

# EI NEW ENERGY

S U P P L E M E N T

Vol. III, No. 43

October 23, 2014



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## EI New Energy Top 100 Green Utilities

### TOP 100 RANKINGS BASED ON CARBON EMISSIONS AND RENEWABLE ENERGY

Rank		Points	Company	Country	Capacity (GW)	Rank		Company	Country	Capacity (GW)	
2014	2013*					2014	2013*				
1	1	245	Iberdrola	Spain	45.0	51	49	63	Egyptian Electricity Holding	Egypt	28.8
2	2	217	Energias de Portugal	Portugal	22.3	52	39	63	TransAlta	Canada	8.6
3	4	213	China General Nuclear	China	18.6	53	55	60	Korea Electric Power Corp.	S. Korea	68.7
4	3	206	NextEra Energy	US	42.5	54	50	59	AES	US	29.6
5	5	166	China Guodian	China	123.7	55	58	58	Taiwan Power	Taiwan	32.0
6	6	138	Enel	Italy	98.9	56	57	58	Tokyo Electric Power Co.	Japan	65.1
7	7	134	Dong Energy	Denmark	5.8	57	59	57	Pinnacle West Capital	US	6.4
8	8	133	EDF	France	140.4	58	53	57	Taq	UAE	9.0
9	10	118	E.On	Germany	61.1	59	66	56	Southern Co.	US	45.4
10	9	117	Berkshire Hathaway Energy	US	25.7	60	60	56	Inter Rao UES	Russia	34.4
11	12	115	Exelon	US	35.1	61	NA	56	Kahramaa	Qatar	8.8
12	11	112	Statkraft	Norway	16.0	62	62	54	Chubu Electric Power Co.	Japan	33.4
13	13	105	GDF Suez	France	82.0	63	65	53	Kansai Electric Power Co.	Japan	36.0
14	28	103	SSE	UK	11.7	64	69	52	OGE Energy	US	6.8
15	16	102	Verbund	Austria	10.9	65	67	51	Tohoku Electric Power Co.	Japan	22.5
16	14	102	Cemig	Brazil	7.2	66	73	51	Tavanir	Iran	54.0
17	15	100	China Yangtze Power Co.	China	25.3	67	61	50	Tata Power	India	8.6
17	17	100	Energatom	Ukraine	13.8	68	71	50	Kyushu Electric Power Co.	Japan	22.9
17	17	100	Rosatom	Russia	25.2	69	70	49	Egat	Thailand	15.5
20	20	100	Hydro-Quebec	Canada	36.1	70	68	49	Tenaga Nasional Berhad	Malaysia	9.0
21	22	99	PG&E	US	7.7	71	64	49	Tennessee Valley Authority	US	34.3
22	24	99	BC Hydro	Canada	12.0	72	63	48	FirstEnergy	US	20.5
23	21	98	China Datang	China	115.0	73	81	48	Elektrik Uretim AS	Turkey	23.8
24	26	98	China Huaneng	China	142.2	74	72	48	J-Power	Japan	22.9
25	25	98	Alpiq	Switzerland	6.5	75	NA	46	Acwa Power	Saudi Arabia	7.8
26	29	96	Ontario Power Generation	Canada	16.2	76	74	45	DTE Energy	US	11.1
27	23	95	Fortum	Finland	15.1	77	75	44	Saudi Electricity Co.	Saudi Arabia	45.9
28	27	95	Eletrobras	Brazil	43.0	78	76	43	Hokuriku Electric Power Co.	Japan	8.1
29	47	92	China Power Investment	China	89.7	79	NA	43	Alliant Energy	US	6.3
30	35	91	RusHydro	Russia	35.5	80	80	40	Mosenergo	Russia	12.3
31	31	90	Gas Natural Fenosa	Spain	15.4	81	56	39	Hokkaido Electric Power Co.	Japan	8.4
32	37	83	Public Service Ent. Group	US	13.5	82	88	38	PPL	US	18.8
33	33	82	EuroSibEnerg	Russia	19.5	83	91	36	Dynegy	US	13.2
34	32	81	Vattenfall	Sweden	39.1	84	84	36	Shikoku Electric Power Co.	Japan	7.0
35	34	79	A2A	Italy	10.9	85	77	35	Chugoku Electric Power Co.	Japan	12.0
36	42	79	Corpoelec	Venezuela	24.0	86	79	35	Xcel Energy	US	17.0
37	38	79	Dominion Resources	US	21.7	87	83	34	Sonelgaz	Algeria	9.8
38	36	78	Calpine	US	28.1	88	85	34	American Electric Power	US	37.6
39	40	76	Entergy	US	28.1	89	86	33	Israel Electric Corp.	Israel	13.5
40	45	75	Vietnam Electricity	Vietnam	18.6	90	NA	31	Westar Energy	US	6.7
41	46	75	CEZ	Czech Rep.	15.2	91	90	31	Ameren	US	10.3
42	51	75	China Huadian	China	112.8	92	87	30	Energy Future Holdings	US	13.8
43	41	72	Energie Baden-Wuerttemberg	Germany	13.8	93	98	29	Min. of Electricity and Water	Kuwait	14.7
44	30	71	CLP Holdings	China	16.3	94	92	28	Perusahaan Listrik Negara	Indonesia	34.2
45	48	71	Tenaska	US	6.6	95	93	26	Great Plains Energy	US	6.6
46	43	70	RWE	Germany	49.0	96	95	24	CMS Energy	US	7.2
47	44	70	Duke Energy	US	62.1	97	94	16	NTPC	India	43.1
48	82	70	NRG Energy	US	53.7	98	97	12	Polska Grupa Energetyczna	Poland	12.8
49	NA	68	AGL	Australia	5.8	99	96	10	Eskom	South Africa	42.1
50	54	64	Comision Federal de Electricidad	Mexico	40.6	100	99	3	Public Power Corp.	Greece	12.9

\*Some entries from 2013 revised with additional information, resulting in changes to rankings.

## Renewables Play Leading Role in New Electric Capacity

Renewable energy technologies accounted for a staggering 80% of new electric generation added by large utilities in 2013, compared to only about 30% in 2012. While fossil fuels grew by 8 gigawatts and nuclear by a mere 3 GW, utilities commissioned or acquired some 16 GW of hydropower and 21 GW of non-hydro renewable capacity. Of the non-hydro additions, 13 GW or 60% were built by Chinese companies, compared to 4 GW each in the US and Europe and less than 1 GW in the rest of the world. These are some of the highlights of *EI New Energy's* third annual ranking of 100 of the world's top "green" utilities, measured by their emissions and renewable energy capacity. It is still led by Spain's Iberdrola and Portugal's EDP, together with four European, two Chinese and two US companies in the top 10. Companies at the bottom of the ranking own little or no renewable capacity, and tend to be located in coal-producing countries such as South Africa, Poland, India, Indonesia and the US. The 100 companies represent almost 60% of the world's power generating capacity.

Each company was awarded up to 300 points — up to 100 based on carbon dioxide emissions intensity and up to 200 based on renewable generating capacity, in absolute and relative terms. The main table lists all 100 companies with points, their rank in 2014 and 2013, and their total capacity as an indication of size. Three other tables show the top 20 performers under each criterion — their CO<sub>2</sub> emissions per megawatt hour, the size of their renewable energy capacity in GW, and the proportion of renewables in their total capacity.

New additions include Australia's AGL (ranked 49), Qatar's Kahramaa (61), Saudi Arabia's Acwa Power (75) and the US' Alliant Energy (79). Companies dropping out of the top 100 include China's National Nuclear Corp. and Power Assets, and the US' InterGen and Wisconsin Energy.

Despite policy uncertainties in their key Spanish and US markets, Iberdrola (1) and EDP (2) continue to lead the ranking as they develop renewable capacity in other regions, such as Latin America. Iberdrola also participates in the UK through its subsidiary Scottish Power, with increased emphasis on offshore wind — a segment also targeted by Denmark's Dong Energy (7) and Germany's E.ON (9). Other large European utilities such as Italy's Enel (6) and France's EDF (8) and GDF Suez (13) also perform well in the top 100, thanks to a combination of wind, hydro and nuclear capacity. The UK's SSE (14), which dropped 16 places last year due to its increased CO<sub>2</sub> emissions, has almost climbed its way back as a result of reduced output from coal-fired power stations.

While it generates almost 80% of its electricity from coal, China also performs well, as its major generating companies are investing massively in wind energy. While three of the "Big Five" — China Guodian (5), China Datang (23) and China Huaneng (24) — were already in the top 25 last year, the other two are getting closer: China Power Investment (29) advanced by 18 positions and China Huadian (42) by nine after they increased their renewable capacity by 90% and 45%, respectively. China General Nuclear (3) made it into the top three as a unique example of a company combining nuclear, hydro and non-hydro renewables without any form of fossil fuel generation.

Companies in other big coal-producing countries do not perform as well, such as Indonesia's PLN (94), India's NTPC (97), Poland's PGE (98) or South Africa's Eskom (99). Similarly, in the US, most Midwest utilities tap into the region's abundant wind resources

through purchases from independent producers, whereas their own fleet mostly relies on local coal, which puts them at the end of the ranking. Examples include Ohio's AEP (88), Kansas' Westar Energy (90), Missouri's Ameren (91) and Great Plains Energy (95), and Michigan's CMS Energy (96). By contrast, while Germany and the Czech Republic also heavily use coal, carbon-free nuclear and increasing amounts of renewables allow CEZ (41), EnBW (43) and RWE (46) to achieve reasonably high rankings.

Well-ranked US companies include Florida-based NextEra Energy (4) and Iowa-based Berkshire Hathaway Energy (10) — respectively the first- and third-largest wind operators in the US, Iberdrola being second. Illinois' Exelon (11) also owns significant wind capacity, but mostly owes its good position in the ranking to its nuclear fleet, the largest in the US. Similarly, California's PG&E (21), New Jersey's PSEG (32), Virginia's Dominion (37), Louisiana's Entergy (39) and North Carolina's Duke Energy (47) combine sizable nuclear capacity with some hydro or renewable generation, while independent generators Calpine (38) and Tenaska (45) operate high-efficiency, low-emissions gas-fired fleets. Federally owned Tennessee Valley Authority (71) ranks further down and dropped seven positions as some generation was switched back to coal after gas more than doubled while coal declined by over 20% in 2012. Conversely, NRG Energy (48) gained an impressive 34 places following the acquisition of renewable assets.

While very little renewable capacity is operating in oil- and gas-producing countries, marked differences exist in the rankings of utilities there, depending on the efficiency of thermal power stations. While Kuwait's Ministry of Electricity and Water (93) and Algeria's Sonelgaz (87) still operate a significant proportion of older steam cycle plants, modern combined-cycle gas turbines allow the United Arab Emirates' Taqa (58), Qatar's Kahramaa (61), Acwa Power (75) and Saudi Electricity Co. (77) to achieve lower emissions levels.

Venezuela's Corpoelec (36), Mexico's CFE (50), Egypt's EEHC (51) and Iran's Tavanir (66) also take advantage of substantial local hydro resources. Similarly, nuclear specialists Ukraine's Energoatom (17) and Russia's Rosatom (17) also perform well because nuclear emits no CO<sub>2</sub>. Japan, on the contrary, is now 90% dependent on fossil fuel generation — up from 65% before the Fukushima accident — with its growing, but still limited, renewable capacity mostly in the hands of independent producers, leading to low and worsening rankings for local utilities. All of them are in the second half of the ranking, from Tokyo Electric (56) to Chugoku Electric (85).

A fifth table shows the top CO<sub>2</sub>-free generators, with hydropower and nuclear assigned equal status with renewables. Nuclear and hydro specialists lead this alternative ranking. Hydro is not included as a form of renewable energy in the main ranking due to the controversial social and environmental impact of large dams.

The report also includes a summary graph showing each company as a "bubble" that is sized according to renewable capacity in gigawatts and placed according to its emissions intensity and share of renewable capacity. Firms with large bubbles in the upper right corner of the graphic rank best. This graph confirms Iberdrola, EDP, CGN and NextEra as clear winners.

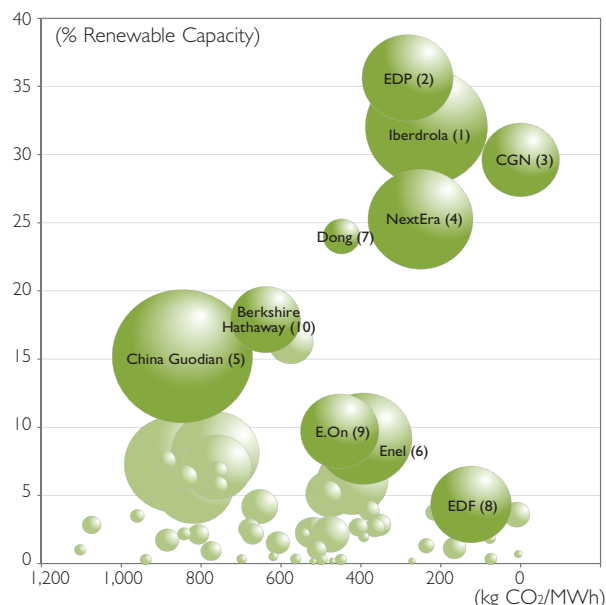
Philippe Roos, Strasbourg

## Top Utilities Ranked by Carbon Emissions

Rank	Points	Emissions (kg CO <sub>2</sub> /MWh)	Company	Country
1	100	0	China General Nuclear	China
1	100	0	China Yangtze Power Co.	China
1	100	0	Energoatom	Ukraine
1	100	0	Rosatom	Russia
5	100	1	Hydro-Quebec	Canada
6	99	6	Cemig	Brazil
7	99	8	Statkraft	Norway
8	99	13	BC Hydro	Canada
9	96	40	Ontario Power Generation	Canada
10	93	75	Eletrobras	Brazil
11	93	76	PG&E	US
12	92	92	Exelon	US
13	91	104	Verbund	Austria
14	89	123	EDF	France
15	85	162	RusHydro	Russia
16	82	195	Alpiq	Switzerland
17	82	197	EuroSibEnerg	Russia
18	82	202	Fortum	Finland
19	79	234	Corpoelec	Venezuela
20	79	235	PSEG	US

Ranking of top 20 utilities based only on emissions intensity of power generation, or the volume of carbon dioxide emitted per megawatt hour of electricity. 100 points = minimum emissions, 0 point = maximum emissions. Latest available data, usually 2013. Source: Energy Intelligence

## Top 10 Green Utilities



EI New Energy top 10 green utilities are represented in dark color, with ranking. The other 90 are in light color. Size of bubble represents volume of renewable capacity in GW. Position on the chart represents % of renewable capacity and carbon emissions intensity. Best position = top right with large bubble. Source: Energy Intelligence

## Top Utilities Ranked by Renewables Capacity (%)

Rank	Points	Renewables % of Total	Company	Country
1	100	36%	Energias de Portugal	Portugal
2	90	32	Iberdrola	Spain
3	83	30	China General Nuclear	China
4	71	25	NextEra Energy	US
5	67	24	Dong Energy	Denmark
6	50	18	Berkshire Hathaway Energy	US
7	45	16	SSE	UK
8	44	16	AGL	Australia
9	43	15	China Guodian	China
10	35	12	CLP Holdings	China
11	34	12	TransAlta	Canada
12	27	10	E.On	Germany
13	26	9	Enel	Italy
14	23	8	China Datang	China
15	23	8	China Power Investment	China
16	21	7	Alliant Energy	US
17	21	7	Gas Natural Fenosa	Spain
18	20	7	China Huaneng	China
19	20	7	RWE	Germany
20	19	7%	NRG Energy	US

Ranking of top 20 utilities based only on % share of renewable power (excluding large hydropower) in total generating capacity. 100 points = highest share of renewables; 0 points = lowest share. Latest available data, usually 2013. Source: Energy Intelligence

## Top Utilities Ranked by Renewables Capacity (Volume)

Rank	Points	Renewables (GW)	Company	Country
1	100	18.7	China Guodian	China
2	77	14.4	Iberdrola	Spain
3	57	10.7	NextEra Energy	US
4	55	10.3	China Huaneng	China
5	51	9.5	China Datang	China
6	48	9.0	Enel	Italy
7	42	7.9	Energias de Portugal	Portugal
8	39	7.2	China Power Investment	China
9	34	6.3	China Huadian	China
10	32	6.0	EDF	France
11	32	5.9	E.On	Germany
12	29	5.5	China General Nuclear	China
13	26	4.9	GDF Suez	France
14	25	4.6	Berkshire Hathaway Energy	US
15	20	3.7	NRG Energy	US
16	19	3.5	RWE	Germany
17	11	2.0	CLP Holdings	China
18	11	2.0	Vattenfall	Sweden
19	10	1.9	SSE	UK
20	9	1.7	Exelon	US

Ranking of top 20 utilities based only on volume of renewable power generating capacity (excluding large hydropower) in gigawatts. 100 points = greatest volume of renewables; 0 points = smallest volume. Latest available data, usually 2013. Source: Energy Intelligence

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## How We Rank the Top 100 Green Utilities

For this report, *EI New Energy* selected 100 of the largest power generators from around the world, based on total installed capacity, renewable capacity and the availability of information. Their capacity ranges from some 140 gigawatts for China Huaneng, now slightly bigger than France's EDF, to just under 6 GW for Denmark's Dong Energy and Australia's AGL, with non-hydro renewables ranging from China Guodian's 19 GW and Iberdrola's 14 GW to zero or just a few megawatts for about 25 companies. In all, they total almost 3,000 GW, or 57% of the world's total generating capacity, based on 2011 data from the International Energy Agency — including 84% of capacity in Japan, 70% in Europe, 60% in the Mideast and Africa, and 55% in the US. Some large utilities in terms of sales, such as New York's Con Edison, are not included, as they only supply power without generating it. Conversely, pure generators without retail activity, such as US independent producer NRG Energy, are included.

Subsidiaries of larger groups — such as Spain's Endesa, now part of Italy's Enel, or its Chilean subsidiary Enersis — are excluded to avoid double counting. Countries such as Australia are hardly represented because reforms have broken up their power sector into many smaller companies. Similarly, most utilities in the UK and the Netherlands have been taken over by foreign companies.

To evaluate their “greenness,” each utility was awarded up to 300 points based on three criteria:

- The first assesses direct greenhouse gas emissions, measured as carbon dioxide emissions per megawatt hour of electricity produced, with 100 points for the lowest emitters — such as pure hydro or nuclear generators — and zero for the highest emitter, Greece's lignite-heavy PPC. Other companies' points are based

on how they compare to the highest emitter. Nuclear energy and renewable sources — including wind, solar and hydropower — are considered to be emission free, despite some controversies. Emissions caused by generating the electricity companies may procure from independent generators are not taken into account.

- The second and third criteria measure a company's renewable energy capacity in volume and in proportion to total capacity. These criteria exclude hydropower, as large dams are controversial — they usually involve flooding large areas of land, displacing populations and drastically changing rivers' downstream water patterns. While firms without renewable generation are assigned zero points in these two categories, those with the highest capacity or proportion earn 100 points. Other companies are awarded points according to their relative performance — for example, a company with 40% of the top-ranked company's renewable capacity is assigned 40 points. Points under these two criteria are to some extent correlated, but large companies may own significant renewable capacity that only amounts to a modest share of total generation, while smaller ones may have a high proportion of renewable capacity without it being huge in gigawatt terms.

The ranking uses the latest available full-year data, usually fiscal 2013, mostly from official company sources. Since information on CO<sub>2</sub> emissions can be hard to obtain, external sources were used for about 15 companies, such as the Air Emissions Benchmarking a group of US companies and nonprofits publish annually. For another 10 companies or so, we produced our own estimates based on published or estimated fuel consumption data. Several entries from 2013 were revised with additional or corrected information, resulting in changes to rankings.

Philippe Roos, Strasbourg

### Top Green Utilities: Carbon-Free Generation Capacity (GW)

Rank	Company	Country	Nuclear	Hydro	Renewables	Total CO <sub>2</sub> -free	CO <sub>2</sub> -free /Total
1	China General Nuclear	China	11.6	1.5	5.5	18.6	100%
1	China Yangtze Power Co.	China	0.0	25.3	0.0	25.3	100
1	Energoatom	Ukraine	13.8	0.0	0.0	13.8	100
1	Rosatom	Russia	25.2	0.0	0.0	25.2	100
5	Hydro-Quebec	Canada	0.0	35.4	0.0	35.4	98
6	Cemig	Brazil	0.0	6.9	0.0	7.0	97
7	BC Hydro	Canada	0.0	10.9	0.0	10.9	91
8	Eletrobras	Brazil	2.0	36.3	0.2	38.4	89
9	Ontario Power Generation	Canada	6.6	7.0	0.0	13.6	84
10	Statkraft	Norway	0.0	12.9	0.6	13.4	84
11	PG&E	US	2.2	3.9	0.2	6.3	82
12	RusHydro	Russia	0.0	27.2	0.4	27.6	78
13	EuroSibEnerg	Russia	0.0	15.0	0.0	15.0	77
14	Verbund	Austria	0.0	7.7	0.4	8.1	74
15	EDF	France	74.8	22.0	6.0	102.7	73
16	Energias de Portugal	Portugal	0.2	7.7	7.9	15.7	71
17	Exelon	US	19.3	1.9	1.7	22.9	65
18	Corpoelec	Venezuela	0.0	14.9	0.0	14.9	62
19	Iberdrola	Spain	3.4	9.9	14.4	27.7	61
20	Alpiq	Switzerland	0.8	2.7	0.3	3.8	59%

Ranking of top 20 utilities based on CO<sub>2</sub>-free generation, including nuclear, hydropower and renewables. Other generation emits CO<sub>2</sub> and includes coal-, gas- and oil-fired capacity. Latest available data, usually 2013. Source: *Energy Intelligence*