

# ENERGY FACTS

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Solar power panels in Indonesia.

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Geothermal power station in Tuscany, Italy.

## Delivering On Renewable Energy Around The World: How Do Key Countries Stack Up?

by Jake Schmidt and Aaron Haifly

In 2002, countries met in Johannesburg, South Africa for the 10th anniversary of the first Earth Summit in Rio de Janeiro, Brazil. At the Johannesburg Earth Summit, countries committed to: "...substantially increase the global share of renewable energy sources with the objective of increasing its contribution to total energy supply..."<sup>1</sup> Since that time, renewable energy deployment and investment have increased, but work remains. At the 20th anniversary of the 1992 Rio Earth Summit—Earth Summit 2012, scheduled for this June—countries, companies, cities, and individuals need to commit to increasing the amount of wind, solar, geothermal, tidal, and wave power throughout the world, to 15 percent of total electricity by 2020—more than doubling what is predicted under current trends.<sup>2</sup>



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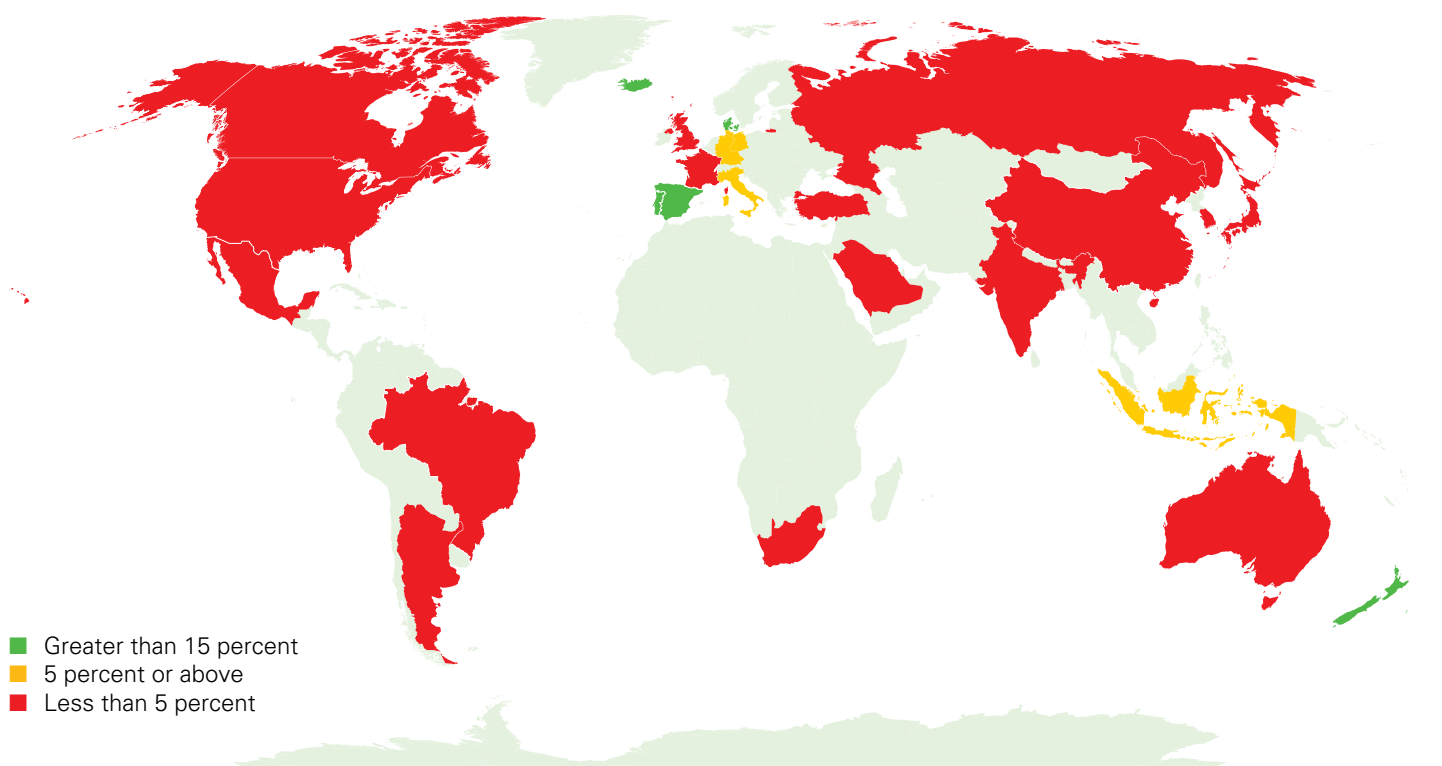
## WHO HAS THE MOST WIND, SOLAR, GEOTHERMAL, TIDAL, AND WAVE ELECTRICITY IN THE G20?

The countries which comprise the Group of Twenty Finance Ministers and Central Bank Governors (also known as the G20) accounted for approximately 80 percent of the total electricity produced in the world in 2010. Given these statistics, as a group they are critical in shaping renewable energy trends, as it is these countries where most of the current and future energy demands are occurring.<sup>3</sup> In 2010, they accounted for more than 82 percent of the world's solar, wind, geothermal, tidal, and wave electricity production.<sup>4</sup> So how do these countries stack up in terms of the share of their electricity that comes from these sources?

Within the G20 countries, Germany had the largest amount of its electricity produced from renewable sources in 2011, followed by the European Union (E.U.) as a bloc, Italy and Indonesia.<sup>5</sup> The United States ranked 7th, India came in 9th, and China ranked 12th (see figure 1).<sup>6</sup> However, all of these countries are significantly behind Spain, Portugal, Iceland, and New Zealand which each produced more than 15 percent of their electricity from these sources.<sup>7</sup>

The largest growth since 2002 has occurred in South Korea, followed by China, and then Brazil (see table 1).<sup>8</sup> This trend shows that these countries both started at a low level of renewable-based electricity production and have significantly sped up their deployment since. (See appendix 1 for information on each country from 2002 to 2011 and details on the methodology.)

**Figure 1: G20 Renewable Electricity Production**



Numbers represent G20 country rankings. Renewable energy in this figure includes wind, solar, geothermal, tidal, and wave.

Source: NRDC, 2012; U.S. Energy Information Administration, 2012; Bloomberg New Energy Finance, 2012.

**Table 1: Electricity from Wind, Solar, Geothermal, Tidal, and Wave in the G20 Countries**

	Percent of Overall Electricity Production		Total Produced from Wind, Solar, Geothermal & Tidal (billion kWh)		Percent Change	
	2011	Rank	2011	Rank	2002 to 2011	Rank
Argentina	0.1%	17	0.06	18	-12%	20
Australia	2.2%	10	5.45	13	1260%	6
Brazil	0.5%	16	2.94	16	4965%	3
Canada	1.0%	13	5.94	12	1254%	7
China	1.5%	12	67.04	3	7605%	2
EU-27	6.7%	2	214.97	1	439%	10
France	2.8%	6	15.91	7	1961%	5
Germany	10.7%	1	55.76	4	266%	12
India	2.4%	9	22.88	5	792%	9
Indonesia	5.7%	4	9.30	10	57%	16
Italy	6.2%	3	18.77	6	225%	13
Japan	1.0%	14	10.61	9	151%	15
Mexico	2.6%	8	7.1	11	37%	17
Russia	0.0%	20	0.5	17	190%	14
Saudi Arabia	0.0%	18	0.05	19	0%	19
South Africa	0.0%	19	0.00	20	6%	18
South Korea	0.9%	15	4.13	15	19584%	1
Turkey	1.9%	11	4.30	14	2847%	4
United Kingdom	4.2%	5	15.32	8	1181%	8
United States	2.7%	7	111.93	2	341%	11
<b>G20 Total</b>	<b>1.8%</b>		<b>2453</b>		<b>274%</b>	

Source: Natural Resources Defense Council, Energy Information Administration, and Bloomberg New Energy Finance.

## CLEAN ENERGY INVESTMENTS ARE GROWING

In 2011, new clean energy investments in the G20 countries increased to \$160 billion, according to Bloomberg New Energy Finance.<sup>9</sup> This indicates a continued trend of rising investments in wind, solar, and other renewable sources of electricity. Since 2004, new clean-energy investment in the G20 countries has grown by almost 600 percent, which has far outpaced the growth in the overall economy in those countries.<sup>10</sup>

Since 2004, the largest amount of total new investment has occurred in the EU, followed by the United States and China (see table 2 and appendix 2).<sup>11</sup> This reflects the implementation of significant policies, incentives, and other programs in these countries to spur renewable electricity deployment.



Wind turbines on the coast of Workington in England.

Table 2: Top Countries for Clean Energy Investments in 2011				
	2011 New Clean Energy Investments		Total (2004 to 1st Quarter 2012)	
	Billion \$US	Rank	Billion \$US	Rank
China	49.74	1	197.49	3
United States	44.51	2	214.96	2
EU-27	38.71	3	290.68	1
Germany	10.57		49.35	
Italy	3.96		24.28	
United Kingdom	5.58		45.42	
Spain	7.34		77.47	
France	2.26		20.84	
India	10.13	4	39.72	5
Brazil	8.23	5	52.31	4
Canada	5.01	6	23.88	6
Indonesia	1.01	7	2.74	1
Australia	1.00	8	10.31	7
Japan	0.54	9	9.41	8
Turkey	0.28	10	5.57	10
South Korea	0.20	11	4.41	11
Argentina	0.14	12	1.83	12
Mexico	0.05	13	6.03	9
South Africa	0.02	14	0.83	10
Russian Federation	0.00	15	0.79	13
Saudi Arabia	0.00	16	0.02	14
<b>Total G20</b>	<b>159.56</b>		<b>860.99</b>	

Source: Bloomberg New Energy Finance, 2012; values include new investments from venture capital, private equity, public markets, and asset finance.

## PROGRESS SINCE 2002, BUT NOT FAST ENOUGH

Since 2002, the G20 countries have more than tripled the amount of their electricity produced from wind, solar, geothermal, tidal, and wave power. Despite this growth, the share of electricity from these sources is still a small portion of their overall electricity mix—2.6 percent for the G20 as a whole.

On current trends, the G20 countries are on a trajectory to produce less than 4 percent of their electricity from these sources by 2015 and less than 6 percent in 2020 (see figure 2).<sup>12</sup>

## COUNTRIES CAN UNLEASH EVEN MORE POTENTIAL AT RIO+20

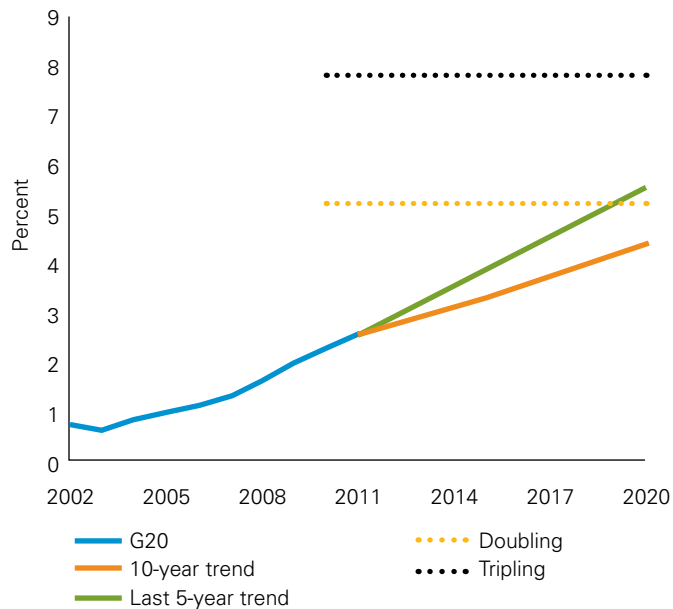
At the Earth Summit 2012 civic and corporate stakeholders must commit to do more to increase electricity production from renewable sources. While a global agreement to spur this deployment is certainly helpful, it is more important that these key actors come to Earth Summit 2012 with *individual* commitments to increase the amount of wind, solar, geothermal, tidal, and wave power throughout the world to 15 percent of total electricity by 2020—more than doubling what is predicted under current trends.<sup>13</sup>



These individual commitments must entail:

1. **Targeted, short-term individual commitments** that entail specific new laws, programs, and incentives that will enable them to meet their existing pledges, or details on new actions that they will implement with clear plans through 2015 at the latest. For example, countries could commit to passing laws to ensure that 15 percent of their electricity is produced from these renewable sources. Or, companies could commit to invest a certain amount of money in this effort.
2. **Commitments to work together**, where appropriate, including sharing technical assistance and coordinating actions. These efforts should include a group of like-minded countries, companies, and Non-Government Organizations that commit to implement the necessary steps to close the gap between the current trend and the 15 percent target. These entities must commit to follow-through so that Rio is not simply a one-off event.
3. **Provisions for monitoring and reporting** to ensure that the commitments are delivered on the ground. These should entail specific timelines for each action and clear metrics for determining success.

**Figure 2: G20 Trends in Wind, Solar, Geothermal, Tidal, and Wave Electricity Production**



Office building with solar power panels in London, England.



## APPENDIX 1: G20 COUNTRIES WIND, SOLAR, GEOTHERMAL, TIDAL, AND WAVE ELECTRICITY PRODUCTION: 2002 TO 2011

Share of Electricity from Wind, Solar, Geothermal, Tidal, & Wave											
	Actual										Change 2002 to 2011
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	
Canada	0.08%	0.15%	0.2%	0.2%	0.4%	0.5%	0.6%	0.6%	0.8%	1.0%	1195%
Mexico	2.52%	2.97%	2.9%	3.0%	2.7%	3.0%	2.8%	2.7%	2.7%	2.6%	1%
United States	0.66%	0.67%	0.7%	0.8%	1.0%	1.2%	1.7%	2.2%	2.4%	2.7%	304%
Argentina	0.09%	0.08%	0.1%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.1%	-39%
France	0.15%	0.17%	0.2%	0.3%	0.5%	0.8%	1.1%	1.6%	2.2%	2.8%	1820%
Germany	2.78%	3.22%	4.3%	4.7%	5.3%	6.9%	7.2%	7.6%	8.4%	10.7%	287%
Turkey	0.12%	0.11%	0.1%	0.1%	0.1%	0.4%	0.9%	1.5%	1.8%	1.9%	1491%
United Kingdom	0.33%	0.33%	0.5%	0.7%	1.1%	1.4%	1.9%	2.3%	3.1%	4.2%	1169%
Saudi Arabia	0.00%	0.00%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0%
South Africa	0.02%	0.02%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-10%
Australia	0.19%	0.34%	0.3%	0.4%	0.7%	1.1%	1.6%	1.5%	1.8%	2.2%	1085%
India	0.45%	0.57%	0.7%	1.0%	1.2%	1.5%	1.6%	1.8%	2.1%	2.4%	422%
Indonesia	5.79%	5.62%	5.6%	5.2%	5.0%	5.0%	5.6%	6.3%	6.0%	5.7%	-1%
Japan	0.43%	0.51%	0.6%	0.6%	0.7%	0.7%	0.7%	0.8%	0.9%	1.0%	145%
China	0.05%	0.06%	0.1%	0.1%	0.1%	0.2%	0.4%	0.7%	1.1%	1.5%	2688%
South Korea	0.01%	0.01%	0.0%	0.0%	0.1%	0.1%	0.2%	0.4%	0.4%	0.9%	12775%
Russia	0.02%	0.04%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	128%
Brazil	0.02%	0.02%	0.0%	0.0%	0.1%	0.1%	0.1%	0.3%	0.4%	0.5%	2942%
Italy	2.22%	2.44%	2.5%	2.6%	2.8%	3.2%	3.4%	4.3%	5.1%	6.2%	181%
EU-27	1.36%	1.61%	2.0%	2.4%	2.8%	3.5%	4.0%	4.8%	5.5%	6.7%	389%
<b>G20</b>	<b>0.52%</b>	<b>0.57%</b>	<b>0.8%</b>	<b>0.9%</b>	<b>1.1%</b>	<b>1.3%</b>	<b>1.6%</b>	<b>2.0%</b>	<b>2.2%</b>	<b>2.6%</b>	<b>395%</b>

Source: Energy Information Administration, International Energy Statistics, available at: <http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm>.

## APPENDIX 2: CLEAN ENERGY INVESTMENTS IN THE G20 COUNTRIES: 2004–1ST QUARTER 2012

Table 4: New Clean Energy Investments in the G20 Countries: 2004 – 1st Quarter 2012 (billion \$US)										
	2004	2005	2006	2007	2008	2009	2010	2011	Q1 2012	Total 2004-Q1 2012
Argentina	0.01	0.12	0.12	0.30	0.50	0.14	0.38	0.14	0.12	1.83
Australia	0.53	1.18	1.45	1.56	0.95	1.12	2.52	1.00	0.01	10.31
Brazil	0.38	1.81	4.41	8.72	13.40	7.08	7.21	8.23	1.06	52.31
Canada	1.14	1.72	2.07	3.38	2.00	2.95	5.57	5.01	0.05	23.88
China	1.43	4.81	9.31	13.92	23.65	37.33	48.98	49.74	8.34	197.49
EU-27	10.70	19.99	30.31	49.58	52.33	42.93	41.39	38.71	4.75	290.68
France	0.51	2.13	3.87	3.68	3.60	2.11	2.29	2.26	0.39	20.84
Germany	2.03	3.86	7.32	7.95	4.24	6.02	7.02	10.57	0.35	49.35
India	2.00	2.71	3.71	5.52	4.13	3.46	6.59	10.13	1.45	39.72
Indonesia	0.06	0.18	0.12	0.43	0.12	0.41	0.16	1.01	0.24	2.74
Italy	0.82	1.94	1.10	2.58	3.95	2.88	6.66	3.96	0.38	24.28
Japan	1.46	1.39	1.44	1.04	1.61	1.33	0.55	0.54	0.06	9.41
Mexico	0.14	0.13	0.09	0.36	0.61	1.32	1.96	0.05	1.38	6.03
Russian Federation	0.00	0.00	0.14	0.07	0.48	0.10	0.00	0.00	0.00	0.79
Saudi Arabia	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.02
South Africa	0.00	0.01	0.13	0.02	0.17	0.00	0.02	0.02	0.46	0.83
South Korea	0.20	0.21	0.53	1.36	1.12	0.36	0.44	0.20	0.00	4.41
Spain	3.22	4.06	6.27	19.77	21.28	8.54	6.02	7.34	0.97	77.47
Turkey	0.00	0.07	0.29	0.57	1.09	2.03	1.09	0.28	0.15	5.57
United States	1.05	3.94	5.40	5.64	5.05	10.98	6.75	5.58	1.03	45.42
United Kingdom	4.84	10.43	28.28	32.62	36.73	20.91	30.00	44.51	6.65	214.96
<b>G20 Total</b>	<b>22.89</b>	<b>44.77</b>	<b>82.41</b>	<b>119.45</b>	<b>138.87</b>	<b>121.47</b>	<b>146.87</b>	<b>159.56</b>	<b>24.71</b>	<b>860.99</b>

## Methodology and Sources:

Data for all countries from 2002 to 2010 is based upon the Energy Information Administration's (EIA), *International Energy Statistics*—available at: <http://205.254.135.7/cfapps/ipdbproject/IEDIndex3.cfm?tid=6&pid=29&aid=12> – with the following exceptions:

- 2010 solar, wind, geothermal, tidal, and wave production data based upon NRDC calculation by taking the percentage increase of installed capacity (MW) for the period 2009 to 2010 from BP's *Statistical Review of World Energy 2011* (available at: <http://www.bp.com/sectionbodycopy.do?categoryId=7500&contentId=7068481>) applied to the amount of production (kWh) in 2009 from EIA.
- 2011 solar, wind, geothermal, tidal, and wave capacity data (MW) from Bloomberg New Energy Finance (BNEF) per source. Production data (kWh) per source based upon NRDC calculation comparing the change in capacity from 2010-2011 multiplied by the 2010 production data.
- Total electricity in 2011 based on Eurostat data (France, Germany, Turkey, United Kingdom, Italy, South Africa, EU-27); International Energy Agency (IEA) monthly reports (Canada, Mexico, Australia, Japan, South Korea); domestic energy bureaus (United States, Brazil, India, Indonesia, Russia, Argentina); demand projections (Saudi Arabia); and China Electricity Council (China).

1 See Johannesburg Plan of Implementation: [http://www.johannesburgsummit.org/html/documents/summit\\_docs/2309\\_planfinal.htm](http://www.johannesburgsummit.org/html/documents/summit_docs/2309_planfinal.htm)

2 The U.N. Secretary General has convened a high-level panel on “Sustainable Energy for All” which outlines an objective of “doubling the share of renewable energy in the global energy mix”. While it isn't clear the exact details of this commitment, this is mostly discussed in the context of: (1) all energy (i.e., including transportation in addition to electricity) and (2) a broad definition of “sustainable energy” (i.e., including large hydro and biomass energy production).

3 Energy Information Administration, *International Energy Statistics*, available at: <http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm>.

4 Ibid.

5 For the purposes of this report we included the total for the E.U. as a whole, but also show the individual values for the E.U. Member States that are also individually members of the G20; Throughout this paper we use renewable electricity from wind, solar, geothermal, tidal, and wave power. Some sources also include hydropower and biomass when reporting “renewable electricity”.

6 See Appendix 2 for data sources and methodology used for calculating these values.

7 These values are for 2010 as this is the most recent production data published for all the countries in the world. Values from: Energy Information Administration, *International Energy Statistics*, available at: <http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm>

8 See Appendix 2 for data sources and methodology used for calculating these values.

9 Bloomberg New Energy Finance, 2012. “New clean energy investments” included in this report include venture capital, private equity, public markets, and asset finance. This is slightly different than data reported in other places which includes investment in small distributed capacity (SDC) and an adjustment for re-invested equity, see for example: Pew Environment Group, 2012, *Who's Winning the Clean Energy Race?* 2011 Edition, available at: [http://www.pewenvironment.org/uploadedFiles/PEG/Publications/Report/FINAL\\_LORES\\_WhoIsWinningTheCleanEnergyRace-REPORT-2012\(1\).pdf](http://www.pewenvironment.org/uploadedFiles/PEG/Publications/Report/FINAL_LORES_WhoIsWinningTheCleanEnergyRace-REPORT-2012(1).pdf)

10 Between 2004 and 2010, gross domestic product in the G20 countries increased by around 60 percent, according to data from the World Bank, available at: <http://data.worldbank.org/indicator/NY.GDP.MKTP.CD/countries?page=1&display=default>

11 From 2004 through the first quarter of 2012 (Q1 2012).

12 The lower value is based upon assuming that the growth trend since 2002 continues at the same rate. The higher value is based upon assuming that the trend of the last 5 years continues;

13 The International Energy Agency projects that these sources will account for 6.1 to 6.8 percent with current policies.

