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2012 Who's Winning the Clean Energy Race?

the CleanEnergy Economy

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Who's Winning the Clean Energy Race?

2012 EDITION

About the report

Who's Winning the Clean Energy Race? 2012 Edition was developed for public informational and educational purposes. It is an update of Pew's reports tracking 2009, 2010, and 2011 clean energy investment in the developed and developing countries that make up the Group of 20.

Underlying data for this report were compiled for Pew by Bloomberg New Energy Finance, a leading market research firm with a global network of analysts providing data and news on the transformation of the energy sector. Currency values are in U.S. dollars. A full description of the data sources and methodology employed in the development of this report can be found on page 30.

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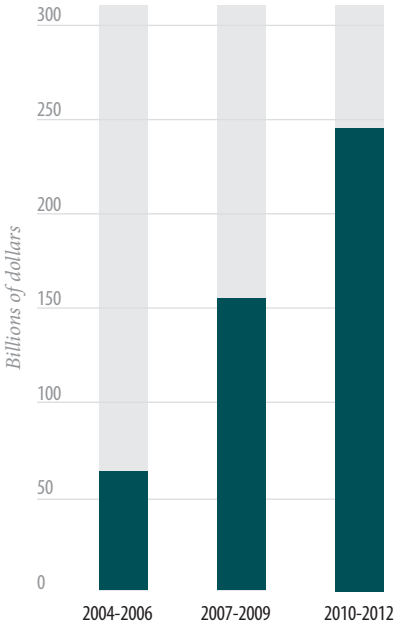
Overview

In less than a decade, clean energy transitioned from novelty products to the mainstream of world energy markets. The sector emerged not so much in a linear fashion as an episodic one—in fits and starts associated with the worldwide economic downturn, continent wide debt crises, national policy uncertainty, and intense industry competition. Through it all, however, the clean energy sector moved inexorably forward, with overall investment in 2012 five times greater than it was in 2004.

Although 2012 investment levels worldwide declined 11 percent, to $269 billion, from 2011, the clean energy sector weathered the withdrawal of priority incentives and initiatives offered by governments in numerous key markets, demonstrating its resilience.[1] Reliable clean energy investment data have been collected for nine years now. Looking at the data in three-year increments, average clean energy investment increased by at least $90 billion triennially—from an average of $64 billion in the 2004-06 period to an average of $156 billion in 2007-09 and $245 billion in 2010-12 (see Figure 1).

Progress in Global Clean Energy Investments

Figure 1: Average worldwide clean energy investment*



*Does not include research and development investments.

Source: Bloomberg New Energy Finance

The clean energy sector continues to advance

Beyond its resilience, the clean energy sector also continues to demonstrate dynamism as the cost of wind, solar, and other sources declined in the global marketplace. Individuals, businesses, and countries seeking clean, secure, and affordable sources of power and fuel are finding clean energy an increasingly attractive alternative to conventional sources, which are unpredictable in price and generate local, regional, and global air pollutants. As a result, economic, environmental, and security imperatives are driving clean energy deployment forward.

Who's Winning the Clean Energy Race? 2012 Edition documents how the old order is changing technologically and geographically. Clean energy is gaining ground in the global energy mix. Even as several pioneering countries have stumbled, new markets have opened, and the center for clean energy investment has shifted from West to East.

Notable in 2012 was the growth of clean energy markets in smaller countries outside the Group of 20, or G-20. Investment there increased by 52 percent, to more than $20 billion, while G-20 nations—the world's leading rich and developing countries—experienced a collective decline in private investment of 16 percent, attracting $218 billion, exclusive of research and development spending.[2] Non-G-20 countries' share of total global investment reached 8.5 percent, its highest since reliable data collection began in 2004. This trend is likely to continue: Bloomberg New Energy Finance projects continued annual growth for clean energy of 10 to 18 percent in parts of Asia, Africa, the Middle East, and Latin America through 2020.

Asia emerging as clean energy hub

Asia-Oceania experienced uninterrupted growth in clean energy investment in each of the past nine years. In 2012, Asia became the leading regional destination for clean energy investment for the first time. Investment in the region grew 16 percent, to $101 billion, accounting for 42 percent of the global total. The region that encompasses Europe, the Middle East, and Africa recorded an investment decline of 22 percent, to $87.6 billion. Investment fell in such leading markets as Germany, Italy, the United Kingdom, and Spain as governments curtailed incentive programs.

Investment fell most precipitously in the Americas, with clean energy financing down 31 percent in 2012, to $50.3 billion. The sharp decline followed growth of more than 30 percent in 2011, reinforcing a pattern of investment volatility in the Americas and driving financing in the region to the lowest level since 2009.

Solar energy's future looks bright

The clean energy sector's geographic transition is matched by a technological one. While wind energy remains the most cost-competitive technology, solar has displaced it as the leading recipient of investment dollars. For the second year in a row, solar technologies attracted more clean energy financing than any other technology by a wide margin. Solar accounted for $126 billion worth of clean energy investment in 2012, or 58 percent of the G-20 total. China, Europe, and the United States were top markets for solar investment.

Wind energy investment was a substantial $72.7 billion, enough to spur record levels of deployment. Among G-20 countries, wind energy investment was down 14 percent,

with declines logged in historically large markets including China, Germany, India, and Brazil. The United Kingdom and the United States saw gains in wind energy investment, with a substantial increase in the United States spurred by the potential expiration of the production tax credit that loomed throughout 2012. At year-end, this important tax incentive for the U.S. wind industry was renewed by Congress through 2013.

The remaining clean energy sectors also experienced declining investment totals in 2012. Investment in geothermal, marine, small hydro, and biomass/waste-to-energy technologies collectively fell 29 percent, to $13.5 billion. The biofuels sector had the steepest investment decline, attracting just $2.6 billion, 47 percent less than in 2011. Investment in energy-efficient and low-carbon technologies and services declined 27 percent in 2012, with invesment shrinking to $3.3 billion, from $4.5 billion in 2011.

Clean energy capacity grows

Even though worldwide investment fell by 11 percent in 2012, significant and sustained price declines for leading technologies helped fuel a record 88 gigawatts, or GW, of new capacity around the world. By the end of 2012, 648 GW of clean energy generating capacity was in place globally. With a record 48.6 GW of new generating capacity installed in 2012, the wind sector led all others with 280 GW deployed worldwide.

Although solar investment fell 13 percent in 2012, lower prices made it possible for overall deployment to increase 6 percent, to 31 GW. With these additions, cumulative installed solar capacity eclipsed 100 GW, four times its level in 2009. As of the end of 2012, 104 GW of solar generating capacity was installed globally. Significant amounts of additional solar capacity were deployed in Germany, Italy, China, the United States, and Japan.

Clean energy continues to account for a significant share of new generating capacity in key regions and around the world. In the United States, wind, solar, and other renewable energy sources accounted for 49 percent of the generating capacity added in 2012.[3] In the European Union, 70 percent of new capacity was renewable for the second consecutive year.[4]

Innovative financing helps expand solar sector

An array of clean energy financing tools also reinforced momentum in the solar sector. Small-distributed capacity investment in residential solar photovoltaic projects held up best in 2012, decreasing only 1.6 percent, to $72.8 billion. This category includes all money invested in residential-scale solar projects of less than 1 megawatt, or MW. Financial innovations helped spur small-distributed capacity investment in several key markets. In the United States, for example, this sector advanced through development of "third-party financing" mechanisms, which now account for more than 50 percent of the residential and commercial market for rooftop solar installations.[5] In the clean energy sector, these arrangements allow consumers to obtain solar power at little or no upfront cost. A third-party installs and maintains the solar array in exchange for monthly payments from the consumer for the electricity generated by the system.

Still, asset finance remains the leading source of investment in clean energy, with $136.5 billion worth of asset financing realized in 2012, or 62 percent of all G-20 clean energy investments. This category includes all money invested in renewable energy generation projects, whether from internal company balance sheets, debt finance, or equity finance, but it excludes refinancing and short-term construction loans. Asset financing typically is associated with installation of clean energy equipment and generating capacity. In 2012, G-20 asset financing dropped 20 percent from the year before.

Venture capital and private equity investment declined by 34 percent in 2012, falling to $5.6 billion. The United States, with $4.3 billion attracted, continues to dominate this finance class, accounting for 78 percent of all venture capital/private equity investment. This category includes all money invested by venture capital and private equity funds in the equity of companies developing renewable energy technology.[6] In general, venture capital and private equity financing occurs in the innovation stage, when companies are proving the market potential of goods and services.

Finally, the stock prices of clean energy companies remained depressed by product price declines, significant oversupply in the manufacturing sector, and persistent uncertainties over government policies. As a result, public market financing fell sharply to $4.6 billion, 55 percent below 2011 levels.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The race clarifies with China in the lead

The competition among countries for clean energy leadership is resulting in a reshuffling of the old order. In 2012, China advanced its position as the epicenter of clean energy finance, attracting $65.1 billion in investment, 20 percent more than in 2011 and an unsurpassed 30 percent of the G-20 total. It garnered 25 percent of all solar energy investment, setting a one-year record with $31.2 billion invested. China also accounted for 37 percent of all wind energy investment ($27.2 billion) and 47 percent of the investment in the "other renewable energy" category ($6.3 billion) that includes small hydro, geothermal, marine, and biomass. All told, 23 GW of clean energy generating capacity was installed in China in 2012.

Although the United States invented many of the leading clean energy technologies, it continues to underperform in investment and deployment relative to the size of its economy and its history in the field. In 2012, clean energy investment in the United States was down 37 percent, to $35.6 billion, second-highest among G-20 nations. Record amounts of wind-generating capacity (13.6 GW) were installed, spurred in large part by the possibility that the production tax credit might expire at the end of 2012. Although the credit was extended for one year, ongoing uncertainty surrounding this and other policies is emblematic of the lack of a consensus among American policymakers, and it contributes to the halting, disappointing U.S. performance in the worldwide race for clean energy jobs, manufacturing, and market share.

The solar sector was something of a bright spot for the United States, with financial innovations such as private third-party financing leading to a 42 percent increase in investment for residential photovoltaic installations. A record 3.2 GW of solar was installed in the United States last year. The United States took the No. 2 spot in clean energy investing in 2012.

In Germany, investments fell, but world-leading amounts of new solar generating capacity were still added. Clean energy investment in Germany was down 27 percent in 2012 from the year before. With Germany significantly curtailing incentives for clean energy, it was feared that the German market might collapse. But the country remained the G-20's third-leading destination for clean energy investment, with $22.8 billion. This level of investment was sufficient to spur a record 7.5 GW of new solar photovoltaic capacity, as well as 2.4 GW of new wind capacity.

Japan reemerged as a top destination for clean energy investment as national efforts to develop alternatives to nuclear energy gained momentum after the Fukushima Dai-ichi nuclear disaster in 2011. In response, clean energy investment increased 75 percent in 2012, to $16.3 billion. Almost all (97 percent, or $15.7 billion) of clean energy financing in Japan was in the solar sector, which added more than 2 GW of generating capacity. These investments propelled Japan into the No. 5 spot in investment in 2012, with the 27 countries of the European Union that are not separate members of the G-20 at No. 4.

After lengthy delays in the initiation of national programs, South Africa finally emerged in 2012 as an important destination for clean energy investment, attracting $5.5 billion and becoming the fastest-growing market in the G-20. The South African solar sector attracted $4.3 billion in 2012, or 80 percent of the total. Another $1.1 billion was invested in the nation's wind sector. All of the money invested in South Africa was in the form of asset financing for larger commercial and utility-scale projects, catapulting the country into the ninth-leading destination of clean energy investment behind Italy, the United Kingdom, and India. Brazil rounds out the top 10 countries.

Key Findings

Worldwide clean energy investment falls to $269 billion

Public and private investment in solar, wind, and other technologies retreated from an adjusted 2011 record of $302 billion to $269 billion, an 11 percent drop. Still, 2012 was the third year in a row that worldwide clean energy investment eclipsed $200 billion. Investment fell in many traditional markets but grew in emerging markets. Investment in countries outside the G-20 increased in 2012 by 52 percent, to more than $20 billion, while G-20 members experienced a decline in private investment of 16 percent, attracting a total of $218 billion, exclusive of research and development spending (see Figure 2).

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Progress in Global Clean Energy Investments

Non-G-20 countries gain greater share of global investment in 2012

Figure 2: Global and G-20 clean energy investment*

*Does not include research and development investment.

Source: Bloomberg New Energy Finance

The non-G-20 countries' share of global investment reached 8.5 percent of the global total, its highest level since reliable data collection began in 2004. This trend is likely to continue: Bloomberg New Energy Finance projects continued annual growth for clean energy of 10 to 18 percent in parts of Asia, Africa, the Middle East, and Latin America through 2020. In 2012, significant gains in clean energy investment were recorded in countries such as Chile, Romania, Morocco, Bulgaria, and Ukraine.

Although 2012 investment in the G-20 declined amid the withdrawal or expiration of key financial incentives and persistent policy uncertainty in long-standing clean energy markets, the sector has been remarkably resilient over the past decade. Reliable investment data have been collected for nine years. Broken down in three-year increments, average investment increased by $90 billion in each triennial, from $64 billion in 2004-06 to $156 billion in 2007-09 to $245 billion in 2010-12.

Asia takes the lead for regional investment

Clean energy investment flows continued to shift in 2012 from established markets in the West to the emerging markets of the East. The Asia and Oceania region has experienced uninterrupted growth in investment annually for nine years and in 2012 became the leading regional destination for investment for the first time. Clean energy investment in the region grew by 16 percent, to $101 billion, accounting for 42 percent of the global total. In fact, this was the only region to experience investment growth in 2012, largely due to gains recorded in China and Japan.

The region that encompasses Europe, the Middle East, and Africa has traditionally led all others in attracting clean energy investment. In 2012, however, investment fell 22 percent, to $87.6 billion. This was the first drop since reliable data have been collected. Investment declined in the region overall as various long-standing and substantial markets—Germany, Italy, the United Kingdom, and Spain—shrank in the face of curtailed government incentives. Dramatic investment growth in South Africa helped stanch losses elsewhere in the region.

The Asia and Oceania region became the leading destination for investment and grew by 16 percent, to

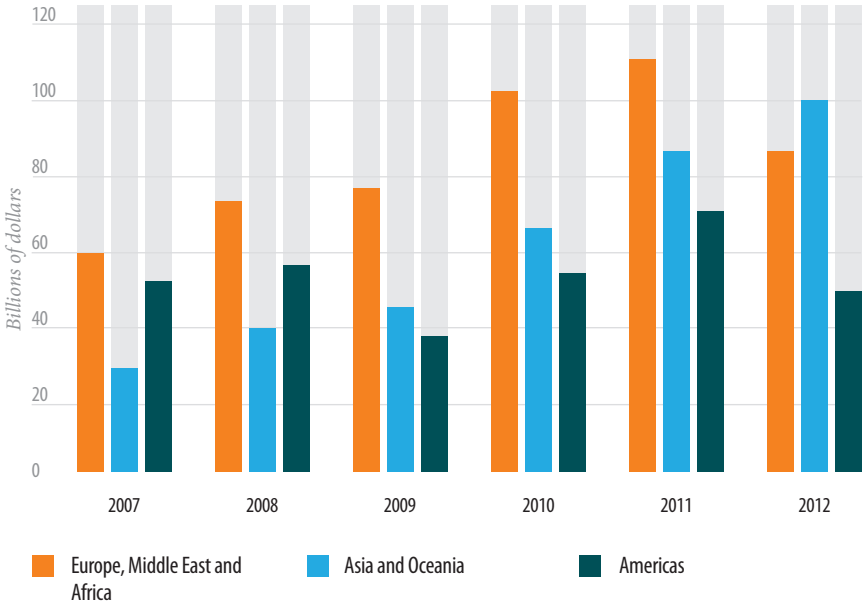
$101 billion,

accounting for 42 percent of the global total.

Investment fell most precipitously in the Americas, where clean energy financing in 2012 was down 31 percent, to $50.3 billion. The sharp decline came on the heels of more than 30 percent growth in 2011, reinforcing a pattern of investment volatility in the Americas. Reduced financing in 2012 pushed investment in the region to the lowest level since 2009. The region's largest markets—the United States, Brazil, and Canada—fell by 37, 32, and 23 percent, respectively. Mexico, however, experienced investment gains of 548 percent, to $2 billion. (See Figure 3 for a regional breakdown of clean energy investment.)

Asian and Oceania Region Captures the Most Clean Energy Investment

Figure 3: Total investment in clean energy by region, 2007-12



Source: Bloomberg New Energy Finance

Solar attracts largest share of clean energy investment

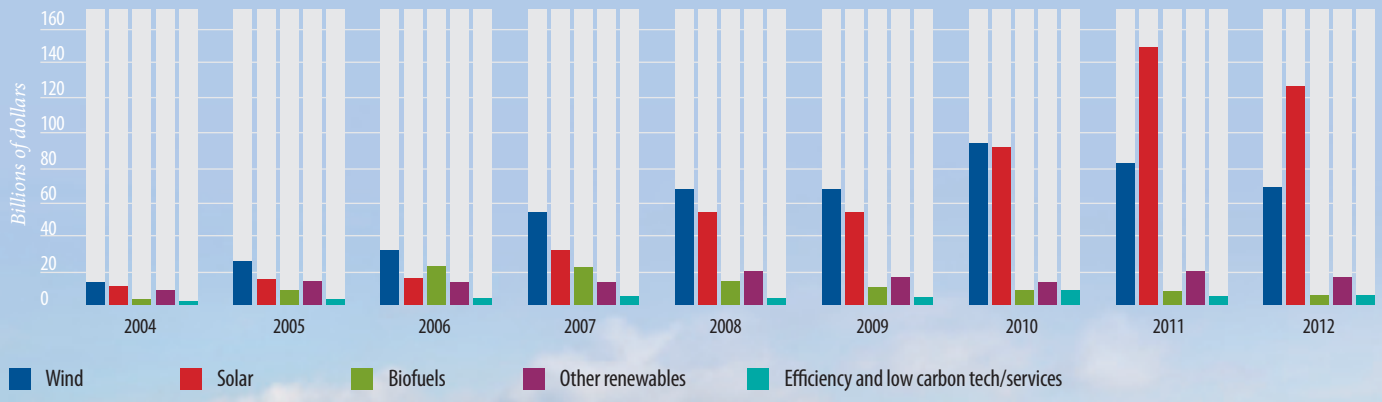
Solar energy technologies were the leading recipient of worldwide clean energy investment for the second year in a row. Solar attracted more financing than any other technology by a wide margin. In all, it accounted for $126 billion in investment in 2012, or 58 percent of the G-20 total. China, Europe, and the United States were top markets for solar investment. China's investment in solar almost doubled from the 2011 level, to $31.2 billion. Germany attracted $17.2 billion and Italy $14.1 billion in the solar sector. While the United States had the third-highest level of solar investment, $16.5 billion, financing fell more than 50 percent from the 2011 level.

Solar energy investment among G-20 nations outpaced wind for the second straight year, but wind energy investment was a substantial $72.7 billion, enough to spur record deployment. Across G-20 nations, wind energy investment was down 14 percent, with declines logged in historically large markets including China, Germany, India, Brazil, and the United States, where the potential expiration of the production tax credit loomed throughout 2012. Project developers eager to qualify for the credit helped drive investment totaling $13.9 billion in the U.S. wind sector, a slight decrease from 2011.

The remaining sectors also recorded declining investment in 2012. Investment in geothermal, marine, small hydro, and biomass/waste-to-energy technologies ("other renewables" in Figure 4) fell 29 percent, to $13.5 billion. The biofuels sector showed the steepest investment decline, attracting just $2.6 billion, 47 percent less than in 2011. Investment in energy-efficient/low-carbon technologies and services dropped 27 percent, with invesment shrinking to $3.3 billion, from $4.5 billion the year before. (See Figure 4 for a complete breakdown of investment by technology.)

Solar Energy Attracts Largest Share of of Clean Energy Investment

Figure 4: G-20 investment by sector, 2004-12



Source: Bloomberg New Energy Finance

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Small-distributed capacity remains investment priority

Small-distributed capacity investment declined less than any other financing type, falling 1.6 percent, to $72.8 billion. The ongoing strength of financing for small-distributed capacity reflects the growing attractiveness of residential solar photovoltaic projects. Asset financing remained the leading source of clean energy investment, with $136.5 billion realized in 2012, or 63 percent of all G-20 clean energy investment. (For a full description of the financing categories explored in this report, see Figure 15 on page 24.)

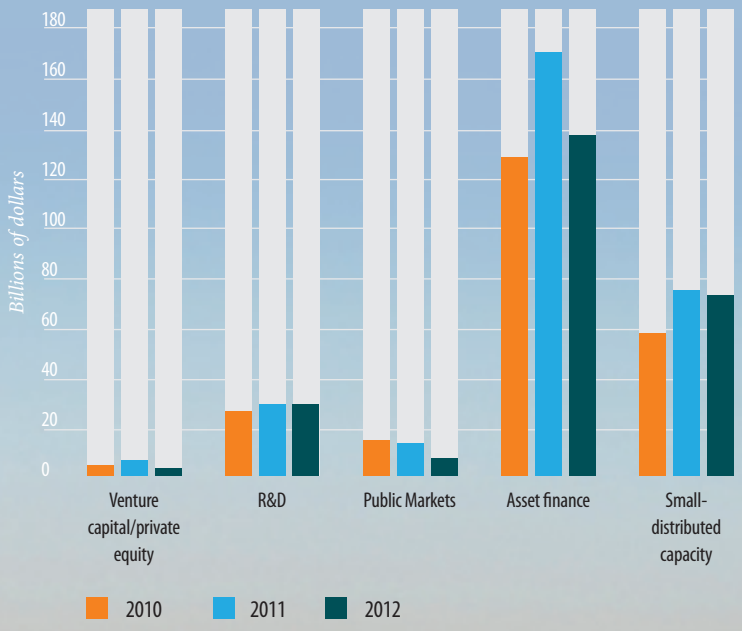
Reflecting the overall downward trend of clean energy, asset financing fell 20 percent from 2011 levels. China attracted almost half of the G-20 asset financing, accounting for $57.6 billion, or 43 percent of the total. Germany was the leading recipient of small-distributed capacity investment with $15.1 billion. This type of investment increased 55 percent in Japan, to $12.9 billion.

Venture capital and private equity investment declined 34 percent in 2012, to $5.6 billion. The United States, with $4.3 billion attracted, continued to dominate this finance class, accounting for 78 percent of all venture capital and private equity. Public and private research and development investment was steady in 2012, at $30 billion. The United States continued to lead the world in total corporate research and development investment, accounting for 24 percent, and 34 percent of government research investment. With leading venture capital and research and development investment, the United States continues to demonstrate leadership in clean energy innovation—even as other data demonstrate ongoing difficulty translating these strengths into momentum for domestic manufacturing and deployment at home and abroad.

Clean energy stock prices remained depressed by product price declines, significant oversupply in the manufacturing sector, and persistent policy uncertainties. As a result, public market financing fell sharply to $4.6 billion, down 55 percent.

Asset Finance Remains Leading Financing Type

Figure 5: G-20 investment by financing type, 2010-12



Source: Bloomberg New Energy Finance

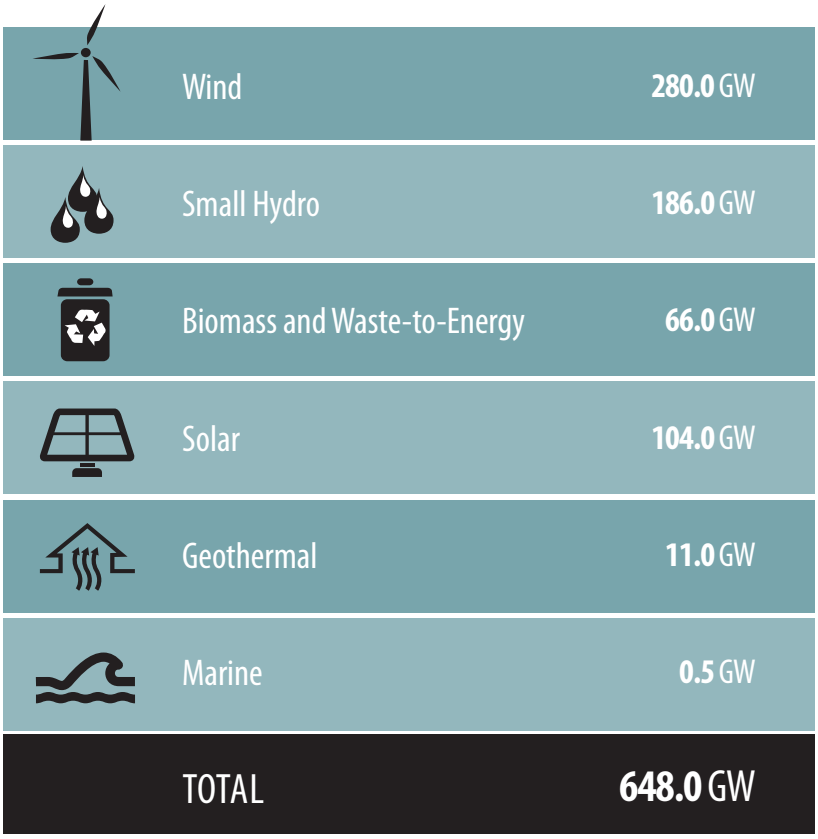
Record solar and wind installations help raise total capacity to 648 GW

Even though worldwide clean energy investment fell by 11 percent in 2012, dramatic and continued price declines for leading technologies helped fuel a record 88 GW of capacity additions around the world. By the end of the year, 648 GW of clean energy generating capacity was in place globally (see Figure 6). With 48.6 GW of new generating capacity installed in 2012, the wind sector led all others with 280 GW deployed worldwide.

China installed
16 GW
of wind, followed closely by the United States, which had record additions of wind generating capacity totaling 13.6 GW in 2012.

Wind Is Leading Installed Clean Energy Technology

Figure 6: Total worldwide installed capacity by sector



Source: Bloomberg New Energy Finance

The solar sector demonstrates how much declining prices are helping spur large-capacity additions. Although solar investment was down 13 percent in 2012, lower prices made it possible for annual solar deployment to increase by 6 percent to more than 31 GW. With these additions, cumulative installed solar capacity eclipsed 100 GW, four times the 2009 level.

As they did a year earlier, Germany and Italy deployed more solar energy than any other country, adding 7.6 GW and 3.4 GW, respectively. China and the United States each added 3.2 GW, reflecting priority government incentives for solar in the former and financial innovation (third-party financing) in the latter. Japan also showed the impact of government policies aimed at shifting that country's power generation from nuclear to renewables. Solar investment in Japan rose 84 percent in 2012, to $15.7 billion, helping add more than 2 GW of generating capacity.

As in the solar sector, declining prices for wind technologies helped enable record installation of new wind energy generating capacity. All told, 48.6 GW of wind was added in 2012. Wind installations in the United States more than doubled, to a record 13.6 GW. China continues to deploy more wind energy than any other country, with 16 GW installed, down 20 percent from 2011. Significant gains in capacity were realized in the United Kingdom, Mexico, and Brazil, while deployment fell in Spain, India, and Italy.

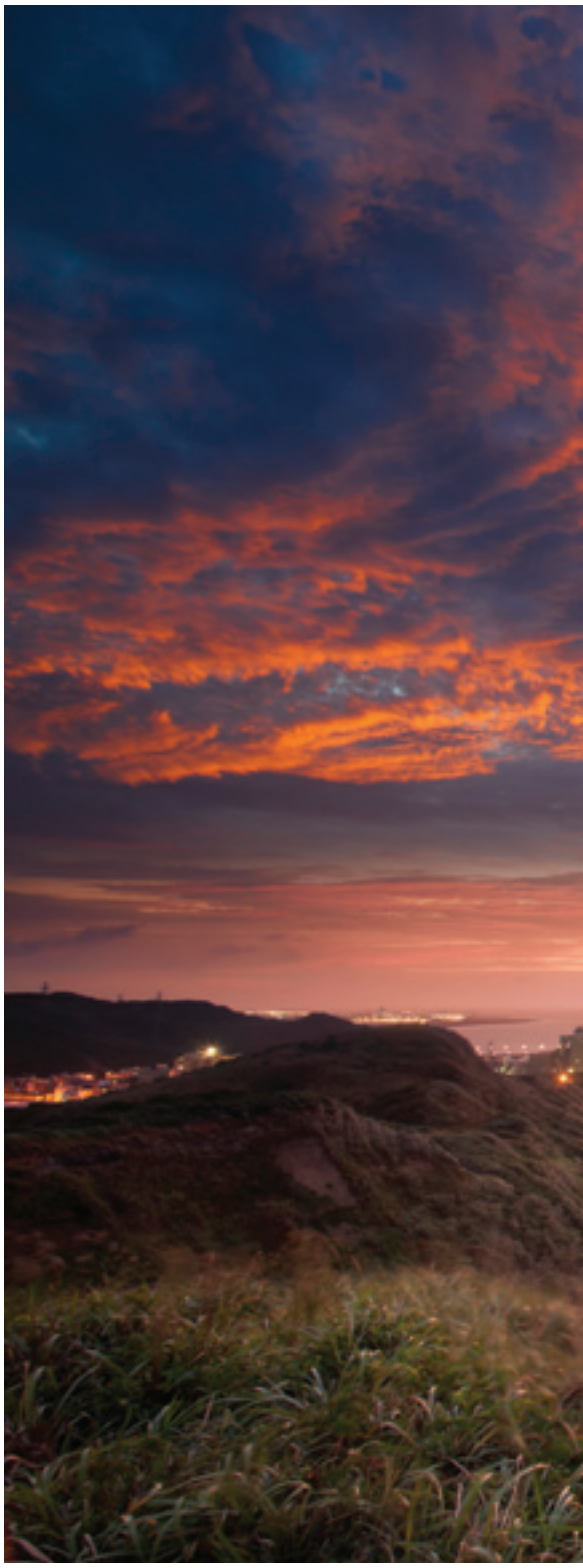
Clean energy continues to account for a significant share of additional generating capacity in key regions and worldwide. In the United States, wind, solar, and other renewable sources accounted for 49 percent of the generating capacity added. In the European Union, 70 percent of new capacity was renewable for the second consecutive year.[7]

Who's Winning the Clean Energy Race?

China is world's clean energy leader

Culminating a remarkable eight-year rise in the clean energy sector, the data suggest that China is the world's leader and is likely to remain so for the foreseeable future. China's clean energy marketplace evolved from a scant $5 billion invested in 2005 to become the largest and most diverse in the world.

The center of gravity in the clean energy world has shifted from the United States and Europe to China. In 2012, China advanced its position as the sector's finance epicenter, attracting $65.1 billion in investment, 20 percent more than in 2011 and an unmatched 30 percent of the G-20 total. China garnered 25 percent of G-20 solar energy investment, setting a one-year record with $31.2 billion, and 37 percent of G-20 wind energy investment, with $27.2 billion recorded. China also registered 47 percent of G-20 investment in the "other renewable energy" category that includes small hydro, geothermal, marine, and biomass.




China advanced its position as the sector's finance epicenter, attracting
$65.1 billion
in investment, an unmatched 30 percent of the G-20 total.

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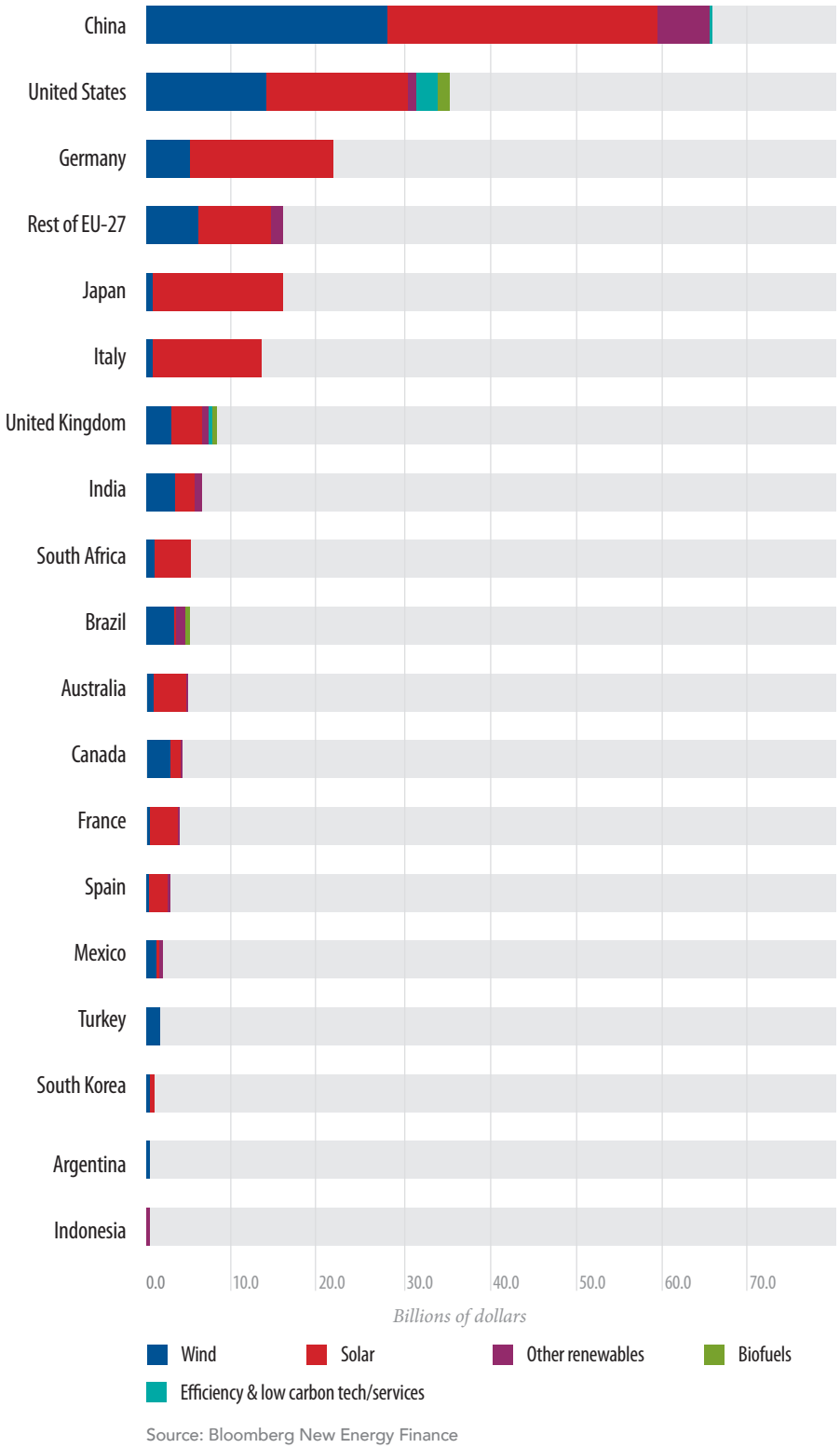
China was among the top 10 nations in every category, leading the world in cumulative installed capacity and five-year rate of growth in installed capacity; among the world's leaders in annual and five-year investment growth; and near the forefront of clean energy investment intensity, calculated as investment per dollar of gross domestic product, or GDP. It accounted for 43 percent of asset financing and 51 percent of public market investment across the G-20 in 2012.

All told, China led the world in attracting investment for wind, solar, and other renewable energy technologies in 2012. A world-leading 16 GW of wind was deployed, along with 3.2 GW of solar. In total, China added 23.1 GW of clean energy generating capacity. For 2013, China has set targets for installation of what would be a world record 10 GW of solar and 18 GW of wind. In less than a decade, China has emerged from afterthought to cornerstone of the solar and wind industries. Given its world-leading long-term goals and record for meeting or exceeding mileposts en route to these goals, China is likely to be a world leader throughout this decade. (See Figures 7 to 14 for country data on investment, capacity additions, and growth rates.)

China Leading Recipient of Wind, Solar Investment in 2012

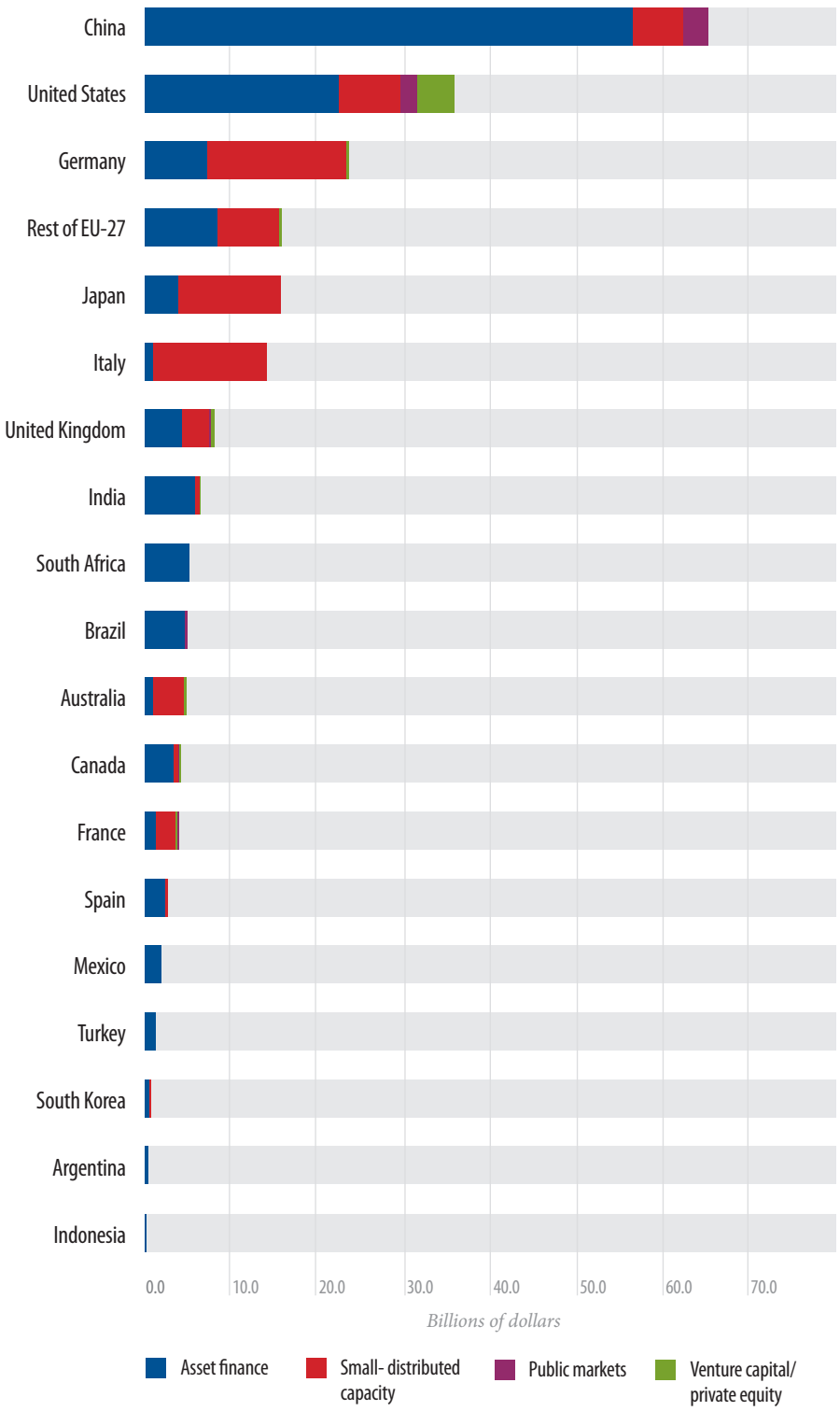
Figure 7: Investment by country and sector, 2012



Source: Bloomberg New Energy Finance

China Secures More Than $50 Billion in Asset Finance in 2012

Figure 8: Investment by country and financing type, 2012



Source: Bloomberg New Energy Finance

China led the world in attracting investment for wind, solar, and other renewable energy technologies in 2012.

Significant Movement in Clean Energy Investment Rankings

Figure 9: Top 10 countries in investment

	2012 (in billions of dollars)	2012 Rank	2011 (in billions of dollars)	2011 Rank
China	65.1	1	54.1	2
United States	35.6	2	56.8	1
Germany	22.8	3	31.3	3
Rest of EU-27	16.3	4	17.7	5
Japan	16.3	5	9.3	8
Italy	14.7	6	30.1	4
United Kingdom	8.3	7	10.0	7
India	6.9	8	12.5	6
South Africa	5.5	9	0.03	20
Brazil	5.3	10	7.8	10

Source: Bloomberg New Energy Finance

South Africa and Mexico See Largest Annual Growth Rates in 2012

Figure 10: Top 10 countries in clean energy investment growth

Rank	Country	1 year growth rate
1	South Africa	20,563%
2	Mexico	548%
3	Turkey	206%
4	Japan	75%
5	Argentina	63%
6	South Korea	61%
7	China	20%
8	Australia	-7%
9	Rest of EU-27	-8%
10	United Kingdom	-17%

Source: Bloomberg New Energy Finance

South Africa and Japan Lead in Five-Year Investment Growth

Figure 11: Top 10 countries in clean energy investment growth, 2007-12

Rank	Country	Growth Rate
1	South Africa	226%
2	Japan	46%
3	Italy	35%
4	China	35%
5	Turkey	26%
6	Australia	26%
7	Rest of EU-27	13%
8	Germany	11%
9	United Kingdom	6%
10	Canada	5%

Source: Bloomberg New Energy Finance

Clean Energy Investment per $ of GDP

Figure 12: Top 10 countries in investment intensity*

Rank	Country	Intensity*
1	South Africa	0.94%
2	Italy	0.80%
3	Germany	0.71%
4	Canada	0.55%
5	China	0.53%
6	Australia	0.51%
7	United Kingdom	0.36%
8	Japan	0.35%
9	Rest of EU-27	0.27%
10	United States	0.23%
10	Brazil	0.23%

Source: Bloomberg New Energy Finance

*Clean energy investment per $ of GDP.

China and the United States Lead in Renewable Energy Capacity

Figure 13: Top 10 countries in installed renewable energy capacity

Rank	Country	Capacity
1	China	152 GW
2	United States	133 GW
3	Germany	71 GW
4	Rest of EU-27	57 GW
5	Spain	34 GW
6	Italy	31 GW
7	India	30 GW
8	Japan	27 GW
9	Brazil	16 GW
10	United Kingdom	15 GW

Source: Bloomberg New Energy Finance

South Korea and Turkey Lead in Five-Year Capacity Growth Rate

Figure 14: Top 10 countries for growth in clean energy installed capacity, 2007-12

Rank	Country	Percentage increase
1	South Korea	33%
2	Turkey	32%
3	Italy	26%
4	China	23%
5	Australia	22%
6	France	22%
7	United Kingdom	22%
8	Brazil	21%
9	Germany	17%
10	Mexico	17%

Source: Bloomberg New Energy Finance

United States stumbles in clean energy race

Uncertainty surrounding the future of the production tax credit spurred unprecedented wind energy installations in the United States in 2012. But the rush to complete wind projects was insufficient to stem a 37 percent drop in U.S. clean energy investment. The 2012 results are consistent with those of the last decade, in which investment in the U.S. clean energy sector rose and fell like a roller-coaster. The lack of consensus on energy policy among policymakers suffused the sector with uncertainty and caused the United States to stumble in the worldwide race for jobs, manufacturing, and market share.

Overall, the United States saw some $35.6 billion invested, second-best among G-20 nations. Of that, $16.5 billion was invested in the solar sector (third-best in the G-20), and $13.9 billion went to wind energy technologies, enabling a U.S.-record 13.6 GW of wind energy and 3.2 GW of solar energy to be installed in 2012. The solar sector was something of a bright spot for the United States, with financial innovations such as private third-party financing leading to an investment increase of more than 40 percent for residential photovoltaic installations. In the United States, third-party financing mechanisms accounted for more than half of the residential and commercial market for rooftop solar installations.

The United States continues to lead the G-20 in the energy-efficient/low-carbon technology and the biofuels-related categories, which attracted $2.5 billion and $1.5 billion, respectively. In addition, venture capital and private equity investment in the United States continued to dominate that class of financing, accounting for $4.3 billion of the $5.6 billion invested, or 78 percent of the total. Similarly, public and private research and development investment was highest in the United States, which accounted for 29 percent of the worldwide total.


Overall,
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$35.6 billion
invested,
second-best among G-20
nations.


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With the United States leading the world in various measures of energy innovation but lagging far behind in such categories as deployment and manufacturing, it's evident that the nation is underperforming—inventing but failing to realize the economic, security, or environmental benefits of clean energy innovations through production and utilization. Installation of 3.2 GW of solar was a record, but it is still less than half the amount that has been installed annually in leading European markets in recent years.

Investment down, solar installations steady in Germany

Germany saw investment fall but was able to maintain its leadership in installation of additional solar generating capacity. Overall, 2012 investment in Germany fell by 27 percent, but this was a smaller decline than in other key European markets such as Italy, France, and Spain. As a result, Germany remained the G-20's third-leading destination for clean energy investment, with $22.8 billion recorded.

Although feed-in tariff incentives were reduced, installation of new solar photovoltaic capacity increased slightly in Germany to a record 7.5 GW.[8] Solar photovoltaic capacity additions were financed primarily with small-distributed capacity investment, of which Germany attracted a world-leading $15.1 billion. Germany is now home to more than 32 GW of solar generating capacity and well on the way to meeting its goal for deployment of 54 GW by 2020. Germany also deployed 2.4 GW of wind energy in 2012, with investment totaling $5.5 billion.

Clean energy investment in Japan increases sharply

Japan was a pioneer in manufacturing and deployment of solar energy, but it fell behind European leaders over the past decade. In the wake of the Fukushima Dai-ichi nuclear disaster in 2011, the Japanese government announced its intention to find alternatives to nuclear power to meet the nation's long-term electricity needs.

In 2012, Japan enacted a new feed-in tariff to accelerate deployment of solar power. The marketplace responded: Clean energy investment in Japan increased 75 percent to $16.3 billion. Almost all (97 percent, or $15.7 billion) of clean energy financing in Japan was in the solar sector. As a result, more than 2 GW of solar energy was deployed in Japan in 2012.

Solar deployment in Italy falls by more than half

In 2011, Italy led the G-20 and the world in deployment of solar energy, with a record 8 GW installed. But generous incentive programs could not be maintained during the country's debt crisis. As a result, clean energy investment and solar deployments in Italy declined by more than 50 percent in 2012. Nonetheless, by attracting $14.7 billion in clean energy investment, Italy remained one of the G-20's leading markets. Italy was second in the world for small-distributed capacity investment, attracting $13.8 billion. It also remained among the top 10 nations for annual and five-year rates of clean energy capacity growth. Italy is second in the world in terms of investment relative to the size of its economy.

Investment in South Africa explodes

South Africa's long-delayed clean energy ambitions took hold in 2012, as the nation rose from last place to ninth among G-20 members, with $5.5 billion invested. From a 2011 total of less than $30 million, clean energy investment in South Africa grew an astonishing 20,500 percent, orders of magnitude higher than any other G-20 member. Investment grew in response to the country's established clean energy targets and feed-in tariff incentives. The South African solar sector attracted $4.3 billion in 2012, or 80 percent of the total. Another $1.1 billion was invested in the nation's wind sector. All of the money invested in South Africa was in the form of asset financing for larger commercial and utility-scale projects, much of which was encouraged through International Finance Corp. concessionary financing.

Financing Types and Trends

About the investment data

This report presents 2012 data on clean energy finance and investment in G-20 nations. Public and private investment in research and development totaling some $30.2 billion in the year are not included in the G-20 investment presentations. No data are presented for G-20 members Russia and Saudi Arabia because clean energy investment there was negligible. Spain, a member of the European Union but not an individual member of the G-20, is presented separately in this report because of the size and relevance of its clean energy sector over the last decade. (For more details on the research methodology underlying this report, please see the Methodology on page 30.)


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Bloomberg New Energy Finance tracks thousands of transactions across the spectrum of clean energy finance, from the research and development funding and venture capital invested in technology and early-stage companies, to the public market and asset financing used to fund business growth and clean energy deployment. The key investment categories are:

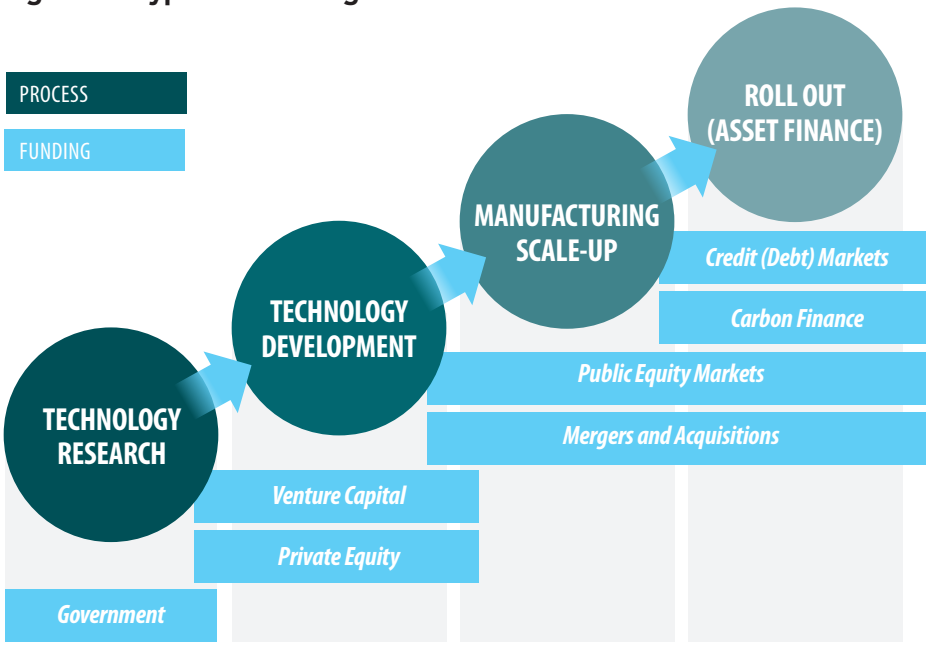
- **ASSET FINANCING.** This category includes all money invested in renewable energy generation projects, whether from internal company balance sheets, debt finance, or equity finance. The category excludes refinancing and short-term construction loans. Asset financing typically is associated with installation of clean energy equipment and generating capacity.
- **SMALL-SCALE DISTRIBUTED CAPACITY.** This category includes all money invested in residential-scale solar projects of less than 1 MW.
- **PUBLIC MARKET.** This category includes all money invested in the equity of publicly listed companies developing renewable energy technology and clean power generation. Public market financing is typically associated with the scale-up phase, when companies are raising capital in public stock markets to finance product manufacturing and rollout. Investment in companies setting up generating capacity is included in the next category.
- **VENTURE CAPITAL AND PRIVATE EQUITY.** This category includes all money invested by venture capital funds in the equity of companies developing renewable energy technology. In general, venture capital is invested at the innovation stage, when companies are proving the market potential of goods and services.

Finally, the data factor reinvested equity into investment totals. Reinvested equity is actually a deduction and is therefore referred to as an "adjustment." The purpose of this adjustment is to remove double counting upon aggregation of asset classes. Double counting is caused when companies that raise funds from the venture capital and private equity community or on the capital markets subsequently invest these funds in projects through asset financing within 12 months. Reinvested equity is deducted from the asset financing category.

These investment vehicles range across successive stages of clean energy development and deployment in a continuum (see Figure 15).

The Clean Energy Financing Continuum

Figure 15: Types of financing



Source: Bloomberg New Energy Finance

Asset financing

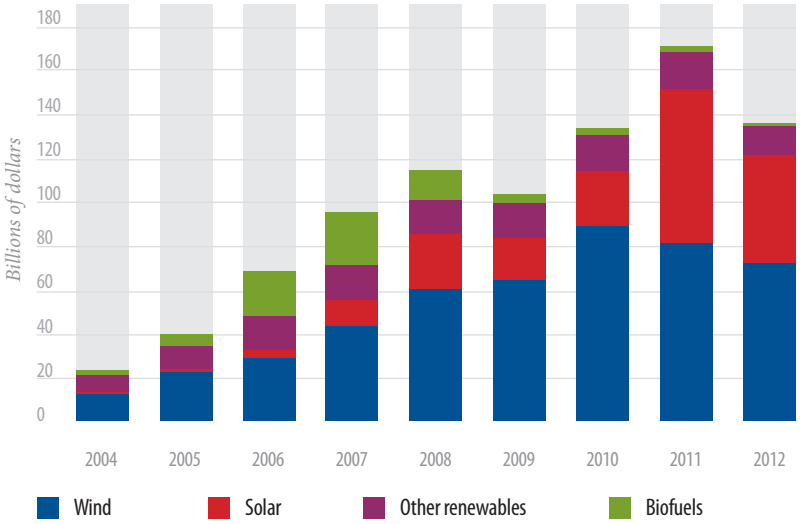
Asset financing, typically associated with the installation of clean energy equipment and generating capacity, is a barometer of clean energy deployment and job creation. It is the dominant class of clean energy finance, accounting for 63 percent of all G-20 clean energy investment in 2012. All told, $136.5 billion was invested in physical assets that generate clean energy services (power, heat, fuels), with onshore wind being the dominant sector because of its relative maturity and scalability. (See Figures 16 and 17 for a breakdown of asset financing by renewable energy sectors and country.)

Key observations about asset financing in 2012 include:

- Asset financing declined 20 percent from the 2011 level.
- G-20 investment in clean energy assets helped finance installation of a record 88 GW of new clean energy capacity.
- Wind energy was the leading sector for asset financing, attracting $72 billion. Solar energy attracted $50.6 billion in asset financing. Other renewable energy sources such as geothermal, small hydro, and marine garnered $12.8 billion. Asset financing for biofuels declined to $1.4 billion, well below the 2011 level.
- China led all G-20 members in clean energy asset financing, attracting $58.8 billion, or 43 percent of all G-20 financing of this type. China's record total for asset financing was more than double that of the United States with $22.7 billion. No other country realized double-digit levels of asset financing.

Asset Financing Favors Wind

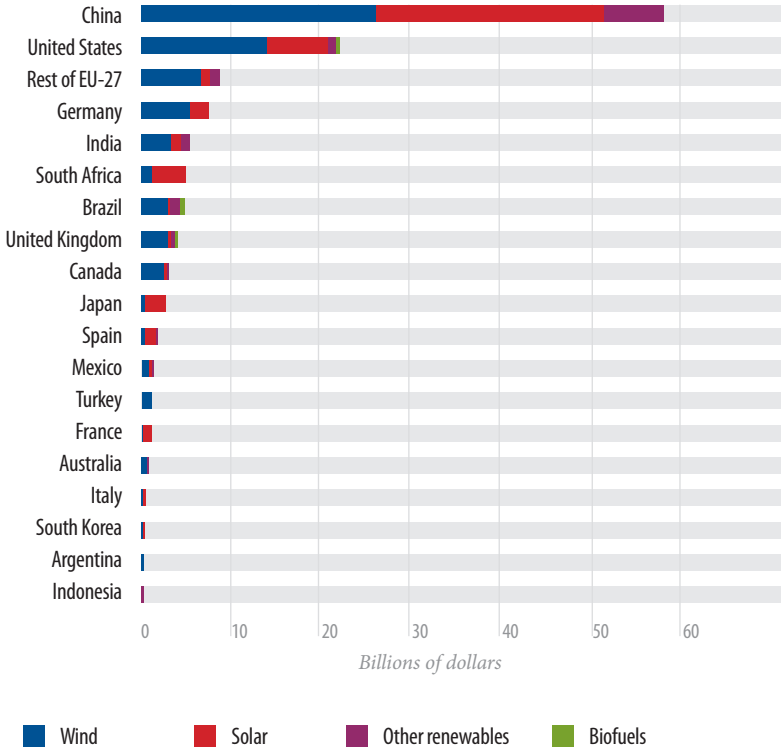
Figure 16: G-20 asset financing by sector, 2004-12



Source: Bloomberg New Energy Finance

China Dominates in Clean Energy Asset Financing

Figure 17: G-20 asset financing by country and sector



Source: Bloomberg New Energy Finance

Small-distributed capacity investment

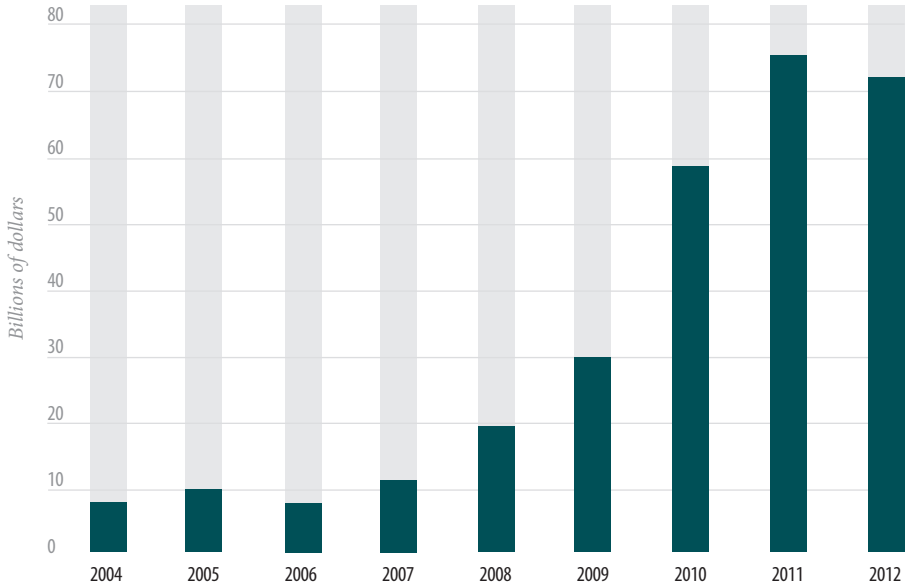
Small-distributed capacity is associated with residential-scale solar projects of less than 1 MW. Investment in small-distributed capacity grew significantly in recent years, riding the wave of declining solar photovoltaic prices and new financing mechanisms. In 2012, small-distributed capacity declined slightly to $72.8 billion. (see Figures 18 and 19.)

Key observations include:

- G-20 investment in small-distributed capacity fell 1.6 percent in 2012, less than any other category of clean energy finance.
- Small-distributed capacity accounts for 33 percent of G-20 clean energy financing.
- Germany and Italy continued to lead this category, with respective investment of $15.1 billion and $13.8 billion. Japan saw investment in this category increase by more than 50 percent, to $12.9 billion. The U.S. small-distributed capacity investment increased 42 percent, to $7 billion.

Small-Distributed Capacity Investment Dips Slightly in 2012

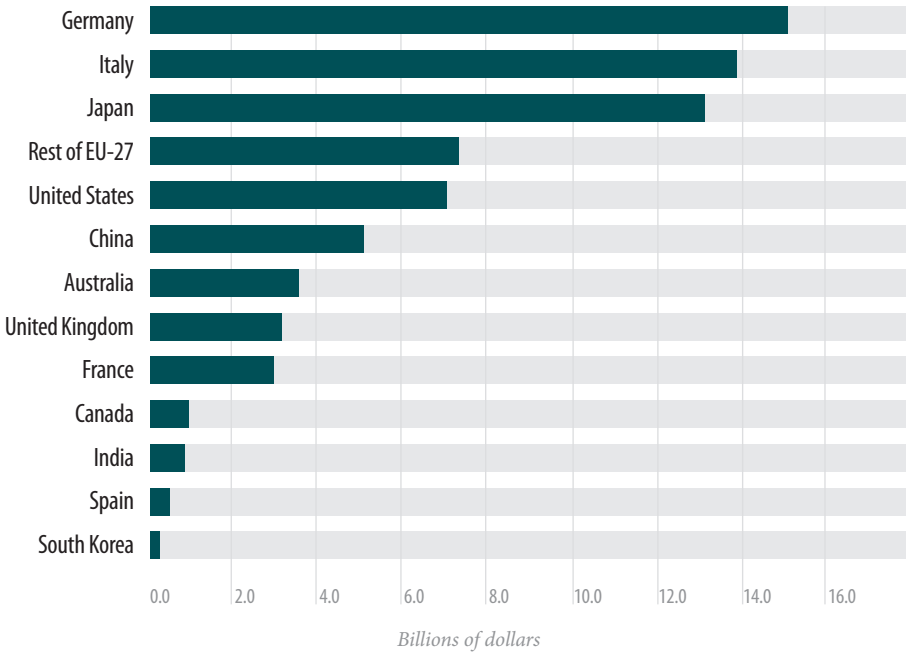
Figure 18: G-20 investment in small-distributed capacity, 2004-12



Source: Bloomberg New Energy Finance

Germany Leads in Small-Distributed Capacity Investment in 2012

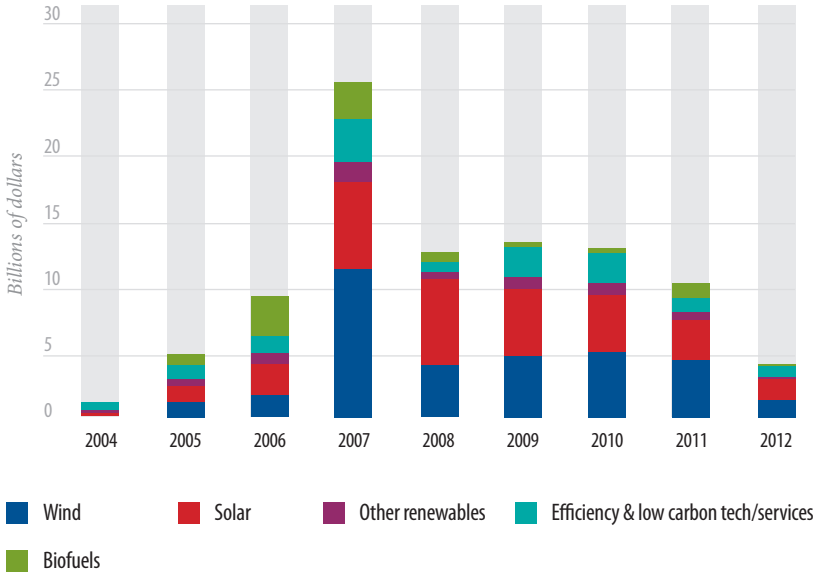
Figure 19: G-20 small-distributed capacity investment, by country



Source: Bloomberg New Energy Finance

Clean Energy Financing via Stock Markets Has Fallen Sharply Since 2010

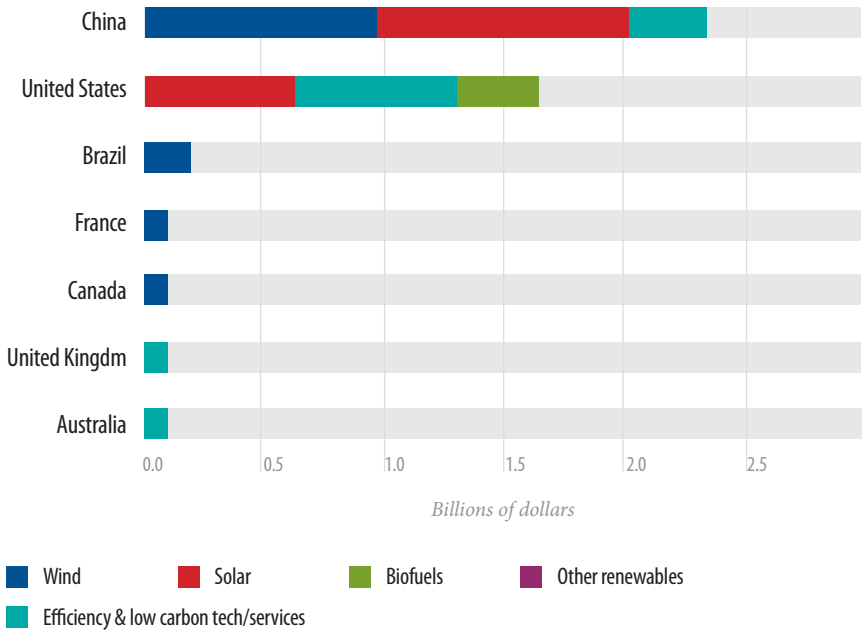
Figure 20: Public market investment by sector, 2004-12



Source: Bloomberg New Energy Finance

China and the United States Top Stock Market Investment Totals

Figure 21: G-20 public market clean energy investment by country and sector, 2012



Source: Bloomberg New Energy Finance

Public market financing

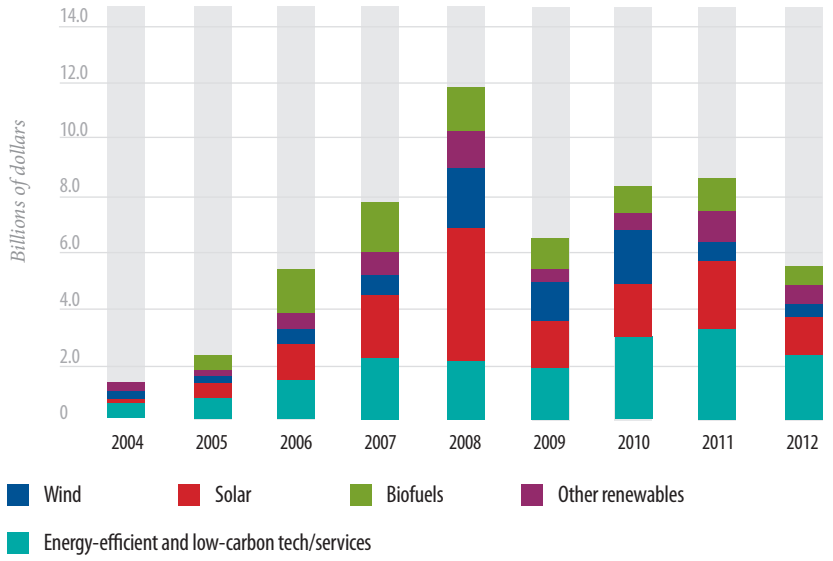
Public market financing enables companies to raise capital for expansion and growth. As the clean energy economy emerged in the mid-2000s, many companies used the stock markets to fund their growth plans. At its peak in 2007, public market funding reached $25.3 billion. But G-20 public offerings have declined significantly since 2009. In 2012, total public market financing fell to $4.6 billion, the lowest since 2005 and 55 percent below 2011 levels. (See Figures 20 and 21 for public market financing details by sector and by country.)

Key observations include:

- Steep price declines, persistent manufacturing overcapacity, and low profit margins significantly diminished the value of clean energy stock indexes, making it less attractive for companies to issue initial public offerings in 2012.
- China and the United States accounted for 85 percent of financing in this category, with $3.9 billion of the $4.6 billion total. China accounted for $2.3 billion of the G-20 total. Public market offerings in the United States were $1.6 billion. Brazil recorded $200 million in public market investment in 2012.
- The solar energy sector led all other technologies in attracting public market financing, with $1.7 billion invested. Wind energy attracted $1.3 billion in public markets. The energy-efficient/low-carbon technology sector gained $1.1 billion through public markets, followed by biofuels with $400 million.

Venture Capital Favors Solar and Energy-Efficient/ Low-Carbon Technologies

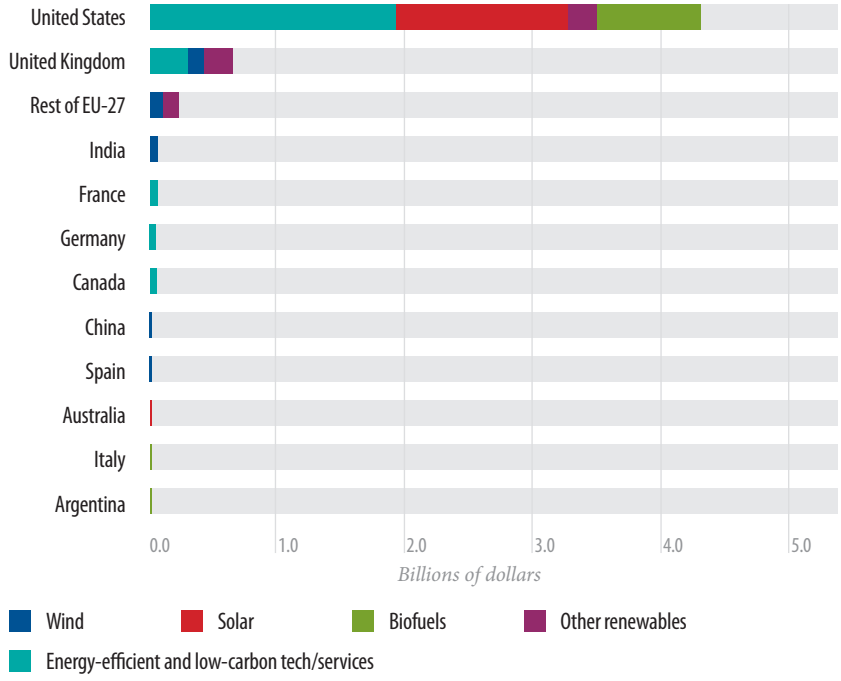
Figure 22: G-20 venture capital and private equity financing by sector, 2004-12



Source: Bloomberg New Energy Finance

The United States Dominates Venture Capital Financing

Figure 23: G-20 venture capital and private equity financing by country and sector



Source: Bloomberg New Energy Finance

Venture capital and private equity financing

Venture capital and private equity financing are closely linked with technology innovation and development. (See Figure on page 24.)

While accounting for less than 3 percent of clean energy investment, venture capital is an important indicator of innovation and development of promising new technologies. Venture capital financing in 2012 fell 34 percent, to $5.6 billion. (See Figures 22 and 23 for a breakdown of venture capital and private equity financing by country and sector.)

Key observations include:

- The United States remains the leader in venture capital and private equity financing, accounting for $4.3 billion in 2012, 78 percent of the G-20 total. The United Kingdom was the only other country with significant investment levels from such financing attracting $600 million in equity investment by venture capital and private equity firms.
- For the fourth year in a row, energy-efficient/low-carbon technologies were the leading beneficiary of venture capital investment, attracting $2.2 billion. Solar energy attracted $1.6 billion.

Installed renewable energy capacity

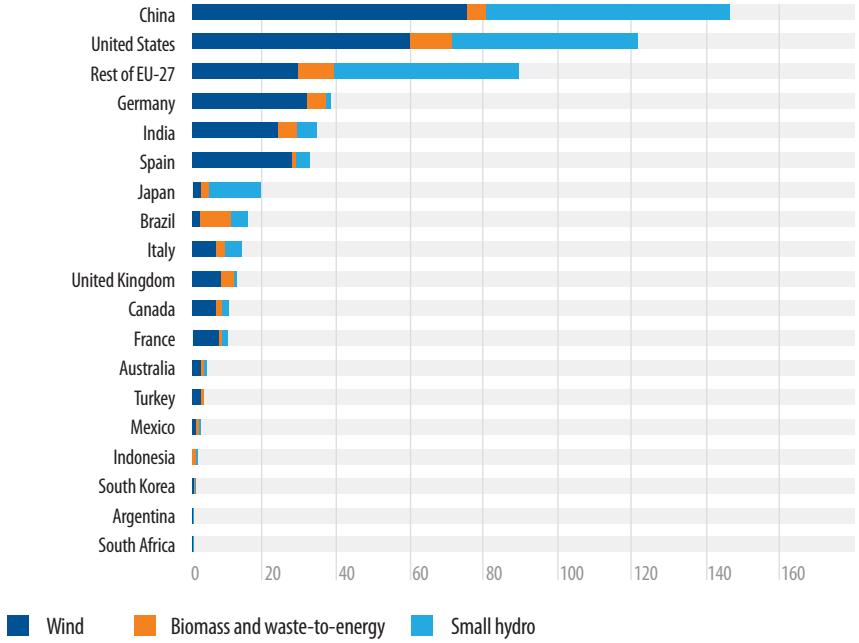
Even though clean energy investment declined by 11 percent worldwide in 2012, renewable power generating capacity increased by 16 percent, with 88 GW of new clean power around the globe. At the end of the year, 648 GW of generating capacity was in place globally. With 48.6 GW of generating capacity added in 2012, the wind sector led all others with 280 GW installed. A record 31 GW of solar was installed in 2012, raising global renewable energy capacity by 42 percent, to 104 GW, four times the amount of solar in place in 2009. (See Figures 24 and 25 for a breakdown of installed renewable energy capacity by sector and country.)

Key developments include:

- China has the world's largest clean energy capacity, with 152 GW installed. It added 16 GW of wind energy in 2012, raising total installed wind energy capacity to more than 74 GW.
- U.S. wind energy capacity grew by a record 13.6 GW in 2012, and there is a cumulative total of 59 GW of wind installed. The United States leads the world in installed biomass and waste-to-energy capacity, as well as geothermal energy generating capacity.
- For the third consecutive year, Germany installed more than 7 GW of solar energy generating capacity in 2012, helping boost overall clean energy capacity by more than 10 GW.
- Installations in Italy fell by more than 50 percent in 2012, but 3.4 GW of new solar power was installed, the second-highest level in the world.

China and the United States Outpace World in Installed Wind and Small Hydro Capacity

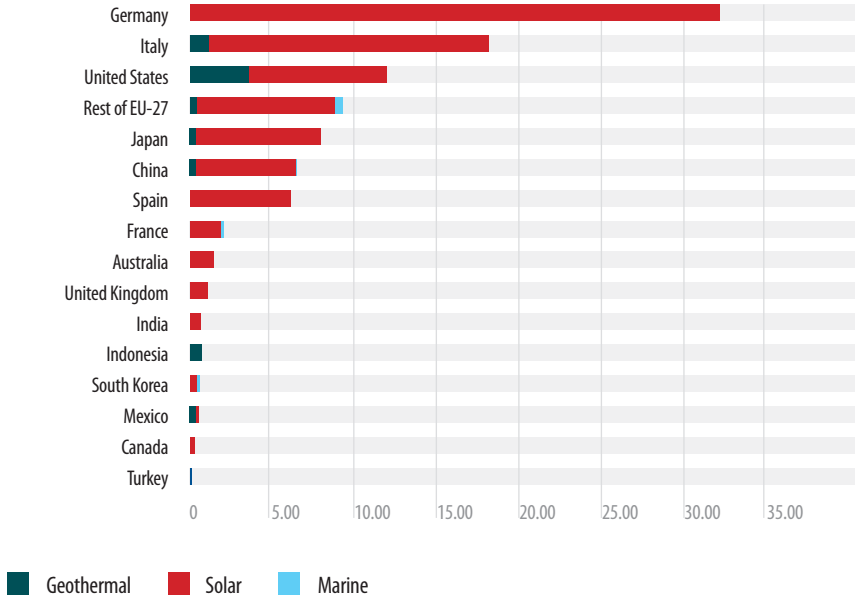
Figure 24: G-20 total installed wind, biomass, and small hydro capacity in GW, 2012



Source: Bloomberg New Energy Finance

Germany Leads in Installed Solar Capacity

Figure 25: G-20 installed geothermal, solar, and marine capacity in GW, 2012



Source: Bloomberg New Energy Finance

Methodology

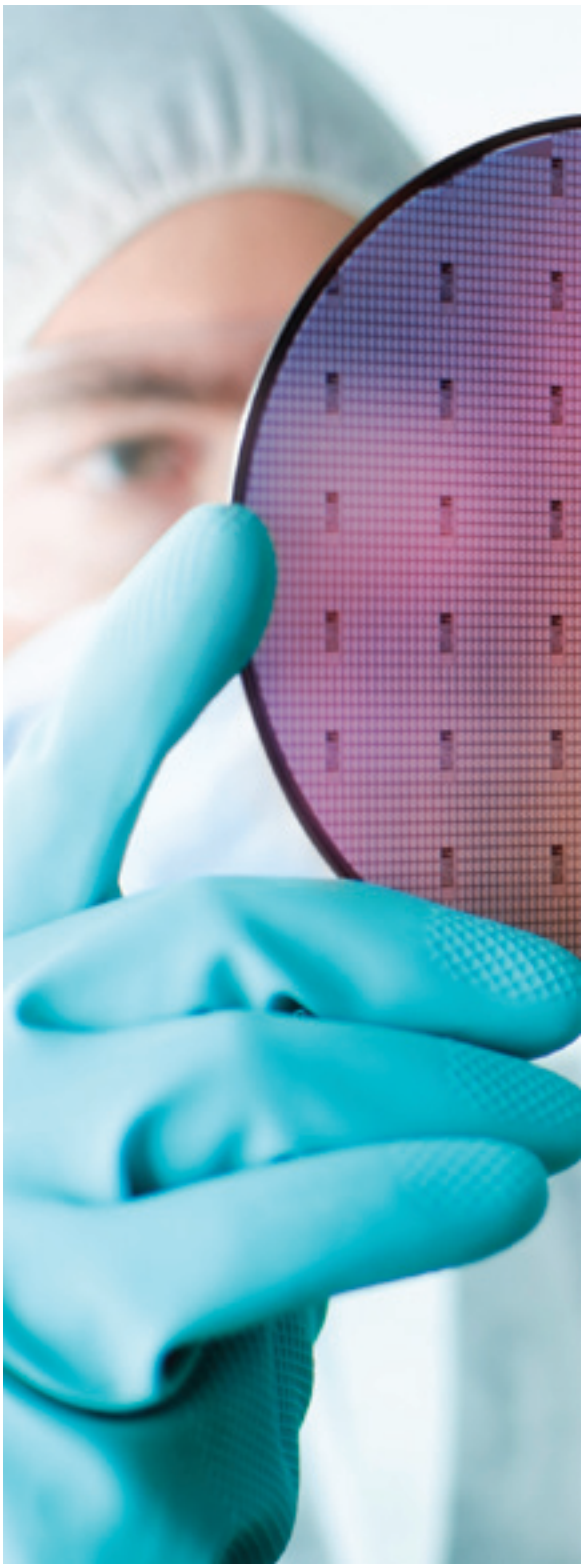
All figures in this report, unless otherwise credited, are based on the output of Bloomberg New Energy Finance's Desktop database (see below) and analysis by its regional and sector experts. Data are current as of the end of 2012 and are categorized by country. Members of the EU not profiled individually are aggregated as the "Rest of EU-27."[9]

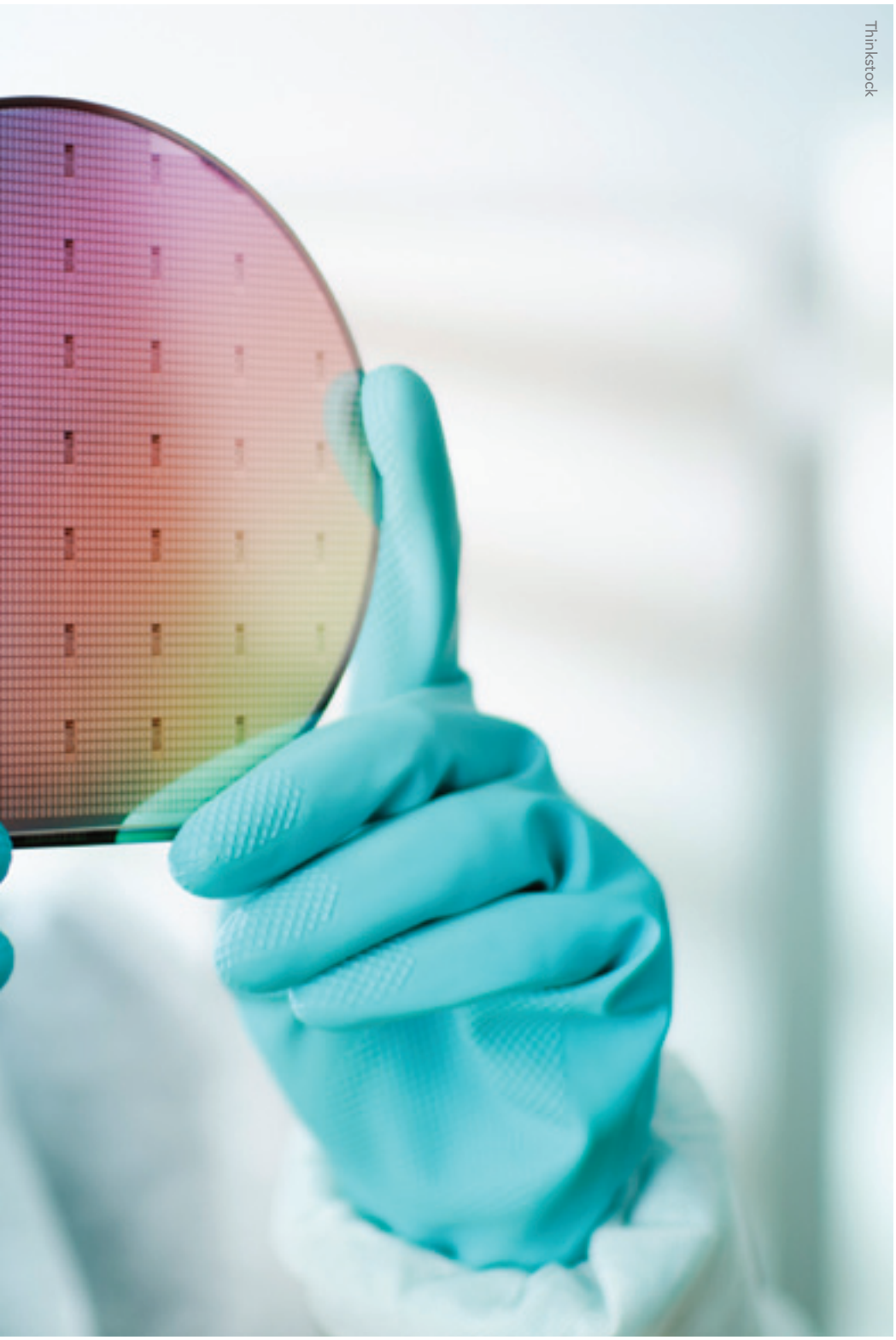
The Bloomberg New Energy Finance Desktop is a Web-based database of clean energy and energy smart technology companies, manufacturing facilities, generation projects, and financial deals that are organized according to transaction type, sector, geography, and timing. The Desktop database includes 30,000 transactions, 32,000 renewable energy projects, and more than 50,000 organizations, including startups, corporations, venture capital and private equity providers, banks, and other investors. The Bloomberg New Energy Finance Desktop database is available by subscription and can be accessed at www.bnef.com.

Research for this report included data on the following renewable energy projects: all biomass, geothermal, and wind generation projects of more than 1 MW; all hydro projects between 1 and 50 MW; all marine energy projects; all biofuels projects with a capacity of 1 million liters or more a year; and all solar projects, where those less than 1 MW were estimated separately and referred to as small-distributed capacity in this report.

Energy-efficient/low-carbon technology services includes financial investment in technology companies covering energy efficiency, smart grid, energy storage, advanced transportation, carbon capture and storage, and general clean energy services companies. These sectors are also included in the corporate and government research and development investment figures. Investment in efficiency and low-carbon technology projects by governments and public financing institutions was excluded.

Where deal values were not disclosed, Bloomberg New Energy Finance assigned an estimated value based on comparable transactions. Deal values were rigorously rechecked and





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updated when further information was released about particular companies and projects. The statistics used were historical figures, based on confirmed and disclosed investment.

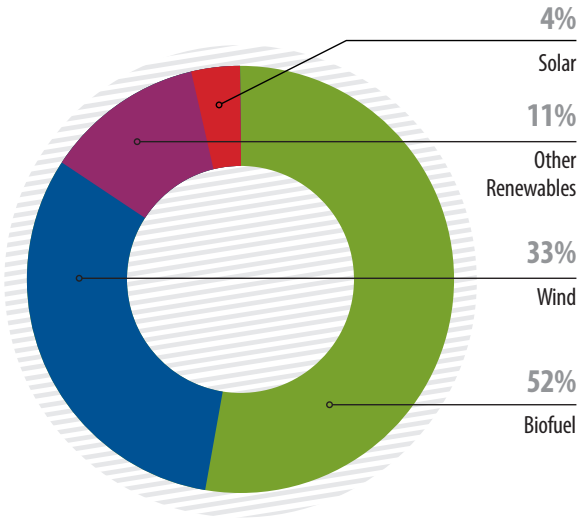
An adjustment for reinvested equity has been included in order to remove potential double counting when aggregating funds raised (through public markets and venture capital/private equity) with funds spent (through asset financing). This calculation looks to match organizations that raised funds and then acted as investors in the financing of a project that occurred within one year of the funds being raised.

Bloomberg New Energy Finance continuously monitors investment in renewable energy and energy efficiency. This is a dynamic process. As the sector's visibility grows, information flow improves. New deals come to light, and existing data are refined, meaning that historical figures are constantly updated.

Argentina

Clean energy investment in Argentina rebounded in 2012, rising 63 percent, to $271 million, but still fell one spot to 18th place in the G-20. Investment in the wind sector grew to $200 million. Although the country experienced the fifth-largest increase in clean energy investment, the pace of clean energy capacity additions will have to accelerate if Argentina is to achieve its 2016 target for generating 8 percent of power from clean energy. Access to financing is a major challenge for renewable energy project developers, as it is in other sectors. The financing situation could worsen if Argentina is barred from access to International Monetary Fund financing over concerns about a lack of transparency in economic data.

Distribution of investment by sector, 2006-12



Finance and Investment (2012)

Total Investment	$271 million
G-20 Investment Rank	18
Percentage of G-20 Total	0.1%
5-Year Growth Rate	-3.9%

Installed Clean Energy (2012)

Total Installed Renewable Energy	0.7 GW
Percentage of G-20 Total	0.1%
5-Year Growth Rate	8%
Key Renewable Energy Sectors	
Biodiesel	3090 million liters per year
Small Hydro	475 MW
Wind	194 MW

Key Clean Energy Targets

Renewable Energy	8% of total power generation (by 2016)
Ethanol	5% of total gasoline consumption
Biodiesel	7% of total diesel consumption

Key Investment Incentives

Wind, Solar, Biomass, Small Hydro	Tax incentives: Value-added tax rebate/accelerated depreciation benefit
Biofuel	Tax exemption for producers and guaranteed fixed prices set by government

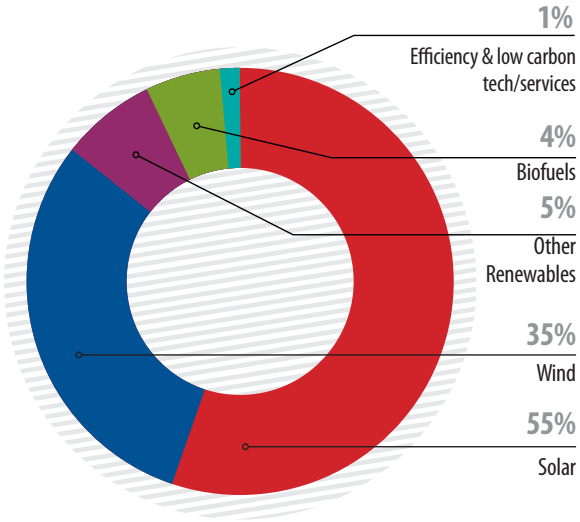
Key Investment Incentives

	Carbon Cap	✓	Auto Efficiency Standards
	Carbon Market	✓	Feed-In Tariffs
✓	Renewable Energy Standard		Government Procurement
✓	Clean Energy Tax Incentives		Green Bonds

Australia

Clean energy investment in Australia declined 7 percent in 2012, to $4.9 billion, the 11th position in the G-20. Nonetheless, Australia is a promising long-term market, ranking among the top 10 for one- and five-year investment trends and for clean energy investment intensity. Solar energy was the leading technology for investment in 2012, attracting $3.6 billion that supported capacity additions in excess of 1 GW. In the wind sector, $1.1 billion was invested and 100 MW of new capacity was installed. Certain incentives for clean energy were reduced, but a carbon pricing initiative took effect midyear and a $10 billion fund was established for commercialization of renewable and other energy projects that reduce emissions. Large-scale solar projects commenced in Australia, with initiation of more than 100 MW each. The federal renewable target helped fuel contracts for 500 MW of new wind capacity at the end of 2012

Distribution of investment by sector, 2006-12



Finance and Investment (2012)	
Total Investment	$4.9 billion
G-20 Investment Rank	11
Percentage of G-20 Total	2.2%
5-Year Growth Rate	25.8%

Installed Clean Energy (2012)	
Total Installed Renewable Energy	6.6 GW
Percentage of G-20 Total	1%
5-Year Growth Rate	22%
Key Renewable Energy Sectors	
Wind	2.6 GW
Solar	2.4 GW

Key Clean Energy Targets (2020)	
Large-Scale Renewable Energy	41 terrawatt-hours additional
Small-Scale Renewable Energy	4 terrawatt-hours additional

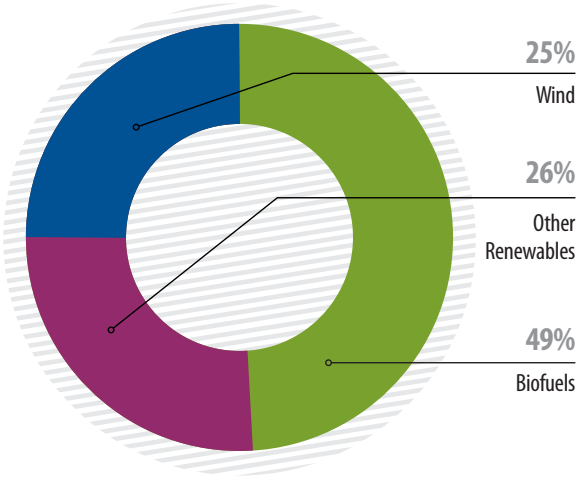
Key Investment Incentives	
Solar	Generation-based subsidies
Renewable Energy	Tax benefits for efficiency and biofuels

Key Investment Incentives			
✓	Carbon Cap	✓	Auto Efficiency Standards
✓	Carbon Market	✓	Feed-In Tariffs
✓	Renewable Energy Standard	✓	Government Procurement
✓	Clean Energy Tax Incentives		Green Bonds

Brazil

Clean energy investment in Brazil decreased by 32 percent in 2012, to $5.3 billion, but the country remained in 10th place for clean energy investment in the G-20. Brazil remains a promising destination for wind energy investment, which was fourth-highest in the G-20 at $3.5 billion. Wind remains a highly competitive resource in Brazil but faces challenges associated with transmission and connection to the grid. Still, wind capacity additions increased by 1.1 GW, bringing the total installed wind generating capacity to 2.3 GW. Brazil's ethanol industry suffered from weak demand but could be revived by a new blending mandate that will increase ethanol from 20 percent of gasoline to 25 percent by 2017. The advent of smart meter usage in 2012 could open new opportunities for rooftop solar generation. In addition, several large solar installations are under way in advance of the 2014 World Cup in Brazil.

Distribution of investment by sector, 2006-12



Finance and Investment (2012)	
Total Investment	$5.3 billion
G-20 Investment Rank	10
Percentage of G-20 Total	2.4%
5-Year Growth Rate	-11.7%

Installed Clean Energy (2012)	
Total Installed Renewable Energy	15.8 GW
Percentage of G-20 Total	3%
5-Year Growth Rate	21%
Key Renewable Energy Sectors	
Ethanol (liters)	38 billion
Biomass	8.8 GW
Wind	2.3 GW

Key Clean Energy Targets	
Ethanol	20% of total gasoline consumption
Biodiesel	5% of total diesel consumption

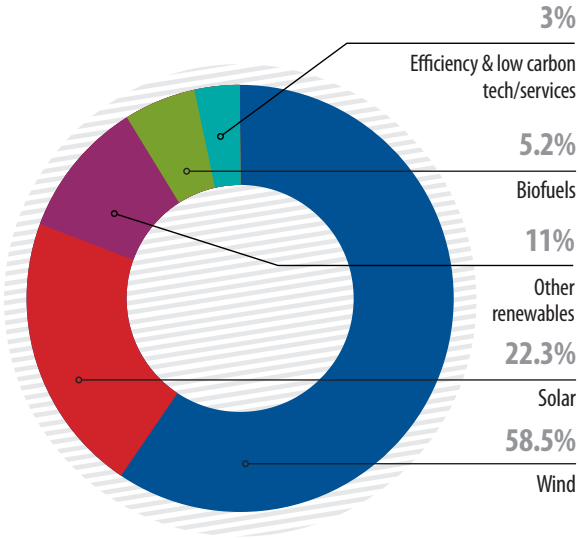
Key Investment Incentives	
Biomass, Small Hydro, Solar, Wind	Generation-based subsidies, preferential Brazilian Development Bank (BNDES) loans, transmission and distribution taxes discount, tax incentives
Biofuel	Preferential BNDES loan (first- and second-generation biofuels)

Key Investment Incentives			
✓	Carbon Cap	✓	Auto Efficiency Standards
	Carbon Market	✓	Feed-In Tariffs
✓	Renewable Energy Standard	✓	Government Procurement
✓	Clean Energy Tax Incentives		Green Bonds

Canada

Canada's clean energy investment declined by 23 percent in 2012, to $5.5 billion, and fell from 11th place to 12th among G-20 nations. Canada ranks fourth in terms of clean energy investment intensity and 10th for five-year investment growth. The wind sector received 57 percent of all investment, a total of $2.5 billion, enabling installation of 900 MW of new wind generating capacity. Most of the rest of the clean energy investment (37 percent) was for solar energy, which garnered $1.7 billion. Ontario's feed-in tariff is supportive of solar-sector expansion. In late 2012, the Canadian government announced regulations for coal-fired power plants that will require new generating units in 2015 and plants more than 50 years old to meet carbon-dioxide emissions standards.

Distribution of investment by sector, 2006-12



Finance and Investment (2012)	
Total Investment	$4.4 billion
G-20 Investment Rank	12
Percentage of G-20 Total	2%
5-Year Growth Rate	4.7%

Installed Clean Energy (2012)	
Total Installed Renewable Energy	11.4 GW
Percentage of G-20 Total	1.9%
5-Year Growth Rate	14%
Key Renewable Energy Sectors	
Wind	6.3 GW
Small Hydro	2.4 GW

Key Clean Energy Targets (2020)	
Wind (Quebec)	4.7 GW
Solar	500 MW

Key Investment Incentives*	
Wind, Solar, Biomass	Generation-based subsidies, preferential loans

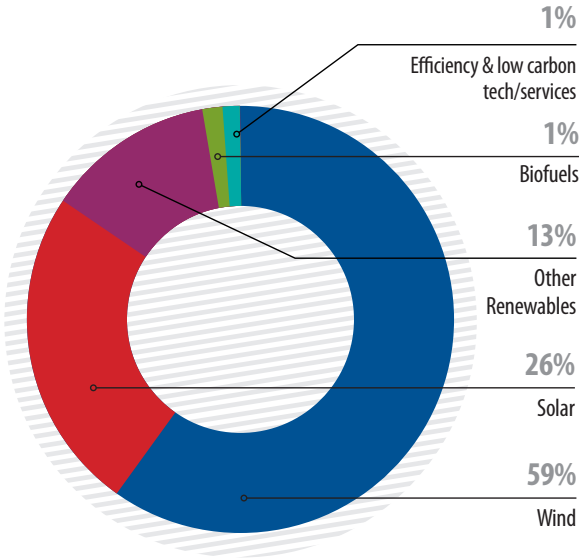
*primarily through provincial governments

Key Investment Incentives			
	Carbon Cap	✓	Auto Efficiency Standards
✓	Carbon Market (Quebec)	✓	Feed-In Tariffs
	Renewable Energy Standard		Government Procurement
✓	Clean Energy Tax Incentives		Green Bonds

China

China attracted $65.1 billion worth of clean energy investment in 2012, 20 percent above the 2011 level, regaining first place among all G-20 nations. By itself, China accounted for 30 percent of total clean energy investment in the G-20. It led the world in investments in solar ($31.2 billion), wind ($27.2 billion), and other renewables ($6.3 billion). China also led the world in deployment of clean energy technologies, adding 16 GW of wind and 3.2 GW of solar generating capacity. Overall, China added 23 GW of clean energy capacity and has 152 GW overall, more than 23 percent of the world total. For the first time, solar investment in China in 2012 outpaced wind—a trend that may continue in 2013, as China pursues its target for installation of a world-record 10 GW of both grid-connected and distributed photovoltaics.

Distribution of investment by sector, 2006-12



Finance and Investment (2012)	
Total Investment	$65.1 billion
G-20 Investment Rank	1
Percentage of G-20 Total	30%
5-Year Growth Rate	34.6%

Installed Clean Energy (2012)	
Total Installed Renewable Energy	152 GW
Percentage of G-20 Total	25%
5-Year Growth Rate	23%
Key Renewable Energy Sectors	
Wind	74 GW
Small Hydro	65 GW
Solar Photovoltaic	6.5 GW

Key Clean Energy Targets (2020)	
Wind	100 GW by 2015, 200 GW by 2020
Biomass and waste-toenergy	13 GW by 2015, 30 GW by 2020
Solar	21 GW by 2015, 50 GW by 2020

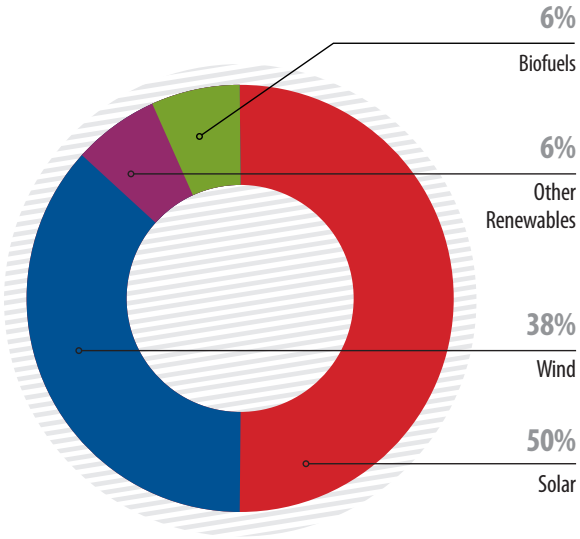
Key Investment Incentives	
Wind	Fixed feed-in tariff
Renewable Energy	Renewable portfolio standard and guaranteed purchase
Solar	Fixed feed-in tariffs

Key Investment Incentives			
	Carbon Cap	✓	Auto Efficiency Standards
✓	Carbon Market	✓	Feed-In Tariffs
✓	Renewable Energy Standard		Government Procurement
✓	Clean Energy Tax Incentives	✓	Green Bonds

France

France experienced a 35 percent decrease in clean energy investment in 2012, falling to $4.3 billion, and the 13th rank in the G-20. The solar sector continued to garner the bulk of clean energy investment, $3.9 billion, more than 90 percent of the overall total. A total of 900 MW of solar and 700 MW of wind generating capacity was added. France is among the top 10 countries for capacity additions over the past five years, and clean energy figures into the government's plans to reduce the share of energy derived from nuclear plants. Following a national debate on energy transition, a energy bill is expected to feature clean energy in 2013. In 2012, tenders were awarded for 1.9 GW of offshore wind, which figures in France's long-term energy plans as well.

Distribution of investment by sector, 2006-12



Finance and Investment (2012)	
Total Investment	$4.3 billion
billionG-20 Investment Rank	13
Percentage of G-20 Total	2%
5-Year Growth Rate	3.4%

Key Clean Energy Targets (2020)	
Renewable Energy	23% of final energy consumption
Biofuels	10% of energy in transport
Efficiency	20% reduction in primary energy consumption

Installed Clean Energy (2012)	
Total Installed Renewable Energy	13.9 GW
Percentage of G-20 Total	2.3%
5-Year Growth Rate	22%
Key Renewable Energy Sectors	
Wind	7.4 GW
Solar PV	3.6 GW

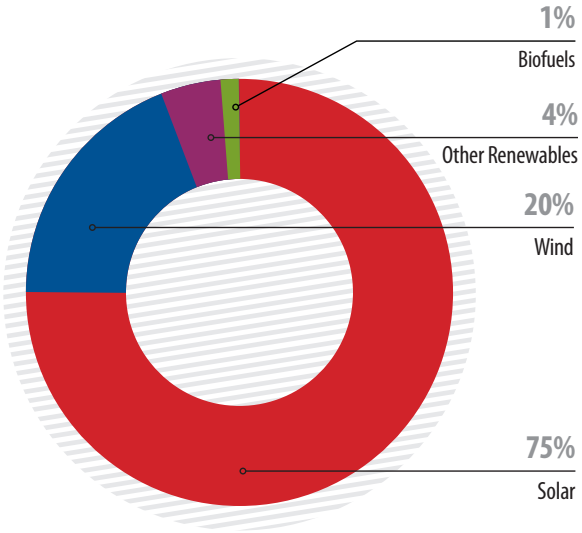
Key Investment Incentives	
Wind, Solar, Biogas	Feed-in tariffs
Renewable Energy Equipment	Tax credit for renewable energy equipment used for residential power
Tender Offers	Offshore wind 6 GW 2012-20, photovoltaic larger than 100 kW
Efficiency	Energy-saving certificate program

Key Investment Incentives			
✓	Carbon Cap	✓	Auto Efficiency Standards
✓	Carbon Market	✓	Feed-In Tariffs
	Renewable Energy Standard	✓	Government Procurement
✓	Clean Energy Tax Incentives		Green Bonds

Germany

Clean energy investment in Germany fell for the second year in a row, declining 27 percent, to $22.8 billion. Still, Germany maintained third place in the G-20 and remains one of the world's most important clean energy markets. Investment totaling $17.2 billion in the solar sector was second-highest in the world. Germany was able to spur deployment of more than 7.5 GW of solar generating capacity for the third year in a row and now hosts 32.2 GW of solar power plants, twice as much as any other country. Germany also attracted $5.5 billion in the wind sector, fourth-highest in the G-20, and deployed an additional 2.4 GW of wind. Overall, Germany had 71 GW of clean generating capacity installed at the end of 2012, third most in the world. The nation's shift away from nuclear power caused power prices to spike and price control to become a major political issue a year ahead of elections. The political debate may affect funding of the Energy Turnaround and future investment in the clean energy sector.

Distribution of investment by sector, 2006-12



Finance and Investment (2012)	
Total Investment	$22.8 billion
G-20 Investment Rank	3
Percentage of G-20 Total	10.4%
5-Year Growth Rate	10.6%

Installed Clean Energy (2012)	
Total Installed Renewable Energy	71 GW
Percentage of G-20 Total	12%
5-Year Growth Rate	17%
Key Renewable Energy Sectors	
Wind	31 GW
Solar	32 GW
Biomass	5.8 GW

Key Clean Energy Targets	
Renewable Energy	80% of final electricity by 2050
Biofuels	10% renewable energy share in transport by 2020

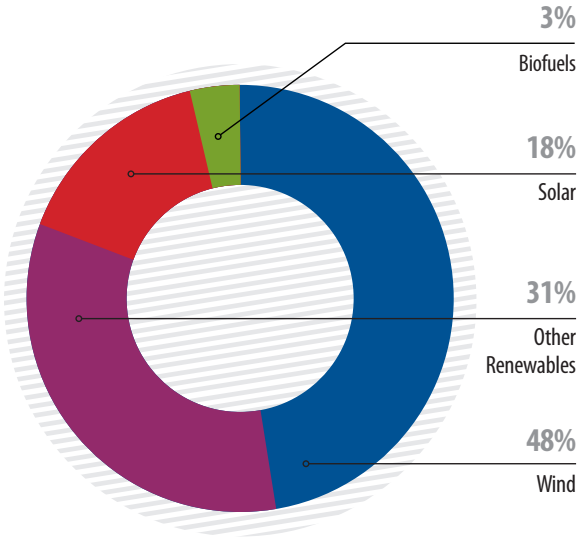
Key Investment Incentives	
Wind, Solar, Biomass	Feed-in tariffs (accelerated FiT for offshore wind)
Biofuels	Biofuel blending requirement
Renewable Heating	Market incentives

Key Investment Incentives			
✓	Carbon Cap	✓	Auto Efficiency Standards
✓	Carbon Market	✓	Feed-In Tariffs
	Renewable Energy Standard	✓	Government Procurement
✓	Clean Energy Tax Incentives	✓	Green Bonds

India

India's clean energy sector cooled significantly in 2012, with investment falling 45 percent, to $6.9 billion. As a result, India fell to the G-20's eighth position, from sixth a year earlier. Wind technologies attracted $3.4 billion, fifth-highest in the G-20 and almost half of India's total, enabling installation of 2.5 GW of new wind generating capacity. Solar investments were down 45 percent, to $2.3 billion, and 1 GW of new solar generating capacity was added. Overall, 4 GW of clean power was added in India, which has set a target for adding 30 GW of clean power between 2012 and 2017. To help spur progress toward this goal, the government has announced lower interest rates for renewable energy projects in 2013. Reintroduction of incentives for wind technologies could spur investment in that sector and solar may benefit from state-level policy initiatives.

Distribution of investment by sector, 2006-12



Finance and Investment (2012)	
Total Investment	$6.9 billion
G-20 Investment Rank	8
Percentage of G-20 Total	3.1%
5-Year Growth Rate	2.1%

Installed Clean Energy (2012)	
Total Installed Renewable Energy	30.5 GW
Percentage of G-20 Total	5%
5-Year Growth Rate	14%
Key Renewable Energy Sectors	
Wind	20 GW
Small Hydro	4.9 GW
Solar	1.3 GW

Key Clean Energy Targets (2017)	
Wind	15 GW from 2012
Solar	10 GW from 2012

Key Investment Incentives*	
All Renewable Energy	Feed-in tariffs, lower tax rates for 10 years, renewable energy certificates
All Renewable Energy, Except Wind	80% accelerated depreciation in first year, capital subsidy
Wind and Solar	Generation-based incentives

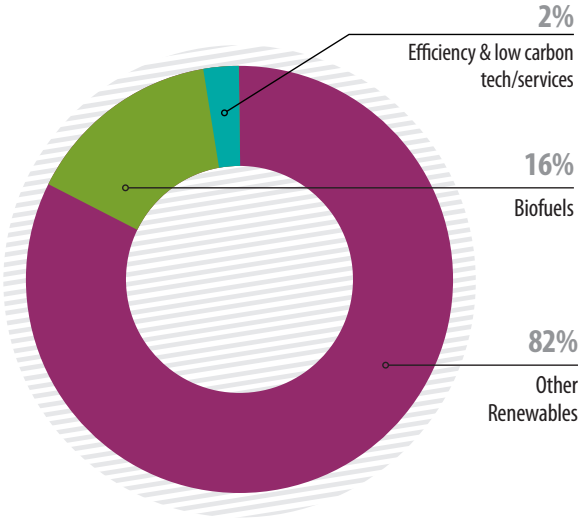
*primarily through provincial investment

Key Investment Incentives			
	Carbon Cap	✓	Auto Efficiency Standards
	Carbon Market		Feed-In Tariffs
	Renewable Energy Standard	✓	Government Procurement
✓	Clean Energy Tax Incentives	✓	Green Bonds

Indonesia

After world-leading growth in 2011, clean energy investment in Indonesia contracted in 2012, falling 82 percent to just $200 million. As a result, Indonesia fell from 14th to 19th in the G-20. Almost all of the investment in Indonesia was directed toward development of geothermal energy resources. Indonesia has an estimated 40 percent of the world's known geothermal energy resource. In 2012 investment was guided toward developing this natural source of heat. Indonesia aspires to develop solar and wind resources but has not attracted meaningful investment in these sectors.

Distribution of investment by sector, 2006-12



Finance and Investment (2012)	
Total Investment	$200 million
G-20 Investment Rank	19
Percentage of G-20 Total	0.1%
5-Year Growth Rate	-15%

Installed Clean Energy (2012)	
Total Installed Renewable Energy	3.2 GW
Percentage of G-20 Total	0.5%
5-Year Growth Rate	3%
Key Renewable Energy Sectors	
Geothermal	1.6 GW
Biodiesel	4250 mLpa MW

Key Clean Energy Targets (2025)	
Geothermal	9.5 GW
Wind	970 MW
Solar	870 MW
Renewable Energy Power	15% of all electricity to be sourced from clean energy

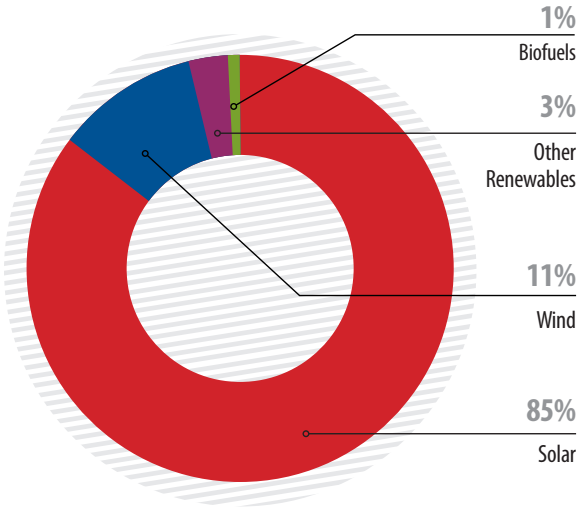
Key Investment Incentives	
Geothermal	Preferential tariffs, no import duties or VAT, lower income tax
Renewable Energy Power	Preferential tariff for projects below 10 MW, import duty and value-added tax exemption, income tax reduction, guaranteed purchase of renewable power by state utilities

Key Investment Incentives			
	Carbon Cap		Auto Efficiency Standards
	Carbon Market	✓	Feed-In Tariffs
	Renewable Energy Standard	✓	Government Procurement
✓	Clean Energy Tax Incentives		Green Bonds

Italy

Clean energy investment in Italy declined 51 percent in 2012, to $14.7 billion, sixth-highest in the G-20. More than 90 percent of the clean energy investment in Italy was for solar energy resources, which garnered $14.1 billion, fifth most in the G-20. Italy remains among the top 10 nations on a variety of measures, including the amount of investment relative to overall gross domestic product. Investment totals were down sharply, as the government capped incentives for solar and replaced the green certificate program with tenders. To help offset tariff reductions, Italy reformed its net metering rules for small-scale solar photovoltaic installations. Italy garnered the second-highest level of small-distributed capacity investment in 2012. Overall, 3.4 GW of new solar was installed in 2012, along with 1.3 GW of wind.

Distribution of investment by sector, 2006-12



Finance and Investment (2012)	
Total Investment	$14.7 billion
G-20 Investment Rank	6
Percentage of G-20 Total	6.7%
5-Year Growth Rate	35%

Installed Clean Energy (2012)	
Total Installed Renewable Energy	31.5 GW
Percentage of G-20 Total	5.2%
5-Year Growth Rate	26%
Key Renewable Energy Sectors	
Wind	7.9 GW
Solar	16 GW
Small Hydro	4.6 GW

Key Clean Energy Targets (2020)	
Renewable Electricity	26.4%
Transportations	Renewable energy 10% of transportation energy

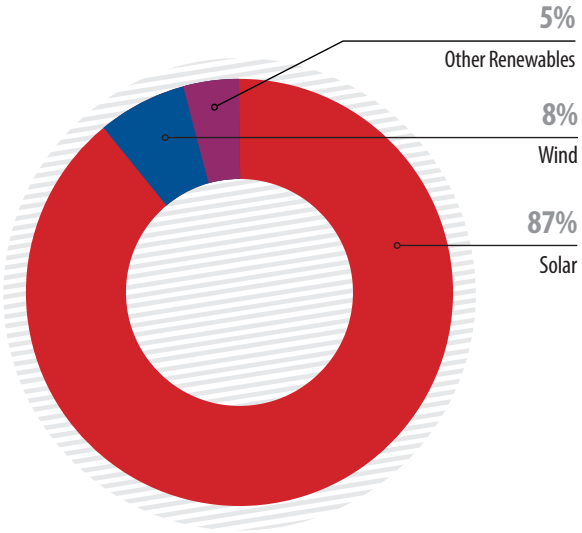
Key Investment Incentives	
Wind, Solar, Biomass	Feed-in premiums/tenders
Energy Efficiency	Energy efficiency credits

Key Investment Incentives			
✓	Carbon Cap	✓	Auto Efficiency Standards
✓	Carbon Market	✓	Feed-In Tariffs
✓	Renewable Energy Standard	✓	Government Procurement
✓	Clean Energy Tax Incentives		Green Bonds

Japan

Reflecting Japan's resolve to diversify its power mix in the wake of the Fukushima nuclear power plant disaster in 2011, clean energy investment increased by 75 percent in 2012, to $16.3 billion, the fifth-highest total in the G-20. Japan realized the fourth-highest level of solar investment ($15.7 billion) and was in the top 10 for one- and five-year investment growth, investment intensity, and installation of new clean generating capacity. Japan added more than 2 GW of distributed solar capacity. In the wind sector, $500 million was invested. A new central government in Japan is reevaluating the nation's energy policies but is expected to continue support for distributed power and storage technologies. Japan also is working to improve battery performance, advance electric vehicles, and extend charging infrastructure.

Distribution of investment by sector, 2006-12



Finance and Investment (2012)	
Total Investment	$16.3 billion
G-20 Investment Rank	5
Percentage of G-20 Total	7.5%
5-Year Growth Rate	46.4%

Installed Clean Energy (2012)	
Total Installed Renewable Energy	27 GW
Percentage of G-20 Total	4.4%
5-Year Growth Rate	6%
Key Renewable Energy Sectors	
Bioenergy	3.1 GW
Geothermal	0.5 GW
Small Hydro	13.2 GW
Solar	7.4 GW
Wind	2.6 GW

Key Clean Energy Targets (2020)	
Solar	28 GW

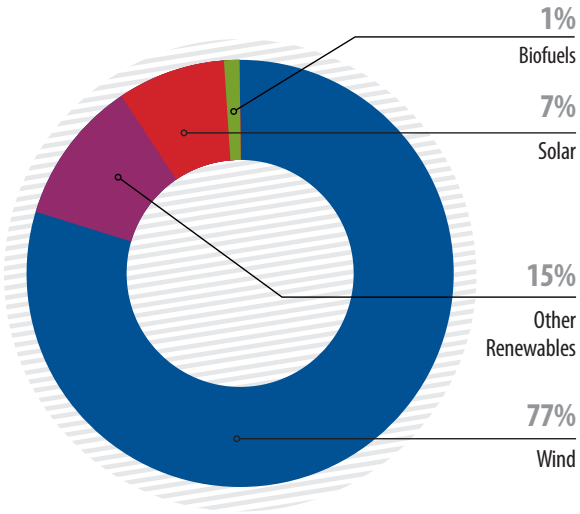
Key Investment Incentives	
Renewable Power	Feed-in tariff
Energy Efficiency	Cash subsidies for energy efficiency, energy management systems
Electric Vehicles	Subsidies for charging infrastructure investments

Key Investment Incentives			
	Carbon Cap	✓	Auto Efficiency Standards
	Carbon Market	✓	Feed-In Tariffs
	Renewable Energy Standard	✓	Government Procurement
✓	Clean Energy Tax Incentives	✓	Green Bonds

Mexico

Clean energy investment in Mexico grew by 548 percent in 2012, to $2 billion. Most of the clean energy investment (65 percent) was directed to the wind sector, which attracted $1.3 billion. Another $300 million worth of investment was directed to the solar sector. These investments spurred a 50 percent increase in wind energy installations, which reached 700 MW. Wind surpassed geothermal as the largest clean energy sector in Mexico. The nation recently enacted climate change legislation that seeks to reduce emissions by 30 percent from projected levels by 2020. Mexico also set a goal for acquiring 35 percent of its electricity from renewable sources by 2024. A new ethanol-blending mandate for gasoline sold in major cities has been postponed.

Distribution of investment by sector, 2006-12



Finance and Investment (2012)	
Total Investment	$2 billion
G-20 Investment Rank	15
Percentage of G-20 Total	1%
5-Year Growth Rate	-328%

Installed Clean Energy (2012)	
Total Installed Renewable Energy	3.6 GW
Percentage of G-20 Total	0.56
5-Year Growth Rate	17%
Key Renewable Energy Sectors	
Geothermal	1008 MW
Wind	1.7 GW

Key Clean Energy Target (2024)	
Renewable Energy	35% (includes large hydro)

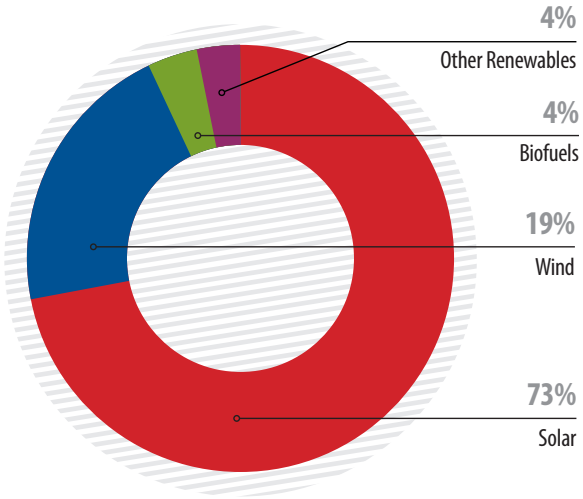
Key Investment Incentives	
Renewable Energy	Full depreciation of renewable generating assets after 5 years

Key Investment Incentives			
✓	Carbon Cap	✓	Auto Efficiency Standards
	Carbon Market		Feed-In Tariffs
✓	Renewable Energy Standard	✓	Government Procurement
✓	Clean Energy Tax Incentives		Green Bonds

South Africa

Clean energy investment in South Africa exploded in 2012, from less than $100 million to a robust $5.5 billion, rising 11 spots to the ninth position in the G-20. More than 75 percent ($4.3 billion) of the clean energy investment in South Africa was in the solar sector. Another $1.1 billion was directed to the wind sector. Clean energy investment in South Africa is likely to remain strong as the country implements its relatively new renewable energy tender program, which has initiated 28 projects. A second round of clean power auctions has been initiated as well. The recent lifting of constraints on nuclear power and shale gas development indicates South Africa's desire to meet growing power requirements with a diverse mix of energy sources.

Distribution of investment by sector, 2006-12



Finance and Investment (2012)	
Total Investment	$5.5 billion
G-20 Investment Rank	9
Percentage of G-20 Total	2.5%
5-Year Growth Rate	226%

Installed Clean Energy (2012)	
Total Installed Renewable Energy	106 MW
Percentage of G-20 Total	0.02%
5-Year Growth Rate	5%
Key Renewable Energy Sectors	
Solar	9 MW
Small Hydro	81 MW

Key Clean Energy Targets	
Renewable Energy	9% final energy consumption by 2030
Ethanol	5% of total gasoline consumption
Biofuels/Biodiesel	5% of total diesel consumption
Energy Efficiency	Reduce demand by 3.4 GW by 2020

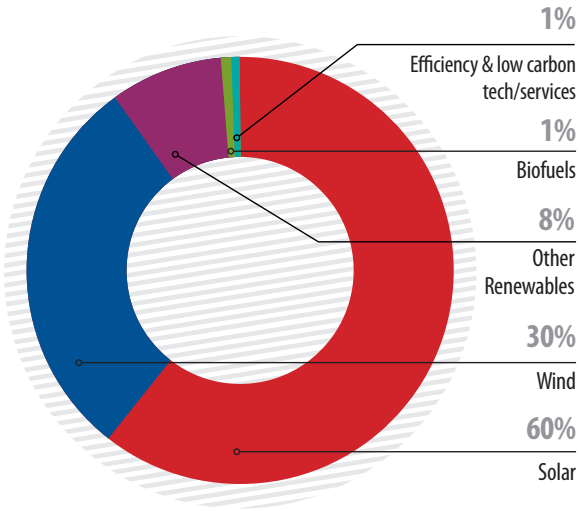
Key Investment Incentives	
Wind, Solar, Small Hydro, Biomass	Feed-in Tariff as part of reverse auction

Key Investment Incentives			
	Carbon Cap		Auto Efficiency Standards
	Carbon Market		Feed-In Tariffs
	Renewable Energy Standard	✓	Government Procurement
	Clean Energy Tax Incentives		Green Bonds

South Korea

Clean energy investment in South Korea increased 50 percent in 2012, to $900 million, but the nation fell from 15th to 17th place in the G-20. A renewable energy portfolio standard replaced the feed-in tariff system. Investments were fairly evenly divided between the wind and solar sectors. The South Korean wind industry attracted $500 million worth of investment while solar garnered $400 million. Installations in the wind sector were 100 MW in 2012, doubling 2011 levels. In the solar sector, 200 MW were deployed.

Distribution of investment by sector, 2006-12



Finance and Investment (2012)	
Total Investment	$900 million
G-20 Investment Rank	17
Percentage of G-20 Total	0.4%
5-Year Growth Rate	-8.1%

Installed Clean Energy (2012)	
Total Installed Renewable Energy	2 GW
Percentage of G-20 Total	0.3%
5-Year Growth Rate	33%
Key Renewable Energy Sectors	
Solar	1 GW
Wind	543 MW

Key Clean Energy Targets	
Renewable Energy	15% of final consumption by 2030
Wind	9 GW by 2024
Solar	4.2 GW by 2024

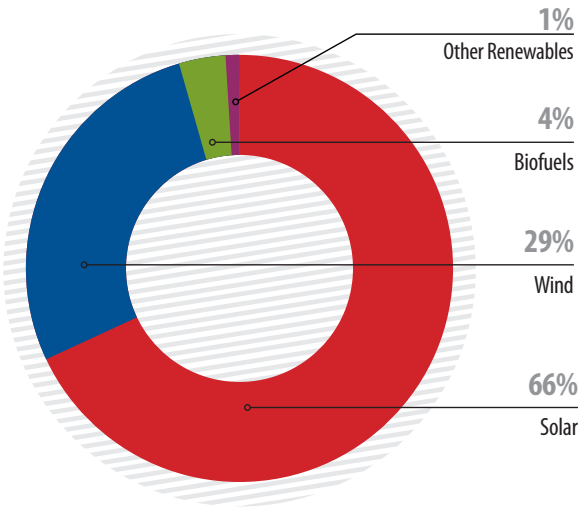
Key Investment Incentives	
Renewable Energy	Renewable portfolio standard, green certificates

Key Investment Incentives			
✓	Carbon Cap	✓	Auto Efficiency Standards
	Carbon Market		Feed-In Tariffs
✓	Renewable Energy Standard		Government Procurement
✓	Clean Energy Tax Incentives	✓	Green Bonds

Spain*

Clean energy investment levels in Spain declined by 68 percent in 2012, to $2.9 billion. Austerity measures and associated reductions in tariff incentives cooled what had been one of the world's hottest clean energy markets. Spain fell from ninth to 14th position in the G-20. In the wind sector, $500 million was invested and 1.1 GW installed. The solar sector attracted 79 percent of the overall total, with $2.3 billion invested and 900 MW installed. All generating sources in Spain are now subject to a 7 percent generation tax. Feed-in tariffs for all new generation projects have also been suspended.

Distribution of investment by sector, 2006-12



Finance and Investment (2012)	
Total Investment	$2.9 billion
G-20 Investment Rank	14
Percentage of G-20 Total	1.3%
5-Year Growth Rate	-32%

Installed Clean Energy (2012)	
Total Installed Renewable Energy	34 GW
Percentage of G-20 Total	5.6%
5-Year Growth Rate	10%
Key Renewable Energy Sectors	
Wind	23 GW
Solar	6.2 GW

Key Clean Energy Targets (2020)	
Renewable Energy	20% of final energy consumption
Biofuels	10% of transportation consumption

Key Investment Incentives	
Wind, Solar, Biomass	Feed-in tariffs— suspended for new projects
Biomass Cogeneration	Preferential loans of up to 1.5 million euros
Biofuels	Exempt from hydrocarbon tax until 2012

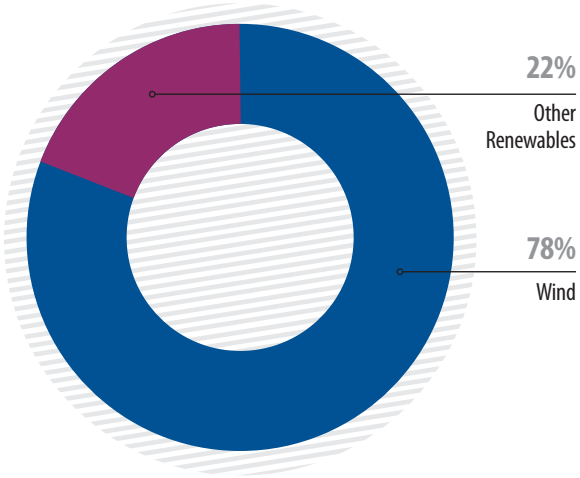
*Spain is not a G-20 member but is an important clean energy player within the EU.

Key Investment Incentives			
✓	Carbon Cap	✓	Auto Efficiency Standards
✓	Carbon Market		Feed-In Tariffs
	Renewable Energy Standard	✓	Government Procurement
✓	Clean Energy Tax Incentives		Green Bonds

Turkey

After falling sharply a year earlier, clean energy investment was up sharply in Turkey in 2012. Growing by 180 percent, clean energy investments reached $1.4 billion. All of the investment was in wind energy technologies. Deployment of wind energy generating capacity reached 500 MW in 2012. Turkey is among the top 10 countries for one- and five-year investment growth and for five-year capacity growth.

Distribution of investment by sector, 2006-12



Finance and Investment (2012)	
Total Investment	$1.4 billion
G-20 Investment Rank	16
Percentage of G-20 Total	0.6%
5-Year Growth Rate	26%

Installed Clean Energy (2012)	
Total Installed Renewable Energy	3.3 GW
Percentage of G-20 Total	0.5%
5-Year Growth Rate	32%
Key Renewable Energy Sectors	
Small Hydro	837 MW
Wind	2.3 GW

Key Clean Energy Targets (2023)	
Wind	20 GW
Renewable Energy	30% of energy consumption

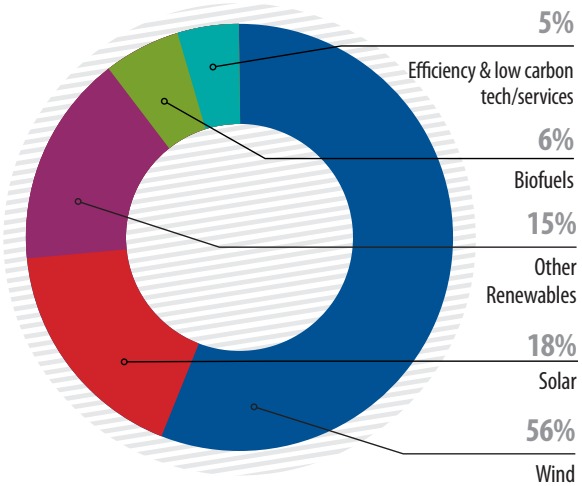
Key Investment Incentives	
Wind, Solar, Geothermal	25% of generation by 2020
Wind	Equipment exempt from value-added tax and customs duty

Key Investment Incentives			
	Carbon Cap		Auto Efficiency Standards
	Carbon Market	✓	Feed-In Tariffs
	Renewable Energy Standard	✓	Government Procurement
✓	Clean Energy Tax Incentives		Green Bonds

United Kingdom

Uncertainty surrounding clean energy policy in the United Kingdom contributed to a 17 percent investment decline in 2012. Of the $8.3 billion invested, $3.1 billion was directed to the wind sector and $3.5 billion to solar technologies. The UK remains one of the few countries on the top 10 lists in every category of investment and capacity growth. All told, 4.2 GW of new clean generating capacity was installed in 2012, including 2.6 GW of wind and 800 MW of solar. Policy in the UK is in a state of flux. The government is undertaking electricity market reforms and considering a new decarbonization target for the power sector. It has initiated a green investment bank, heat incentive, and major energy efficiency program. The United Kingdom remains a leader in development of offshore wind generating capacity.

Distribution of investment by sector, 2006-12



Finance and Investment (2012)	
Total Investment	$8.3 billion
G-20 Investment Rank	7
Percentage of G-20 Total	3.8%
5-Year Growth Rate	6.1%

Installed Clean Energy (2012)	
Total Installed Renewable Energy	15.3 GW
Percentage of G-20 Total	2.5%
5-Year Growth Rate	22%
Key Renewable Energy Sectors	
Wind	8.7 GW
Biomass	3.9 GW
Solar	2.1 GW

Key Clean Energy Targets (2020)	
Renewable Electricity	30% of final consumption
Transportation	Renewable energy 10% of total transportation energy

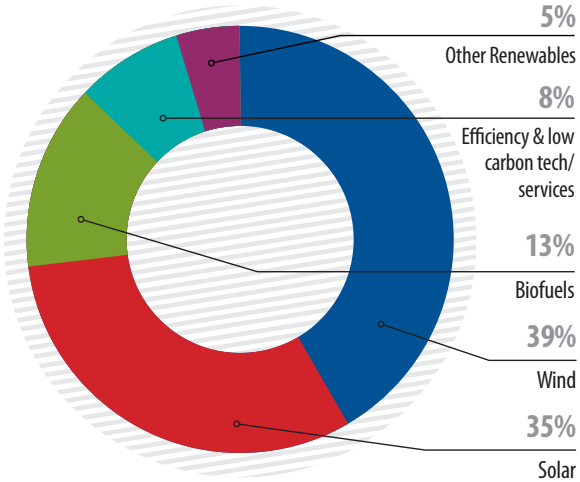
Key Investment Incentives	
Renewable Energy	Feed-in tariffs for small-scale projects; green certificate for large-scale projects
Biofuels	Renewable Transport Fuel Obligation, a blending mandate and certificate program aiming for 5% renewable fuel by 2013-14

Key Investment Incentives			
✓	Carbon Cap	✓	Auto Efficiency Standards
✓	Carbon Market	✓	Feed-In Tariffs
✓	Renewable Energy Standard	✓	Government Procurement
✓	Clean Energy Tax Incentives		Green Bonds

United States

The United States fell hard in 2012 from its G-20 clean energy leadership perch a year earlier, with investment falling 37 percent in 2012, to $35.6 billion. The United States was in second place for wind energy investments ($13.9 billion), third for solar ($16.5 billion), and first place for investment in biofuels and low-carbon and energy efficiency technologies. Uncertainty about whether the production tax credit would be extended propelled record wind capacity additions that totaled 13.6 GW. Innovative, third-party financing mechanisms spurred deployment of a record 3.2 GW of solar generating capacity. All told, 49 percent of new electric generating capacity was renewable. Although the PTC was extended at the end of 2012, the wind sector is expected to contract considerably in 2013. Modest growth is forecast in the solar sector.

Distribution of investment by sector, 2006-12



Finance and Investment (2012)	
Total Investment	$35.6 billion
G-20 Investment Rank	2
Percentage of G-20 Total	16.3%
5-Year Growth Rate	-0.9%

Installed Clean Energy (2012)	
Total Installed Renewable Energy	133 GW
Percentage of G-20 Total	22%
5-Year Growth Rate	11%
Key Renewable Energy Sectors	
Solar	8.1 GW
Wind	59.4 GW
Biomass	13.4 GW
Small Hydro	48.7 GW

Key Clean Energy Targets (2022)	
Biofuels	36 billion gallons

Key Investment Incentives*	
Wind, Solar	Production tax credit, investment tax credit
Solar, Biomass, Geothermal, Fuel Cells	Business energy investment tax credit

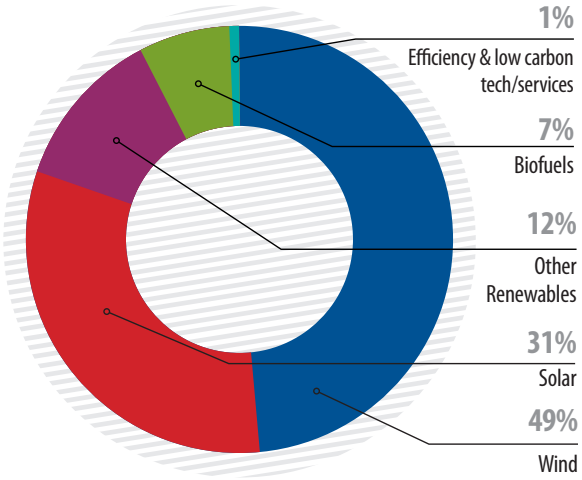
*provided by local, state, and federal governments

Key Investment Incentives			
	Carbon Cap	✓	Auto Efficiency Standards
	Carbon Market		Feed-In Tariffs
	Renewable Energy Standard	✓	Government Procurement
✓	Clean Energy Tax Incentives		Green Bonds

Other EU-27*

The European Union countries not profiled separately in this report saw investments decline 8 percent, to $16.3 billion. Budget austerity across the region led to policy reforms and reduced national incentives. The rest of the EU directed $6 billion (37 percent) to wind resources and $8.9 billion (55 percent) to solar energy. Together, these countries now host 57 GW of renewable energy generating capacity. In 2012, Denmark set a goal for 100 percent renewable energy by 2050. Ireland relaunched renewable energy incentives. Poland began a revision of its renewable energy policy. Romania remains an active clean energy market, although development is limited by grid capacity issues, and its generous incentives are set to be cut in 2014 at the latest.

Distribution of investment by sector, 2006-12



Finance and Investment (2012)	
Total Investment	$16.3 billion
G-20 Investment Rank	4
Percentage of G-20 Total	7.5%
5-Year Growth Rate	12.6%

Installed Clean Energy (2012)	
Total Installed Renewable Energy	56.5 GW
Percentage of G-20 Total	9%
5-Year Growth Rate	13%
Key Renewable Energy Sectors	
Wind	27 GW
Solar	8.3 GW
Small Hydro	48.8 GW

Key Clean Energy Targets (2020)	
Renewable Power	20% of final consumption *differentiated by country
Biofuels	10% of total transportation sector

Key Investment Incentives	
Portugal	Green certificates, preferential loans, investment grants
Greece	Feed-in tariffs, tax incentives
Netherlands	Green premiums, investment subsidies

*does not include data for other EU members profiled in this report

Key Investment Incentives			
✓	Carbon Cap	✓	Auto Efficiency Standards
✓	Carbon Market	✓	Feed-In Tariffs
✓	Renewable Energy Standard	✓	Government Procurement
✓	Clean Energy Tax Incentives		Green Bonds

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Endnotes

1 All monetary values are 2012 U.S. dollars unless otherwise noted. This figure includes all investments, public and private (including research and development), in G-20 and non-G-20 countries.

2 The Group of 20 was established in 1999 to bring together leading industrialized and developing economies to discuss key global economic issues. The G-20 is made up of the finance ministers and central bank governors representing the European Union and 19 countries: Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa, South Korea, Turkey, the United Kingdom and the United States. No data are provided for Russia and Saudi Arabia because clean energy investment there is negligible.

3 "FREC: Renewables Nearly Half of All New US Electrical Capacity in 2012," ecoINSITE, ecoinsite.com/2013/01/frec-renewable-energy-2012-statistics.html.

4 Ron Pernick, Clint Wilder, and Trevor Winnie, *Clean Energy Trends 2013*, Clean Edge Inc., March 2013, 5, http://www.cleanedge.com/sites/default/files/CETrends2013_Final_Web.pdf.

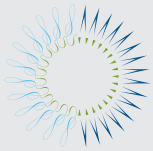
5 Pernick et al., *Clean Energy Trends 2013*, 10.

6 Venture capital and private equity investments in this report are defined as equity-only investments.

7 Ron Pernick, "Clean Energy Trends: The Future Is All About Deployment," Renewable Energy World.com, March 20, 2013, http://www.renewableenergyworld.com/rea/news/article/2013/03/clean-energy-trends-the-future-is-all-about-deployment.

8 Feed-in tariffs are premiums paid to renewable energy projects for production of each megawatt-hour of clean power. They are used to stimulate investment in renewable generating capacity.

9 The "Rest of EU-27" category includes Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Greece, Hungary, Ireland, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, and Sweden.



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