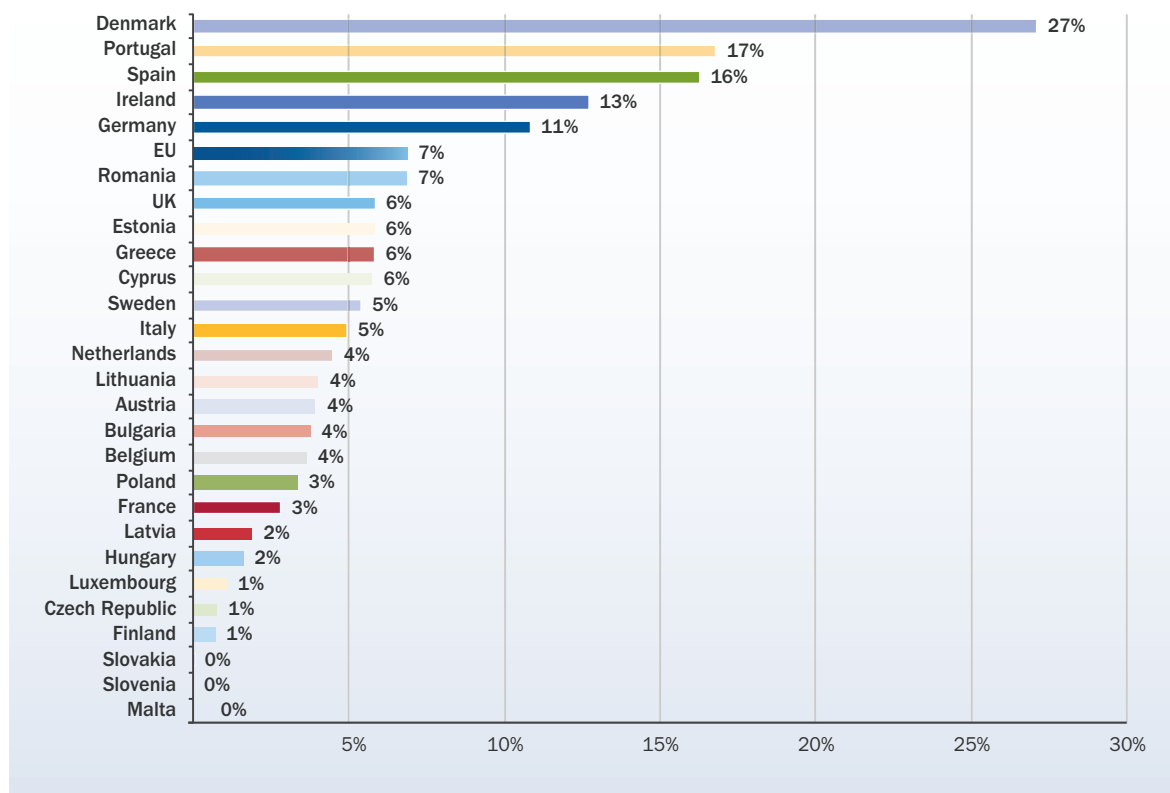
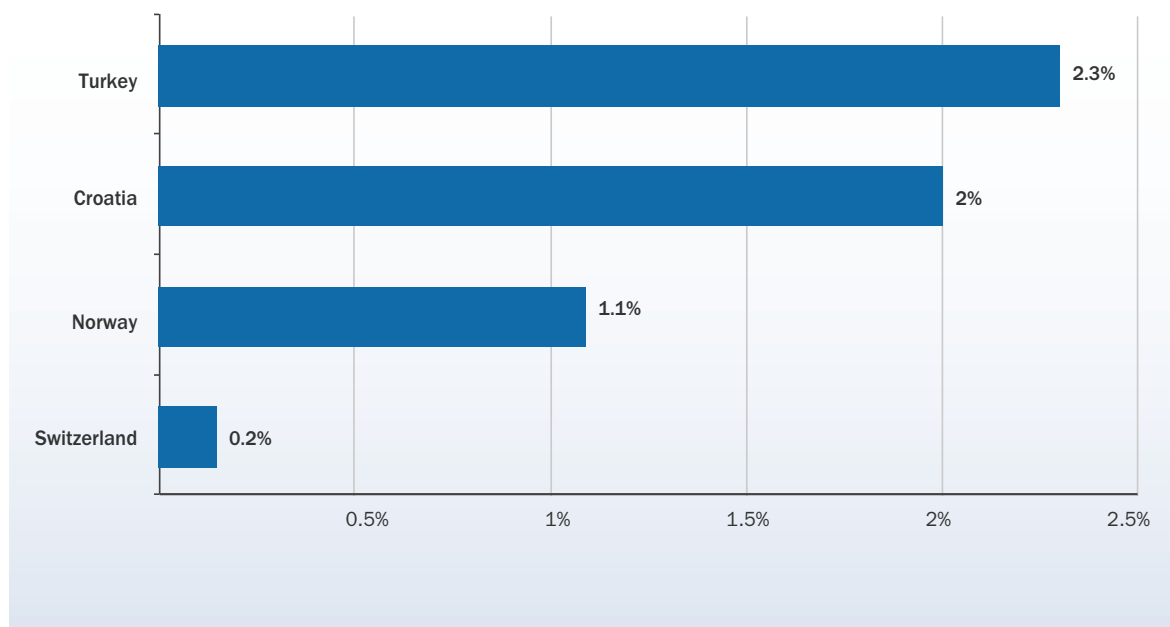


FIGURE 3.6 WIND POWER SHARE OF TOTAL ELECTRICITY CONSUMPTION IN EU (7%) AND IN MEMBER STATES



<sup>(3)</sup> According to the latest figures from Eurostat, gross electricity consumption in the EU was 3,349 TWh in 2010.

FIGURE 3.7 WIND POWER SHARE OF TOTAL ELECTRICITY CONSUMPTION IN CROATIA, NORWAY, SWITZERLAND, TURKEY



*Note: wind energy penetration levels are calculated using average capacity factors onshore and offshore and Eurostat electricity consumption figures (2010). Consequently, Figure 3.6 indicates approximate share of consumption met by the installed wind energy capacity at end 2012. The Figure does not represent real wind*

*energy production and electricity consumption data over a calendar year. Consequently real national figures for any given year can vary. For example, according to the Portuguese TSO (REN), wind energy met over 19% of total consumption during 2012.*

## Wind power targets

Despite the growth of annual wind energy installations in 2012 and cumulative capacity reaching 106 GW, wind energy deployment is lagging behind the objectives the EU Member States set themselves in their National Renewable Energy Action Plans (NREAPs) <sup>(4)</sup>. Comparison with the NREAPs does not take into account any subsequent changes to targets. Interestingly, installations in 2012 were higher than EWEA's expectations.

In 2009, the EWEA published a growth scenario <sup>(5)</sup> that expected cumulative capacity in the EU to be 103 GW at the end of 2012. However, EWEA's scenario reaches 230 GW of installed wind energy capacity in 2020, whereas the sum of the Member State's NREAP's is 213 GW. The latter suggests that whereas EWEA took a gradual approach with annual installations increasing slowly at the beginning and more rapidly towards 2020, the Member States, on the whole, "front-loaded" their trajectories.

<sup>(4)</sup> Foreseen by Directive 2009/28/EC of 23 April 2009 on the promotion of the use of energy from renewable sources.

<sup>(5)</sup> Pure Power, wind energy targets for 2020 and 2030 – a report by the European Wind Energy Association.

TABLE 4.1 WIND POWER CAPACITY TARGETS, NATIONAL RENEWABLE ENERGY ACTION PLANS AND REAL (MW)

	Onshore 2012		Offshore 2012		Total 2012		Difference 2012			
	NREAP	Real	NREAP	Real	NREAP	Real	Onshore	Offshore	Total	
Austria	1,435	1,378	0	0	1,435	1,378	-57	0	-57	-4%
Belgium	720	996	503	380	1,223	1,375	276	-124	152	12.5%
Bulgaria	451	684	0	0	451	684	233	0	233	51.7%
Cyprus	114	147	0	0	114	147	33	0	33	28.9%
Czech Rep	343	260	0	0	343	260	-83	0	-83	-24.2%
Denmark	2,985	3,241	856	921	3,841	4,162	256	65	321	8.4%
Estonia	311	269	0	0	311	269	-42	0	-42	-13.5%
Finland	380	262	0	26	380	288	-118	26	-92	-24.2%
France	7,598	7,564	667	0	8,265	7,564	-34	-667	-701	-8.5%
Germany	30,566	31,027	792	280	31,358	31,307	461	-512	-51	-0.2%
Greece	2,521	1,749	0	0	2,521	1,749	-772	0	-772	-30.6%
Hungary	445	329	0	0	445	329	-116	0	-116	-26.1%
Ireland	2,334	1,713	36	25	2,370	1,738	-621	-11	-632	-26.7%
Italy	7,040	8,144	0	0	7,040	8,144	1,104	0	1,104	15.7%
Latvia	49	68	0	0	49	68	19	0	19	38.8%
Lithuania	250	225	0	0	250	225	-25	0	-25	-10%
Luxembourg	54	45	0	0	54	45	-9	0	-9	-16.7%
Malta	2	0	0	0	2	0	-2	0	-2	-100%
Netherlands	2,727	2,144	228	247	2,955	2,391	-583	19	-564	-19.1%
Poland	2,010	2,497	0	0	2,010	2,497	487	0	487	24.2%
Portugal	5,600	4,523	0	2	5,600	4,525	-1,077	2	-1,075	-19.2%
Romania	1,850	1,905	0	0	1,850	1,905	55	0	55	3%
Slovakia	150	3	0	0	150	3	-147	0	-147	-98%
Slovenia	2	0	0	0	2	0	-2	0	-2	-100%
Spain	23,555	22,796	0	0	23,555	22,796	-707	0	-707	-3.2%
Sweden	2,311	3,582	97	164	2,408	3,745	1,269	67	1,336	55.6%
UK	5,970	5,497	2,650	2,948	8,620	8,445	-473	298	-175	-2%
<b>EU-27</b>	<b>101,773</b>	<b>101,048</b>	<b>5,829</b>	<b>4,993</b>	<b>107,602</b>	<b>106,041</b>	<b>-725</b>	<b>-836</b>	<b>-1,561</b>	<b>-1.5%</b>
<b>EWEA 2009 EU</b>		<b>98,000</b>		<b>5,300</b>		<b>103,300</b>				
<b>Difference EWEA 2009 and real</b>		<b>3,048</b>		<b>-307</b>		<b>2,741</b>				

Eighteen Member States are falling behind their wind power capacity trajectories. Of these, the furthest behind are Slovakia (-147 MW, -98%), Greece (-772 MW, -30.6%), Czech Republic (-83 MW, -24.2%), Hungary (-116 MW, -26.1%), Portugal (-1,075 MW, -19%) and France (-701 MW, -8.5%). The nine other Member States are, on the other hand, above their trajectory. Sweden is the most noteworthy with 1,336 MW more than forecast (+55%).

The EU overall is lagging by almost 1.6 GW (-1.5%). Table 4.1 also highlights that it is in offshore where there is the biggest discrepancy between the NREAPs and real installations. The Member States are trailing by 836 MW, -14%.

Compared to EWEA's 2009 forecast, on the other hand, onshore installations have increased faster than expected (+3,048 MW or +3%). However, offshore installations are below expectations by 307 MW or -6%.

FIGURE 4.1 WIND POWER CAPACITY TARGETS (NREAPS AND EWEA 2009) AND REAL (MW)

