

Growth of Global Solar and Wind Energy Continues to Outpace Other Technologies

By Matt Lucky, Michelle Ray, and Mark Konold | July 30, 2013

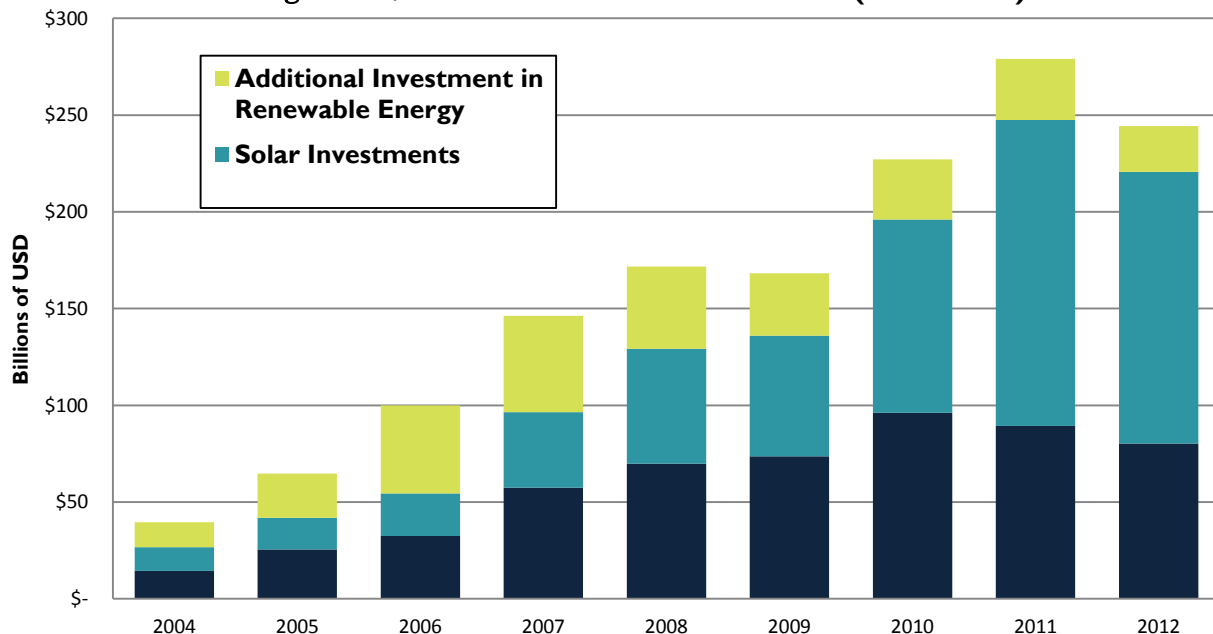
Global use of solar and wind energy continued to grow significantly in 2012. Solar power consumption increased by 58 percent, to 93 terrawatt-hours (TWh).¹ Use of wind power increased in 2012 by 18.1 percent, to 521.3 TWh.²

Although hydropower remains the world's leading renewable energy, solar and wind continue to dominate investment in new renewable capacity. They are quickly becoming the highest-profile renewable energies. And since most renewable energy policies worldwide focus on one or both of these resources, it is important to consider them together.

Global solar and wind energy capacities continued to grow even though new investments in these energy sources declined during 2012. Global investment in solar energy in 2012 was \$140.4 billion, an 11 percent decline from 2011, and wind investment was down 10.1 percent, to \$80.3 billion.³ (See Figure 1.) But due to lower costs for both technologies, total installed capacities grew sharply.⁴ (See Figure 2.)

Solar photovoltaic (PV) installed capacity grew by 41 percent in 2012, reaching 100 gigawatts (GW).⁵ Over the past five years alone, installed PV capacity grew by 900 percent from 10 GW in 2007.⁶ The countries with the most installed PV capacity today are Germany (32.4 GW), Italy (16.4 GW), United

Figure 1 | Solar and Wind Investments (2004-2012)



States (7.2 GW), and China (7.0 GW).⁷

In 2012, installed capacity for concentrating solar power (CSP) reached 2.55 GW, with 970 megawatts (MW) alone added in 2012.⁸ Spain (1.95 GW) and the United States (507 MW) dominate this market, while some growth has been seen in the northern African nations of Algeria (25 MW), Egypt (20 MW), and Morocco (20 MW).⁹

Europe remains the dominant region in the solar sector, accounting for 76 percent of global solar power use in 2012.¹⁰ Solar power use in Europe increased by 51.7 percent between 2011 and 2012.¹¹ Germany now accounts for 30 percent of the world's solar power consumption (a term that includes use of both solar PV and CSP).¹² (See Figure 3.)

Germany again led the world in added PV capacity in 2012, with 7.6 GW of new capacity.¹³ Still, other countries in the region stood out, with PV capacity growing substantially in Denmark (up 2,872 percent), Bulgaria (544 percent), Greece (146 percent), and Austria (126 percent) in 2012.¹⁴ Italy added the third most capacity of any country in the world in 2012 (3.4 GW), bringing its total installed capacity to 16.3 GW.¹⁵ However, in June 2013 Italy reached the subsidy cap for its feed-in tariff (FIT) program, so future solar PV projects will no longer be eligible to receive FITs.¹⁶

Spain added 950 MW of installed CSP capacity in 2012, representing a growth of 95 percent.¹⁷ Nevertheless, a retroactive change in FIT policies and a policy change allowing for taxation of all power producers will likely slow future growth in CSP there.¹⁸

The Asia-Pacific region now accounts for 17 percent of global solar use, leaving it behind only Europe.¹⁹ Solar consumption grew by 69.5 percent in the region in 2012, and Japan (6.7 percent of the

Figure 2 | Growth of Solar PV and Wind Installations (2003-2012)

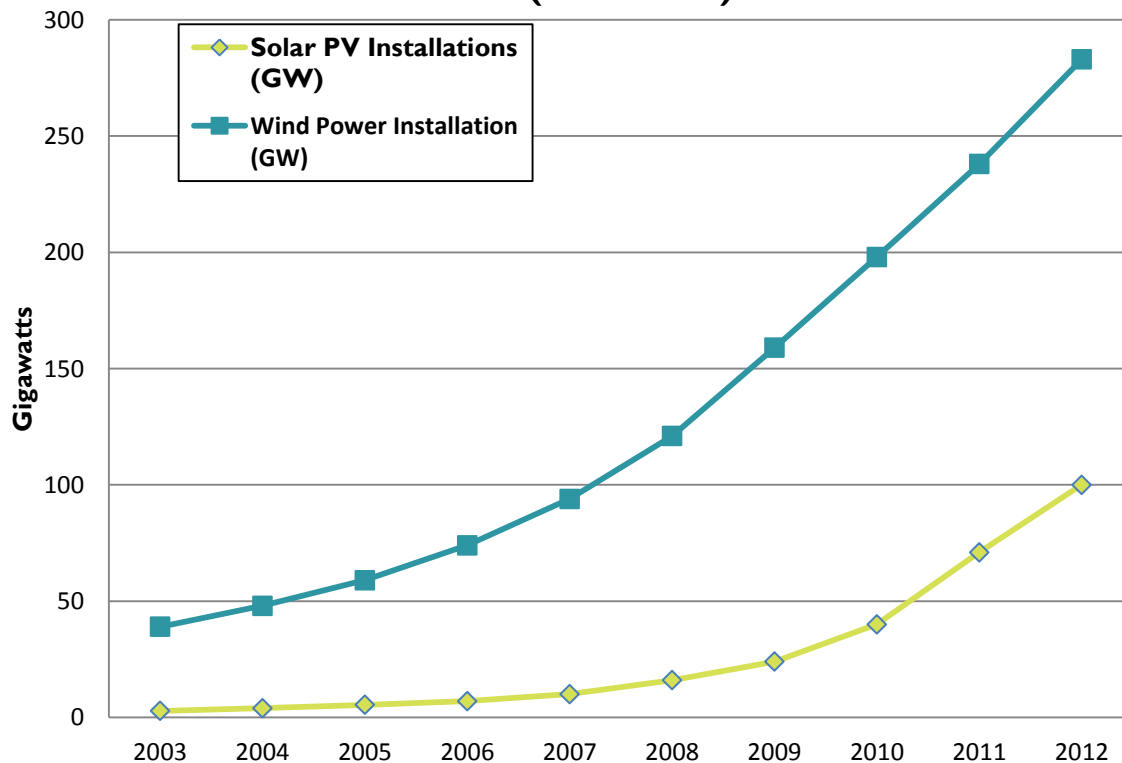
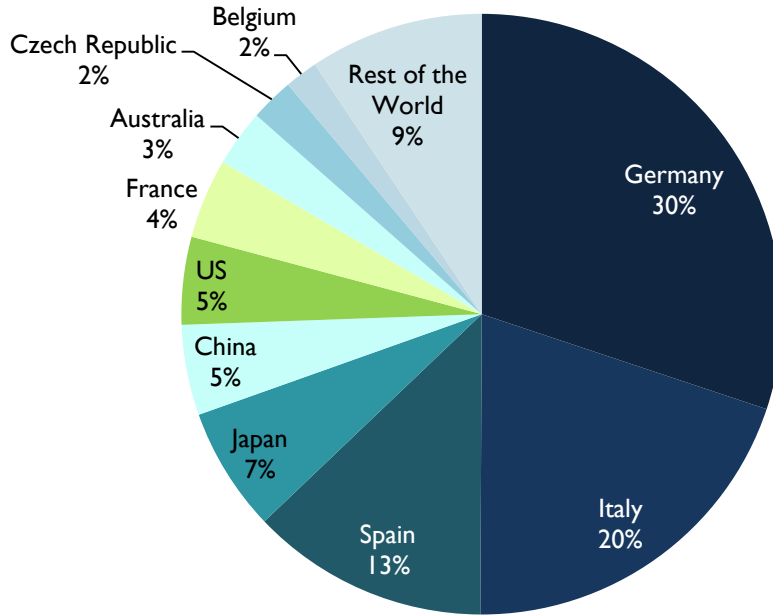


Figure 3 | Country Shares of Global Solar Power Consumption



Solar power consumption increased by **123%** in North America in 2012

world total) and China (4.9 percent) are now among the top five global solar energy consumers.²⁰

The region saw sustained growth in PV capacity, with significant increases in Malaysia (up 733 percent), India (435 percent), Thailand (140 percent), and China (100 percent) from 2011 to 2012.²¹ Japan, largely as the result of a new FiT and the need for new energy sources after the disaster at Fukushima, installed the fifth-highest amount of PV capacity in the world in 2012, going from 5 to 7 GW.²² Australia increased its installed PV capacity from 1.4 GW to 2.4 GW in 2012, largely due to the continuance of FiTs by some state governments.²³

Due to slowing global economic growth, decreasing demand, and oversupply, there were significant net losses in the Chinese PV industry, which supplies more than 50 percent of the world market.²⁴ Suntech—one of the world’s largest PV manufacturers—recently defaulted on \$541 million of bonds, generating fears that other PV manufacturers will default in the future.²⁵ Nevertheless, targets under China’s twelfth Five Year Plan include reaching 21 GW installed solar capacity by 2015 and 50 GW by 2020.²⁶

The net losses for the Chinese PV industry are exacerbated by growing trade wars between China and both the European Union (EU) and the United States after they deemed that Chinese companies were dumping solar panels on their markets for prices below the production costs. The United States set anti-dumping duties ranging from 18.3 percent to 250 percent on Chinese manufacturers, and the EU

levied an initial tariff of 11.8 percent in June, rising to 47.6 percent in August 2013 if there are no further negotiations.²⁷

Solar power consumption increased by 123 percent in North America in 2012.²⁸ The United States alone accounted for 86 percent of the region's use of solar power.²⁹ North America added 3.6 GW of PV capacity in 2012, dominated by the United States (3.3 GW), helping the region reach a total installed capacity of 8.04 GW.³⁰

The United States did not add any CSP capacity in 2012, but 1,300 MW of CSP are currently in construction and due to come online by 2014.³¹ A 392-MW facility in the Mojave Desert is 75 percent complete and will become the world's largest operating CSP facility.³²

In 2012, Africa's solar power consumption increased by 64.2 percent, while use in the Middle East increased by 62.3 percent.³³ The two regions still account for less than 1 percent of global solar consumption, but this number is poised to grow in the future.³⁴ Lower PV prices and the need for manufacturers to find new markets are driving new investments in PV in Africa and the Middle East.³⁵ In terms of CSP, the United Arab Emirates just began operation of a 100-MW plant in March 2013, while South Africa started construction on two plants (50 MW and 100 MW).³⁶ South and Central America remain minor players in the global solar market despite having strong resource potential. In 2012, this region accounted for only 0.1 percent of global solar power consumption.³⁷

Total installed wind capacity edged up in 2012 by 45 GW to a total of 284 GW, an 18.9 percent increase from 2011.³⁸ In keeping with recent years, the majority of new installed capacity was concentrated in China and the United States, which reached total installed capacities of 75.3 GW and 60 GW, respectively.³⁹

The United States was the world's top wind market in 2012. Overall capacity increased 28 percent as the country added 13.1 GW, double the amount it added in 2011.⁴⁰ Increased domestic manufacturing of wind turbine parts, improved technological efficiency, and lower costs helped spur this increase, but the greatest catalyst was the threat of expiration of the federal Production Tax Credit (PTC)—which provides tax credits for kilowatt-hours produced by wind turbines—at the end of 2012.

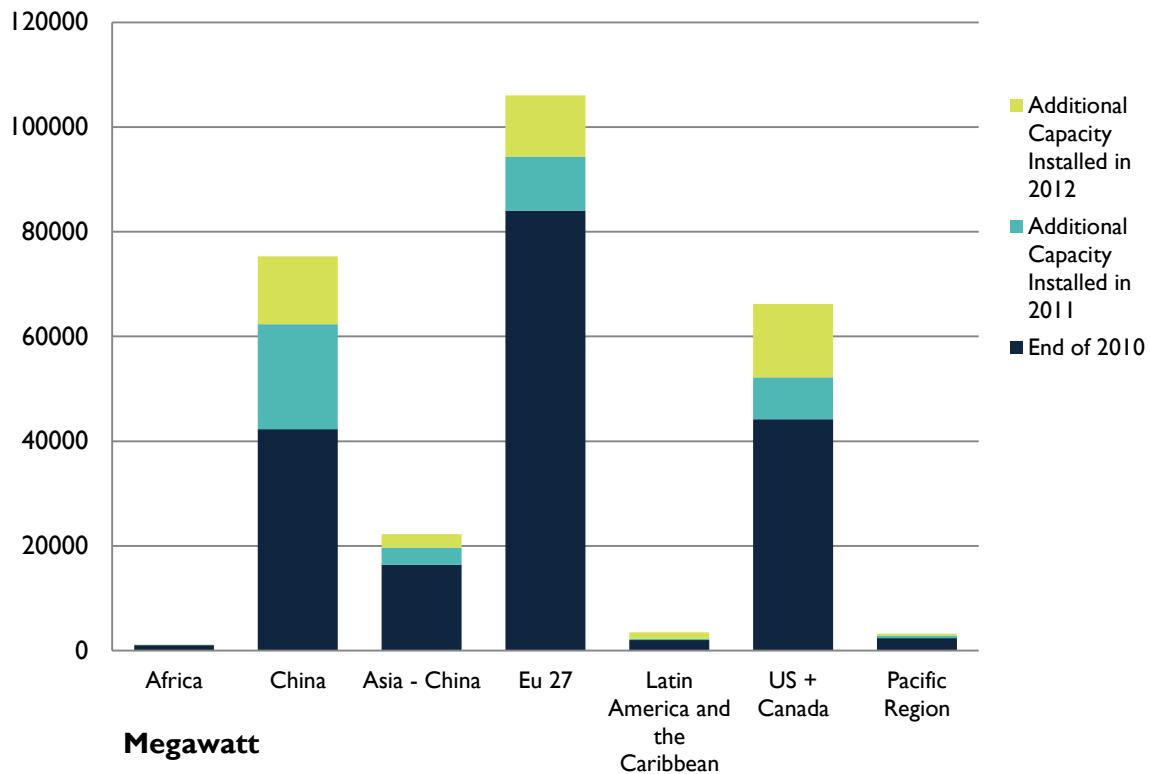
Canada's installed wind capacity grew by 17.8 percent (935 MW), a drop from its 31.4 percent growth in 2011.⁴¹ It was the ninth largest wind market in 2012, and Ontario and Quebec have plans to install another 1,500 MW combined in 2013.⁴² Mexico passed the 1 GW mark in 2012 by adding 801 MW to its existing 600 MW.⁴³ It is now home to Latin America's largest wind power complex (360 MW) as the Oaxaca II, III, and IV projects were brought online in 2012.⁴⁴

The EU remained the dominant region for wind power, as it passed an important milestone by installing 11.9 GW of new capacity to reach 106 GW, representing 37.5 percent of the world's market.⁴⁵ (See Figure 4.) Currently, wind accounts for 11.4 percent of the EU's total installed generation capacity.⁴⁶ Germany and Spain remained Europe's largest wind markets, increasing their total installed capacity to 31.3 GW and 22.8 GW, respectively.⁴⁷ The United Kingdom was third in new installations in 2012, at 1.9 GW, followed by Italy with 1.3 GW.⁴⁸

In 2012, Africa's
solar power
consumption
increased by

64.2%

Figure 4 | Total Installed Wind Capacity (2010-2012)



Onshore wind-generated power is already cost-competitive with conventional power energy sources in many markets.

Asia's 15.5 GW of new installed wind capacity, the highest of any region in 2012, ensured that it remains on the heels of the EU.⁴⁹ Total installed capacity increased to 97.6 GW in 2012.⁵⁰ And while China's 20.8 percent increase maintains the country's regional dominance, India showed respectable gains by adding 2.3 GW to bring its total installed capacity to 18.4 GW, a 14.5 percent increase over 2011.⁵¹

Political instability continued to slow growth in Africa and the Middle East, but installed capacity grew by 9.3 percent in 2012 compared with 2011's rate of 2.6 percent.⁵² The region now has 1,135 MW installed.⁵³ Tunisia nearly doubled its capacity by adding 50 MW, and Ethiopia installed its first commercial-scale wind farm (52 MW).⁵⁴ Sub-Saharan Africa looks poised to lead the way in 2013 as South Africa continues making progress on over 500 MW of new wind power capacity.⁵⁵

Latin America also saw significant growth in installed wind capacity, increasing by 53.7 percent from 2.3 GW to 3.5 GW.⁵⁶ Brazil increased its capacity by 75.3 percent, reaching a total installed capacity of 2.5 GW.⁵⁷ Argentina's 54 MW increase to 167 MW and Nicaragua's 40 MW increase to 102 MW total were also notable in the region.⁵⁸

The wind turbine manufacturing industry was negatively affected by

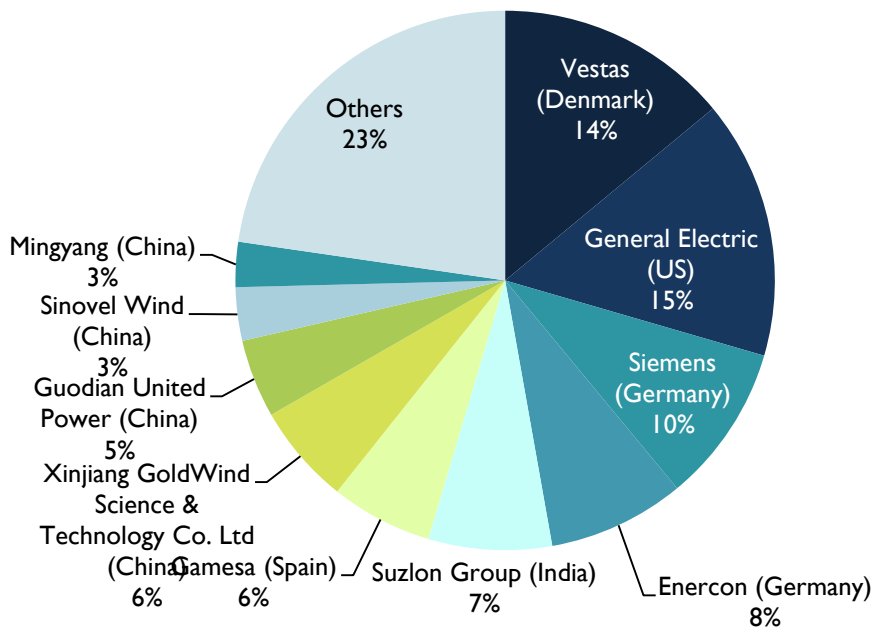
lower government support and overcapacity in 2012, leading to the cancellation of expansion plans and the scaling back of workforce and operations. A slowdown was originally expected in 2013, but the U.S. Congress extended the PTC until the end of the year, which bodes well for many American and European wind turbine and parts manufacturers that benefit from it.⁵⁹

The top 10 wind turbine manufacturers accounted for 77 percent of all capacity sold in the global market in 2012.⁶⁰ (See Figure 5.) Asia and Europe had the most companies in the top 10 (5 and 4, respectively), although U.S.-based General Electric had the greatest share, largely due to developers trying to beat what they thought was the end of the PTC.⁶¹

Offshore wind capacity, mostly concentrated in northern Europe, increased by 1.3 GW (representing 2.9 percent of newly installed capacity in 2012) to bring the world's total offshore capacity to 5.4 GW.⁶² The United Kingdom added 630 MW as part of the first phase of the London Array, reaching a total of 2.9 GW, followed by Denmark (0.9 GW), Belgium (0.4 GW), China (0.4 GW), Germany (0.3 GW), and Japan (0.25 GW).⁶³

While policy uncertainties and changes will likely challenge the growth of solar and wind in the future, these technologies are nonetheless well poised to grow. Declining solar technology prices, while challenging for current manufacturers, are helping solar to reach near grid-parity in many markets. With the decreasing cost of operating and maintaining onshore wind farms, onshore wind-generated power is already cost-competitive with conventional power energy sources in many markets.

Figure 5 | Top 10 Wind Manufacturers 2012



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Notes

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