



Frankfurt School
FS-UNEP Collaborating Centre
for Climate & Sustainable Energy Finance



GLOBAL TRENDS IN RENEWABLE ENERGY INVESTMENT 2019



BloombergNEF

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Figure 1. Renewable energy capacity investment over the decade, 2010-2019

Renewable energy capacity investment over the decade, 2010-2019
\$bn

Solar	1349
Wind	1023
Biomass & waste	115
Small hydro	43
Biofuels	27
Geothermal	20
Marine	0.4

Footnote: Includes an estimate for 2019, based partly on provisional first-half data.

Source: UN Environment, Frankfurt School-UNEP Centre, BloombergNEF

Figure 2. Renewable energy capacity investment from 2010 to 1H 2019, top 20 countries/markets

Renewable energy capacity investment from 2010 to 1H 2019, top 20 countries/markets
\$bn

Country	
China	758
United States	356
Japan	202
Germany	179
United Kingdom	122
India	90
Italy	82
Brazil	55
Australia	47
France	45
Spain	35
Canada	33
Netherlands	25
Mexico	23
Belgium	22
Sweden	20
South Africa	20
Turkey	19
Chile	14
Denmark	14

Footnote: Includes first-half data for 2019, but not an estimate for the second half.

Source: UN Environment, Frankfurt School-UNEP Centre, BloombergNEF

Main

Figure 3. Levelized cost of electricity, by main renewable energy technology, 2009 to 2019 \$/MWh

Levelized cost of electricity, by main renewable energy technology, 2009 to 2019 \$/MWh

	H2 2009	H1 2010	H2 2010	H1 2011	H2 2011	H1 2012	H2 2012	H1 2013	H2 2013	H1 2014	H2 2014	H1 2015	H2 2015	H1 2016	H2 2016	H1 2017	H2 2017	H1 2018	H2 2018	H1 2019
Onshore wind	92.9	85.7	87.8	85.8	78.5	78.2	82.4	79.7	80.9	81.8	82.0	85.5	82.5	81.2	68.2	67.4	67.4	56.0	52.0	50.0
Offshore wind	159.8	177.0	180.3	186.7	213.7	226.8	219.1	215.4	212.3	209.8	203.1	175.7	174.1	160.8	126.2	124.0	124.0	118.0	115.0	89.0
PV	303.6	303.9	278.1	239.8	198.7	176.2	164.1	136.2	146.0	147.5	142.9	128.5	122.0	99.4	100.7	86.0	86.0	70.0	60.0	57.0

Footnote: PV is crystalline silicon with no tracking

Source: UN Environment, Frankfurt School-UNEP Centre, BloombergNEF

Figure 4. Capacity added in renewable power technologies over the decade, 2010-2019 GW

Capacity added in renewable power technologies over the decade, 2010-2019 GW

	Total
Solar PV	633
Onshore wind	458
Biomass & waste	62
Offshore wind	29
Small hydro	44
Geothermal	7
Solar thermal	5
Marine	0.4

Footnote:

Figures are estimated based on actual data to 2018, and for

Source: UN Environment, Frankfurt School-UNEP Centre, Bloomberg

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Figure 5. Renewable energy capacity added over the decade, 2019 vs 2009, by region GW

Renewable energy capacity added over the decade, 2019 vs 2009, by region
GW

China	451
Europe	267
United States	151
Other APAC	119
India	78
Other AMER	42
Middle East & Africa	42
Brazil	33

Footnote:

Figures are estimated based on actual data to 2018, and forecast additions by region falls short of the total of additions by sector. A small proportion of renewable power additions have yet to be completed.

Source:

UN Environment, Frankfurt School-UNEP Centre, BloombergNEF

Figure 6. Net capacity added in main generation technologies over the decade, 2019 vs 2009
Net capacity added in main generation technologies over the decade, 2019 vs 2009
GW

Coal	529
Gas	438
Oil	-2
Nuclear	-7
Hydro	283
Wind	487
Solar	638

Footnote: Figures are estimated based on actual data to 2018, and nuclear saw capacity closed more than offset new capacity

Source: UN Environment, Frankfurt School-UNEP Centre, Bloomberg

Figure 7. Total renewable energy investment over the decade 2010-2019, by category \$bn
Total renewable energy investment over the decade 2010-2019, by category
\$bn

Asset finance*	2065
Small distributed capacity	476
Public markets	86
Corporate R&D	51
Government R&D	50
VC/PE	32

Footnote: Asset finance adjusts for re-invested equity, VC/PE = venture capital and private equity.
Figures for 2019 are estimated based on provisional first-half totals.

Source: UN Environment, Frankfurt School-UNEP Centre, BloombergNEF

Global renewable energy capacity investment, 2004 to 2018
\$bn

	2004	2005	2006	2007	2008	2009	2010	2011
Asset finance	32.5	51.0	80.0	106.6	133.1	112.4	152.4	189.7
Small distributed capacity	8.0	10.1	9.0	13.9	22.2	34.7	60.9	75.1
Total	40.6	61.1	89.0	120.5	155.3	147.0	213.2	264.8
% Growth	-	51%	46%	35%	29%	-5%	45%	24%

Footnote: Total values include estimates for undisclosed deals

Source: UN Environment, Frankfurt School-UNEP Centre, BloombergNEF

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Figure 9. Global investment in renewable energy capacity by sector in 2018, and growth on 2017 \$bn

Global investment in renewable energy capacity by sector in 2018, and growth on 2017
\$bn

	2018	% growth on 2017
Marine	0.0	Close to zero in 2017
Small hydro	0.4	-89%
Biofuels	0.5	-64%
Geothermal	2.0	-1%
Biomass & waste	6.8	61%
Solar	133.5	-22%
Wind	129.7	3%

Footnote: Total values include estimates for undisclosed deals.

Source: UN Environment, Frankfurt School-UNEP Centre, BloombergNEF

Figure 10. Investment in renewable energy capacity by region, 2018, \$bn

Investment in renewable energy capacity by region, 2018, \$bn

	2018	% growth on 2017
China	88.5	-38%
Europe	59.9	45%
United States	42.8	-6%
ASOC (excl. China & India)	41.9	10%
Middle East & Africa	16.1	61%
India	11.0	-15%
AMER (excl. US & Brazil)	9.3	-29%
Brazil	3.4	-44%

Footnote:

Total values include estimates for undisclosed deals.

Source:

UN Environment, Frankfurt School-UNEP Centre, BloombergNEF

Figure 11. Investment in renewables capacity by top 30 country or territory in 2018, and growth on 2017 \$bn

Investment in renewables capacity by top 30 country or territory in 2018, and growth on 2017 \$bn

		% growth on 2017
China	88.5	-38%
United States	42.8	-6%
Japan	17.6	-17%
India	11.0	-15%
Australia	9.2	36%
United Kingdom	8.8	36%
Spain	7.5	859%
Germany	6.3	-52%
Vietnam	5.2	809%
Netherlands	4.9	197%
Sweden	4.5	122%
France	4.1	-8%
South Africa	4.1	3493%
Mexico	3.8	-38%
Brazil	3.4	-44%
Belgium	3.1	312%
Morocco	3.1	173%
Ukraine	2.1	539%
Turkey	2.0	-33%
Italy	2.0	92%
Argentina	1.9	15%
Russian Federation	1.9	371%
Taiwan	1.8	163%
Denmark	1.7	69%
Kenya	1.4	0 in 2017
Korea (Republic)	1.4	-37%
Chile	1.3	-38%
Norway	1.1	15%
Finland	1.0	193%
Egypt	1.0	-71%

Footnote:

Source: UN Environment, Frankfurt School-UNEP Centre, BloombergNEF

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Figure 12. Investment in renewable energy capacity, developed vs developing countries, 2004-2018

Investment in renewable energy capacity, developed vs developing countries, 2004-2018
\$bn

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Developed	32.4	43.8	65.1	85.3	103.2	94.6	144.9	186.7	142.2	118.7	141.2	134.3	134.8	114.9	125.8
Developing	8.1	17.3	23.9	35.2	52.1	52.4	68.3	78.1	96.4	94.2	123.7	167.2	145.8	194.0	147.1
Total	40.6	61.1	89.0	120.5	155.3	147.0	213.2	264.8	238.6	213.0	264.8	301.5	280.6	308.9	272.9
% Growth	-	51%	46%	35%	29%	-5%	45%	24%	-10%	-11%	24%	14%	-7%	10%	-12%

Footnote: Total values include estimates for undisclosed deals. Developed volumes are based on OECD countries excluding Mexico, Chile, and Turkey.

Source: UN Environment, Frankfurt School-UNEP Centre, BloombergNEF

Figure 13. Global capacity in renewable power, 2004-2018 GW

Global capacity in renewable power, 2004-2018
GW

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Solar	4	5	7	9	16	25	44	73	105	147	193	249	324	423	532
Wind	45	55	70	90	117	157	193	233	279	313	361	424	477	528	577
Biomass & waste	47	50	57	59	63	69	76	84	91	96	102	106	114	120	126
Other renewables	131	135	147	153	158	163	168	174	183	193	198	203	207	211	214
Total	227	245	281	311	354	414	481	564	658	749	854	982	1122	1282	1449

Footnote: "Other renewables" does not include large hydro-electric projects of more than 50MW

Source: UN Environment, Frankfurt School-UNEP Centre, BloombergNEF

Figure 14. Renewable energy capacity investment in \$bn vs GW capacity added, 2005-2018

Renewable energy capacity investment in \$bn vs GW capacity added, 2005-2018														
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
GW added	18	36	30	43	60	67	82	94	89	105	128	140	160	167
Capacity investment	61	89	121	155	147	213	266	237	212	264	302	280	310	273

Footnote:

Source: UN Environment, Frankfurt School-UNEP Centre, BloombergNEF

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Figure 15. Renewable power generation and capacity as a share of global power, 2007-2018 %

Renewable power generation and capacity as a share of global power, 2007-2018 %

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Renewable capacity change as a % of global capacity change (net)	19.5%	27.3%	41.7%	31.6%	39.8%	48.6%	38.0%	41.0%	51.3%	50.8%	63.8%	67.7%
Renewable power as a % of global power capacity	7.5%	8.2%	9.2%	10.2%	11.4%	12.4%	13.5%	14.7%	16.2%	17.6%	19.4%	21.0%
Renewable power as a % of global power generation	5.2%	5.3%	5.9%	6.1%	6.9%	7.9%	8.3%	9.0%	9.7%	10.6%	11.6%	12.9%

Footnote: Renewables figure excludes large hydro. Capacity and generation based on BloombergNEF totals.

Source: UN Environment, Frankfurt School-UNEP Centre, BloombergNEF

Figure 16. Net power generating capacity added in 2018 by main technology GW

Net power generating capacity added in 2018 by main technology
GW

Sector	GW
Coal	20
Gas	42
Nuclear	5
Large hydro	19
Other renewables	9
Solar	108
Wind	50

Footnote: The chart does not show the negative figure from net closure of oil-fired capacity in 2018

Source: UN Environment, Frankfurt School-UNEP Centre, BloombergNEF

Main

Figure 17. Global power sector emissions, billions of tonnes of CO2 equivalent, 2012-2018

Global power sector emissions, billions of tonnes of CO2 equivalent, 2012-2018

	2012	2013	2014	2015	2016	2017	2018
Coal	8.9	9.4	9.4	9.1	9.1	9.4	9.7
Gas	2.7	2.6	2.7	2.8	2.9	2.9	3.1
Oil	1.1	1.1	1.0	1.0	1.0	0.9	0.9
Total	12.7	13.1	13.1	12.9	13.0	13.2	13.7

Footnote:

Source: BloombergNEF's New Energy Outlook 2019