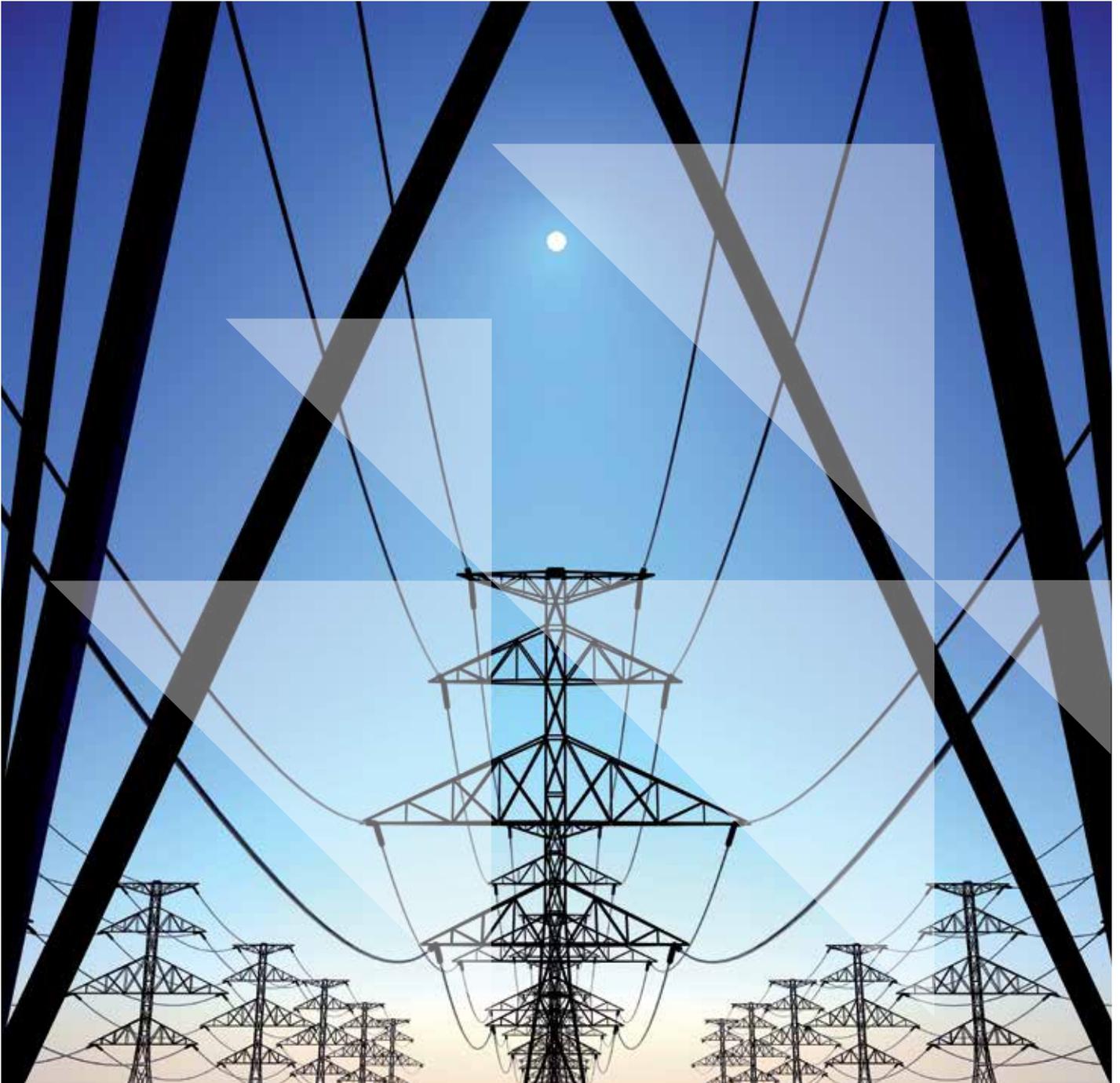

Flicking the switch

Are electric utilities prepared for a low carbon future?

May 2015



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The CDP Quarterly Sector Research series provides investors with the best and most tailored environmental data in the market. Each quarter CDP's team of analysts takes a detailed look at one high-emitting sector. The first report, *No room for passengers: are auto manufacturers reducing emissions quickly enough?*, was published in February 2015. Further sectors include: materials, metals and mining, oil and gas and consumer goods.

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Linking emissions-related metrics to earnings for European electric utilities

-  We launch our Super-League Table for European electric utilities, ranking the utilities based on a number of emissions-related metrics which in aggregate could have a material impact on company performance.
-  Leaders are: Iberdrola, Centrica and Verbund.
-  Laggards are: RWE, EnBW and SSE.

Overview

This report is the second in a series of quarterly reports covering six high-emitting sectors (transport, electric utilities, materials, metal & mining, oil & gas, and consumer goods). In February, we published our first report in the series, covering the global auto manufacturers and launching our new Super-League Table (SLT) approach. The CDP Super-League Table ranks companies in an industry grouping on a number of environmental metrics relevant to that industry, which in aggregate could have a material impact on company earnings and therefore impact investment decisions.

In this report, we launch a Super-League Table for European electric utilities. We rank those companies that responded to CDP's Climate Change questionnaire, which account for c80%¹ of electricity produced by European electric utilities, based on a number of different emissions-related metrics. When taken in aggregate, we believe these metrics could have a material impact on a company's earnings in a European electric utility market where the regulator seeks to cut greenhouse gas (GHG) emissions in the EU by 40% by 2030 (and 80% by 2050) from 1990 levels. To meet this target, more than 45% of European electricity generation would need to come from renewable energy sources (renewables) by 2030, up from 25% in 2013; and a switch from coal back to gas generation would also be required. Additionally, this would require a functional carbon market, with a carbon price significantly higher than today's price² under the EU Emissions Trading Scheme (ETS).

It would also require a market that encourages investment in technologies that support a transition to intermittent renewables, including energy storage and also (clean) power generation technologies that can rapidly adjust

output when there is a drop in supply from renewables. In recent years, coal-fired generation has been replacing cleaner gas generation due to the continued low carbon price under the EU ETS and increased spreads between gas and coal commodity prices.

We highlight those companies that are best positioned to benefit from regulatory change and those that will struggle without adapting their existing business models. In addition, we calculate the carbon cost exposure of the utilities and the impact on earnings under different carbon price scenarios.

Scope of report: emissions

Our SLT focuses on four key areas:

-  **Carbon risk:** we assess the carbon emissions exposure of the utilities in our study and the impact on earnings under different carbon price scenarios.
-  **Renewable energy sources (renewables):** we assess the renewables portfolios for the utilities in our study, including the attractiveness of the markets they are each exposed to.
-  **Coal exposure:** coal and lignite are the power generation technology with the highest emissions intensity. As the carbon price increases, so does the risk of these assets becoming stranded. We assess the utilities' exposure to these generation sources.
-  **Water risk:** worsening water security may constrain the growth of water-intensive electric utilities both directly and indirectly via the supply chain. We assess utilities' exposure to water risk and how they react to mitigate these risk.

Most of the emissions-related metrics in this report consider both scope 1 and 2 emissions³; however, we note that on average scope 1 emissions account for more than 95% of total emissions (scope 1 and 2) for the utilities in our study.

Scope of report: why Europe?

Our report covers European electric utilities, as European companies provide the most comprehensive responses to CDP's 2014 questionnaire. By market cap, 85% of European electric utilities responded to our questionnaire, compared to 45% of US electric utilities and 25% of electric utilities outside of Europe and the US. The current lack of responses outside of Europe makes these datasets less useful.

On average, the European utilities in our study produce 75% of their electricity in Europe, including 50% in their domestic market. The remaining electricity production is split between LatAm (10%), Russia (6%), US (4%) and

rest of the world (5%). In this report, our SLT covers the global assets of the European electric utilities. However, we assess the carbon exposure and impact on earnings based only on the utilities' European assets, as the EU is one of only a few regions with a carbon trading market.

Condensed summary of the Super-League Table (SLT) for European electric utilities

SLT Rank	Company	Country	Overall SLT score	Market share in 2013 (i)	Carbon risk grade	Renewables grade	Coal exposure grade	Water risk grade	CDP performance band (2014)
1	Iberdrola	Spain	2.15	4.7%	A	A	B	A	A
2	Centrica	UK	2.55	0.8%	A	C	A	B	A
3	Verbund	Austria	4.02	1.2%	A	D	A	n/a	A
4	Enel	Italy	5.50	9.9%	B	B	C	B	B
5	EDP	Portugal	5.75	2.1%	C	A	C	B	B
6	EDF	France	5.95	24.7%	B	D	B	C	B
7	Fortum	Finland	6.75	2.3%	B	E	B	E	B
8	GDF Suez	France	7.30	11.7%	C	C	C	C	A-
9	E.ON	Germany	8.25	8.5%	C	B	D	D	B
10	Endesa	Spain	9.15	4.6%	D	E	C	C	A
11	SSE	UK	9.90	1.3%	D	B	E	E	A
12	EnBW	Germany	10.40	2.0%	E	C	D	n/a	A
13	RWE	Germany	11.60	7.5%	E	D	E	D	A
14	CEZ	Czech Republic	n/a	2.3%					
14	Public Power Corp	Greece	n/a	1.3%					
14	PGE (ii)	Poland	n/a	1.9%					
Responders:				81.1%					
Total:				86.6%					
Weighting in determining overall SLT score:					50%	20%	15%	10%	5%

Notes:

(i) In terms of global electricity generation for European utilities (GWh).

(ii) Polska Grupa Energetyczna

Source: CDP

1 Derived from Bloomberg data, comprising the 37 largest European utilities, which generated 2,900 TWh of electricity in 2013. Modelled for the utilities in our study based on CDP data and company data

2 Average carbon price to date in 2015 = EUR7.0

3 Scope 1 emissions include GHG emissions from fossil fuels burned on site, electricity transmission and distribution (T&D) losses from owned T&D systems, and SF6 used for insulation and current interruption in T&D equipment. Scope 2 emissions include indirect emissions from purchased electricity for on-site consumption.

Leaders and laggards

10 of the top 12 European electric utilities⁴ responded to CDP's 2014 questionnaire. In total, our study comprises 13 European electric utilities, which account for c80%⁵ of electricity produced by European electric utilities and together represent EUR350 billion (US\$380 billion) in market cap. The highlights of our analysis are as follows (see condensed SLT below);

- ▶ The largest non-responders to CDP's 2014 questionnaire were: CEZ, the largest utility and biggest public company in Central and Eastern Europe, Polska Grupa Energetyczna (PGE), the largest power producer in Poland with significant exposure to coal and lignite generation sources, and Public Power Corp SA, the largest electric utility in Greece. These companies came bottom of our SLT.
- ▶ The SLT gives some clear results. Iberdrola is ranked top place (with an overall SLT score of 2.15). It is significantly ahead of the nearest major electric utility, Enel, which is ranked fourth (overall SLT score of 5.50). Iberdrola is the only utility to achieve A and B grades in all areas of our analysis. It is a world leader in renewables (26% of production in 2013) and has one of the lowest exposures to coal (9% of production in 2013). It has been reducing both gas and coal production over the last few years and replacing it with renewables.
- ▶ The two smallest utilities by electricity production, Centrica and Verbund, are ranked second and third. They are both leaders in emissions intensity and have the lowest coal exposure (Centrica has no coal assets, and Verbund has 7%). In both cases their intensity is low due to zero-emission assets other than wind, solar, biomass and geothermal. Centrica produced 48% of its electricity in 2013 from nuclear and 48% from relatively low-emission Combined Cycle Gas Turbines (CCGT). Verbund produced 87% from hydro⁶.
- ▶ Enel is ranked fourth, just ahead (based on overall SLT score) of EDP and EDF, which are ranked fifth and sixth. Along with Iberdrola, EDP is a world leader in renewables. However, unlike Iberdrola, EDP has been replacing its reduced gas production (47% pa over 2010-13) with increased coal production (18% pa over 2010-13) (as well as some renewables production). This caused an increase in EDP's emissions intensity over 2010-13 and costs it a top three rank. Enel also performed well in our renewables metrics.
- ▶ GDF Suez is ranked eighth, not far from its French utility peer, EDF (ranked sixth). EDF and GDF Suez are the two largest European utilities with a 25% and 12% share respectively of all power generated by European utilities. GDF was consistently average, achieving a C-grade across all areas in our study.
- ▶ Although EDF is the largest coal plant owner in our study (with 24GW of capacity), it has been running its portfolio of coal plants at a significantly lower capacity than some of its peers, leaving its coal exposure relatively low at 8% by production.
- ▶ EDF has one of the lowest emissions intensities (due to its 74% nuclear production in 2013) but only achieves a B-grade in our carbon risk analysis. This costs EDF a higher position in the SLT, and is because our carbon cover metric, which has the highest weighting in the SLT⁷, is based purely on emissions falling within the EU ETS; and EDF has one of the highest exposures to the EU at 95% (by production) compared to a sector average of 75%.
- ▶ The three German utilities are all in the bottom five. RWE, E.ON and EnBW all have a high exposure to coal and therefore carbon cost exposure. Even at a very low carbon price of EUR4.35 in 2013, RWE's carbon cost was EUR680m. This equates to 10% of its remove EBIT⁸ in 2013.
- ▶ We note that E.ON is expected to spin off its fossil fuel and nuclear generation business in 2016 and focus on renewables. This will create a successor company keeping the E.ON brand, which will focus on renewables, electricity distribution networks and services for customers. The spin-off company will combine conventional generation, global energy trading and exploration and production. RWE has indicated that it has no plans to pursue the same strategy.

Impact of carbon exposure on EBIT

- ▶ Sandbag, the coal divestment lobbying NGO, considers a carbon price of EUR18 necessary for: a large-scale switch from coal back to gas production⁹. At this carbon price, the bottom three utilities in our SLT would all have 18% or more of their EBITs at risk. RWE would have the highest exposure, with 43% of EBIT at risk (see table next page).

4 By global electricity production (GWh), data sourced from Bloomberg.

5 Derived from Bloomberg data, comprising the 37 largest European utilities, which generated 2,900 TWh of electricity in 2013.

6 Hydro received a lower weighting than other renewables in our renewables grade as there is significantly less opportunity for growth in hydro capacity and hence for reducing exposure to fossil fuels and carbon risk.

7 The carbon cover metric carried a 50% weighting in the carbon risk analysis (and therefore a 25% weighting in the overall SLT score).

8 EBIT is adjusted for exceptional/non-recurring items and the carbon cost.

9 Based on a EUR16/MWh gas price – with a USD75/tonne coal price and EUR6/tonne carbon price.

Scenario analysis for carbon cost exposure and impact on earnings

Company	Adjusted EBIT 2013 (i)	Adjusted EBIT margin 2013 (i)	Carbon cost at EUR4.35			Carbon cost at EUR18		
			Carbon cost (EURm)	Carbon cover (ii)	Carbon cost as % EBIT (i) (ii)	Carbon cost (EURm)	Carbon cover (ii)	Carbon cost as % EBIT (i) (ii)
RWE	6,561	13%	680	9.6	10%	2,815	2.3	43%
EnBW	1,432	7%	96	14.9	7%	397	3.6	28%
E.ON	5,946	5%	265	22.4	4%	1,098	5.4	18%
SSE	2,059	6%	87	23.6	4%	361	5.7	18%
Endesa	4,436	14%	134	33.0	3%	556	8.0	13%
EDP	2,200	14%	57	38.7	3%	235	9.4	11%
EDF	9,668	13%	245	39.5	3%	1,013	9.5	10%
GDF Suez	8,028	9%	200	40.1	2%	828	9.7	10%
Enel	11,891	15%	289	41.1	2%	1,198	9.9	10%
Iberdrola	4,345	13%	66	65.6	2%	274	15.8	6%
Verbund	943	29%	11	82.1	1%	48	19.9	5%
Fortum	1,620	27%	13	124.1	1%	54	30.0	3%
Centrica	2,977	10%	11	260.2	0%	47	62.9	2%

(i) We have adjusted EBIT for exceptional/non-recurring items and the 2013 carbon cost (at EUR 4.35)
(ii) Carbon cover is number of times the company can pay its carbon cost through EBIT

Source: CDP data, company data

Linking our findings to investment choices

We recognise that investment decision are based on a multitude of different factors and that some of these factors can be misaligned with emissions reduction.

Our SLT rankings are not intended as definitive winners and losers for investment purposes; however, it is more a proxy for business-readiness in an industry where a significantly higher carbon price is required to meet stringent long-term emissions-reduction targets.

We would flag that companies towards the bottom of our SLT are possibly higher risk investments than those towards the top.

Methodology

We score each electric utility based on a number of different metrics which are first ranked and then graded A to E. A is the best grade and E is the worst. The metrics can be categorised into four key areas:

1) Carbon risk: we analyse carbon risk for the utilities based on their global assets (on average the utilities generate 75% of their electricity in Europe).

We use metrics based on carbon intensity and assess emissions-reduction targets set by the utilities against science-based targets¹⁰. We estimate the carbon exposure and impact on earnings for each utility based on its European assets.

2) Renewable energy sources: we assess utilities' renewables generation portfolio based on their generation from hydro and other renewables in 2013 and the changes in installed capacity over 2010-2013. In order to assess how well utilities capture the opportunity of renewables in various markets, we compare their growth rate of renewables production with that of their domestic markets, and assess the attractiveness of the markets they are exposed to.

3) Coal exposure: we perform a detailed review of the generation portfolio of coal and lignite of each utility. We consider the production from coal and lignite in 2013, the reduction of installed capacity over 2010-2013, and the percentage of subcritical coal plant (i.e. the least efficient and the most carbon intensive coal-fired power

generation) in utilities' coal fleet. In view of the clear regulatory drive to clean up coal and ultimately eliminate coal from power generation, this metric allows us to assess the coal risk facing each utility.

4) Water risk: we evaluate water risk facing utilities based on their water strategy, supply chain management, risks and opportunities, water use intensity and targets and goals¹¹.

Each of the above focus areas has a separate chapter within this report and the precise methodology for how we rank and grade each metric is outlined in the relevant chapter.

In addition to the four key areas, we also include CDP's annual climate performance band for 2014 in the SLT. It scores the 1,749 companies that respond to CDP's main questionnaire based on their climate change readiness. A high score can infer a well-run business with a forward looking management team, not just focused on the short term.

The table (next page) summarises the key areas of the SLT and the weightings we have assigned to each area, according to our sense of potential impact on company performance. In determining the overall SLT score, we apply these weightings to the ranks achieved by the companies in each area.

A summary of key areas, associated metrics and relative weighting within the Super-League Table

Area in super-league table	Link to company earnings	Metrics	Weighting
Carbon risk	Exposure to carbon is directly linked to cost of meeting regulatory demands.	i) Carbon cover ii) Emissions intensity (in 2013) iii) Reduction in emissions intensity (over 2010-13) iv) Progress towards emissions reduction targets	50%
Renewable energy sources	Assessment of utilities' renewables portfolio to capture the opportunity of renewables.	i) Production from renewables ii) Change in installed capacity from renewables (over 2010-13) iii) Change in installed capacity of renewables versus domestic market iv) Attractiveness of renewables markets	20%
Coal exposure	Exposure to coal, especially inefficient coal, and the risk of stranded coal assets.	i) Production from coal (in 2013) ii) Reduction in installed capacity from coal (over 2010-13) iii) Percentage of subcritical coal plants by production and by capacity	15%
Water risk	Potential physical risks may constrain the growth of the power generation business.	i) Water assessment ii) Supply chain management iii) Water risk and opportunity iv) Water accounting v) Targets and goals	10%
CDP performance band	A good annual CDP score is a proxy for a generally well-run company. Well-run companies are better placed to succeed in a changing marketplace.	i) CDP annual performance band	5%

For further study

Interesting areas for further investigation include:

Utilities based in other geographies, including the US, LatAm and China

The impact of electric vehicles and decentralised power generation on the traditional utility business model

Advanced modelling on carbon pricing scenarios. As the carbon price moves higher, the economics of gas improves relative to coal. At a certain price level, utilities which own both these power generation sources would start to switch from coal back to gas, lowering their emissions intensity; thus the utilities' carbon cost exposure would increase at a slower rate than the carbon price and in a non-linear fashion.

Utilities' participation in research, development and deployment of digital grid technology

10 Target setting methodology in line with a 2 degree decarbonization scenario

11 Verbund and EnBW were not targeted by CDP's water questionnaire in 2014 so they are not assessed in the water risk metrics. We calibrate the percentage of the other three key areas in order to have a fair assessment.

Carbon risk

-  Iberdrola has the highest ranking of the major electric utilities, helped by its leading position and continued growth in renewables.
-  A carbon cost of EUR18 could wipe out 18% of EBIT for E.ON and SSE, 28% for EnBW, and 43% for RWE¹².
-  RWE has by far the greatest carbon cost exposure. Its carbon cost was EUR680m in 2013, equating to 10% of its adjusted EBIT¹².

Overview

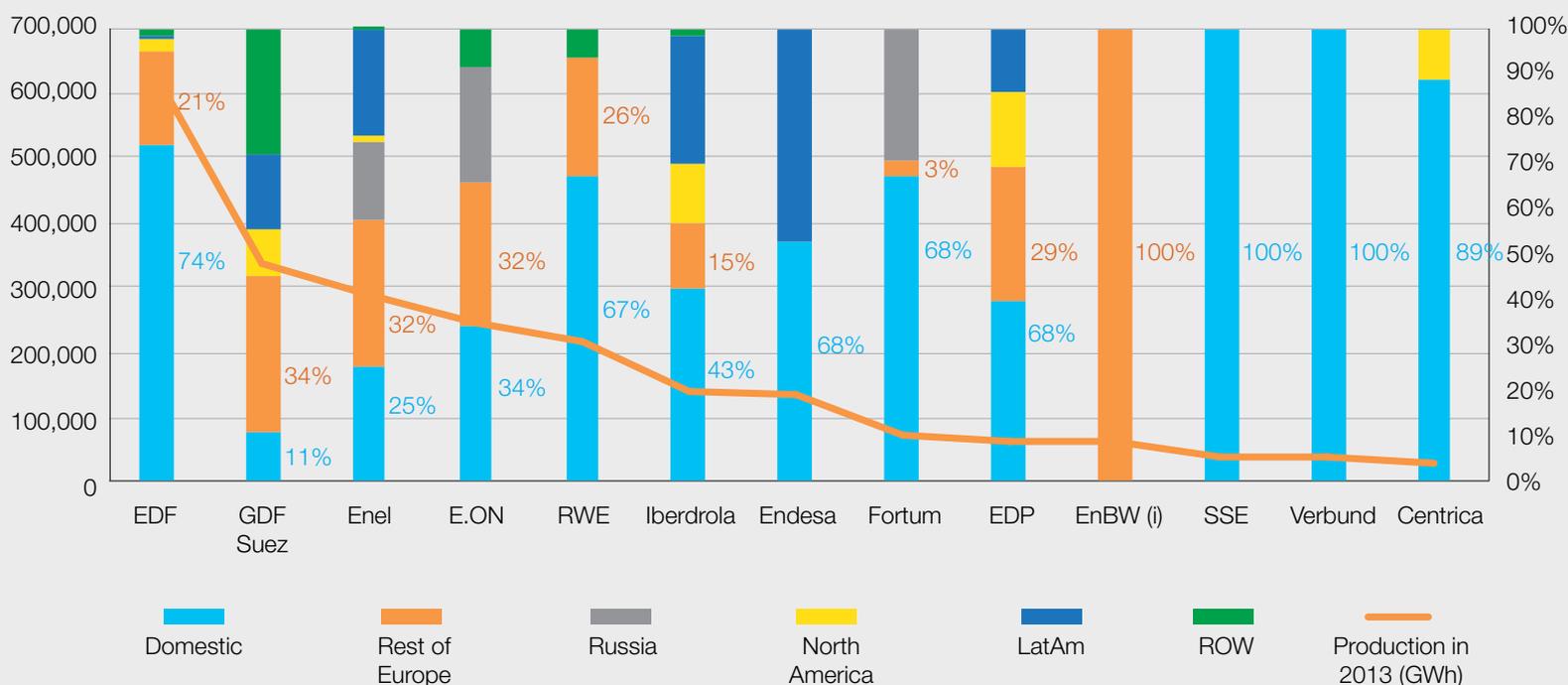
Europe is one of a number of regions that has carbon regulation for certain industries (see table next page). Only a few of these regions, however, have a functioning carbon market. The EU is one of them. All utilities in our study are affected by phase III of the EU ETS, which commenced in 2013. Under this phase, the power generation sector no longer receives free carbon emission allowances, instead the allowances must be purchased through auction; thus the amount of carbon emitted (in Europe) by the utilities has an increased impact on companies' earnings. On average, the utilities produce 75% of their electricity in Europe, including 50% in their domestic markets. The remaining electricity production is split between LatAm (10%), Russia (6%), US (4%) and the rest of the world (5%).

In this chapter, we assess the carbon risk exposure and impact on earnings for the utilities' European assets, under a number of pricing scenarios. We rank the utilities' exposure using a carbon cover metric. In addition, we assess the global assets of the utilities through a number of other metrics based on carbon intensity. The key metrics are:

-  **Metric 1): Carbon cover:** this is the most important metric in our study. It assesses to what extent the utilities can cover their carbon cost exposure with EBIT. We focus on EU carbon exposure as the EU is one of only a few carbon trading markets globally. The utilities in our study have on average 75% exposure to the EU market by production.
-  **Metric 2): Emissions intensity:** this metric identifies the companies that have the lowest sales-adjusted emissions. We use emissions intensity instead of absolute emissions in order not to penalise a company that grows faster than others.
-  **Metric 3): Reduction in emissions intensity:** this metric identifies the companies that have reduced their emissions intensity by the most over the past few years. Since cumulative carbon emissions matter from a global warming perspective, instead of using a compound annual growth rate (CAGR) calculation, which only looks at the first and last year's data, we apply a formula that takes account of the emissions intensity of the utilities over each of the years 2010-13.
-  **Metric 4): emissions targets:** this is a forward-looking metric. All the utilities set at least one emissions target. We assess firstly whether the target is meaningful and aligned with science-based methodology and secondly if the company is on track to meet the target(s). We adopt the yet-to-be published methodology of the CDP technical team and its collaboration partners, previewing their science-based targets pathways model (please see methodology section and also footnote 14). The full findings of this collaboration will be published in May for 90 companies across a number of high-emitting sectors.

¹² We adjust EBIT for exceptional/non-recurring items and the carbon cost.

Electricity production (GWh) (LHS); % split by geography (RHS)



Notes: (i) Split not provided for domestic market (Germany) and other European markets
 Source: CDP data, company data

Existing emissions trading schemes

Scheme name	Country/region	Start year	Sectors
EU ETS	EU	2005	Industry, Aviation, Power
Alberta SGER	Canada	2007	Industry, Power
Swiss ETS	Switzerland	2008	Power, Building
New Zealand ETS	New Zealand	2008	Industry, Forestry, Transport, Waste
RGGI	US	2009	Power
Tokyo CaT	Japan	2010	Building
Kyoto ETS	Japan	2011	Industry, Transport
Saitama ETS	Japan	2011	Building
Australia CPM	Australia	2012	Industry, Transport Waste
California CaT	US	2012	Industry, Power
Kazakhstan ETS	Kazakhstan	2013	Industry, Transport, Power, Agriculture
Guangdong Pilot ETS	China	2013	Industry, Power
Shanghai Pilot ETS	China	2013	Industry, Aviation, Transport, Buildings
Tianjin Pilot ETS	China	2013	Industry, Power, Building
Beijing Pilot ETS	China	2013	Industry, Power, Building
Shenzhen Pilot ETS	China	2013	Industry, Power, Building
Quebec CaT	Canada	2013	Industry, Power
Chongqing Pilot ETS	China	2014	Power
Hubei Pilot ETS	China	2014	Industry, Power
Korea ETS	Korea	2015	Industry, Power

Source: The State and Trends of Carbon Pricing 2014 report (World Bank, 2014)

Highlights

- ▀ Iberdrola is ranked second for carbon risk but is the highest ranking of the major electric utilities. It scores consistently well across all four emissions intensity-related metrics, helped by its leading position in renewables and continued growth in that division.
- ▀ Centrica ranks top in carbon risk. A carbon cost increase (below a certain level, see discussion below), would have the lowest impact on Centrica's earnings. This is due to its low carbon intensity as a result of electricity production from 48% nuclear and 48% gas. However, we note that low gas prices have caused Centrica's CCGT business to be loss-making in 2013, and so appreciate that there is a trade-off between a lower carbon cost and lower revenues from gas based on current gas and coal price economics.
- ▀ Verbund is ranked third. It has the lowest exposure to fossil fuel generation (just 11% of total production) as it generates nearly all its electricity from hydro (87% of production). It would have ranked higher but its reduction in emissions intensity for renewables was ranked relatively low (eighth place). This is a function of a mature hydro market and the fact that Verbund's emissions intensity is already very low. An increase in other renewables would be a potential source of further emissions reductions.
- ▀ EDF has the second-lowest carbon intensity due to its low exposure to fossil fuels (15% of total production). Nearly three-quarters of EDF's production is nuclear, with the final 10% from renewables and hydro. However, its overall carbon risk grade was pushed down due to its higher exposure to the EU ETS compared to some of its more geographically diversified and multi-utility competitors (thus it ranked seventh for the carbon cover metric). EDF has 95% exposure to the EU compared to an average of 75% for the utilities in our study.
- ▀ Despite having the third-highest carbon intensity (and therefore ranking third-from bottom for this metric), GDF Suez is ranked sixth for our carbon cover metric. It has the highest proportion of its electricity production outside the EU and so earnings from this, combined with additional earnings from its gas business, help to increase its carbon cover.
- ▀ RWE has by far the greatest carbon cost exposure. In 2013, it generated 80% of its electricity from fossil fuels, more than three-quarters of which was coal (it has the largest coal exposure of the utilities in our study – see coal exposure chapter). A EUR1 increase in carbon price equates to a EUR156m increase in carbon cost for RWE, based on 2013 numbers. Its carbon cost was EUR680m in 2013, equating to 10% of its adjusted EBIT; this is based on 2013 carbon prices (which averaged EUR4.35), and compares to a EUR7 carbon price so far in 2015.
- ▀ The performance of a number of utilities, including EDP, Endesa, EnBW, SSE and GDF Suez, was impacted by favourable economics of coal compared to gas (due to a low carbon price and a relatively low coal commodity price). In particular, EDP ranks bottom in emissions intensity reductions from 2010-2013. This can be attributed to its increase in production from coal (18% CAGR) and decrease in gas (-46.9% CAGR)¹³.

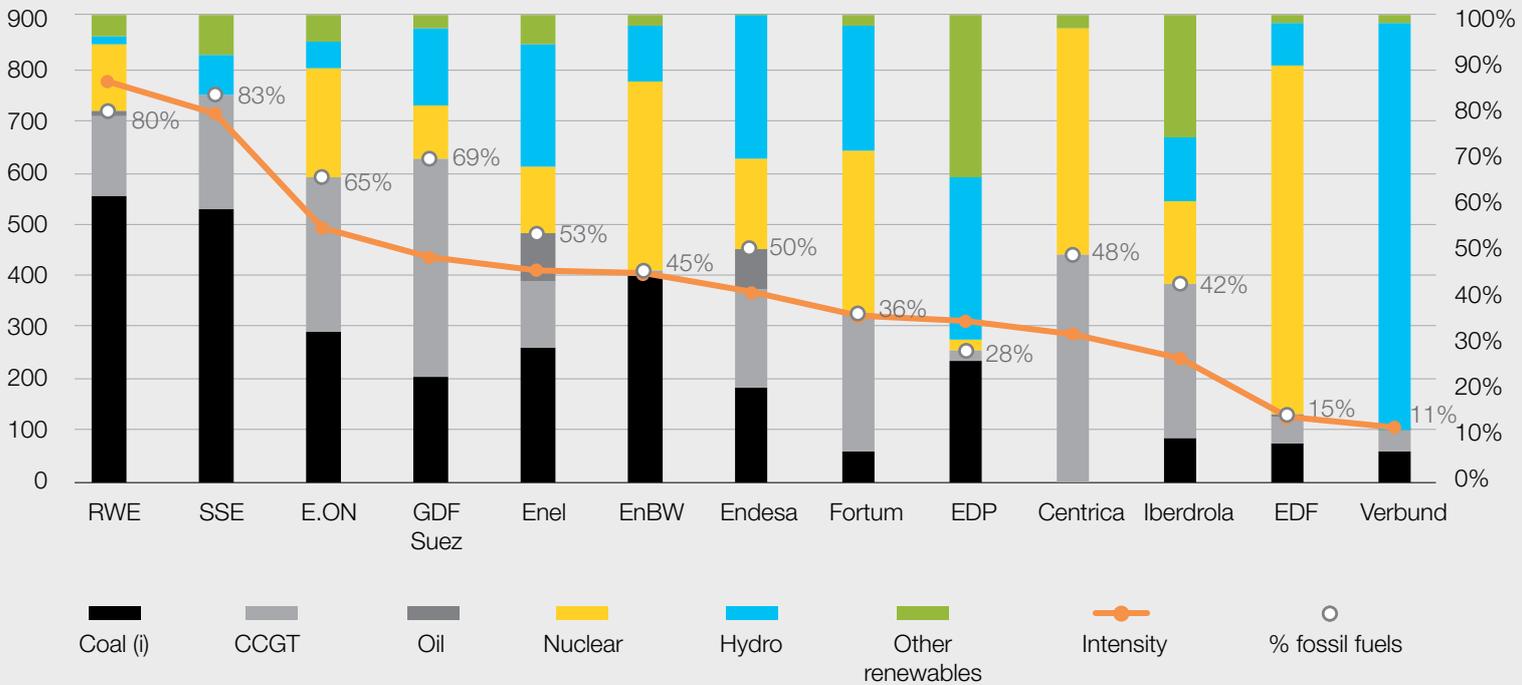
Summary of metrics used to determine the Carbon Risk Grade

Company	Carbon cover	Emissions intensity in 2013	Reduction in emissions intensity over 2010-2013	Progress towards emissions reduction targets	Overall weighted rank	Carbon risk rank	Carbon Risk grade
Centrica	1	4	1	2	1.8	1	A
Iberdrola	4	3	3	1	3.1	2	A
Verbund	3	1	8	4	3.3	3	A
Fortum	2	6	2	9	4.2	4	B
EDF	7	2	5	3	5.0	5	B
Enel	5	9	6	6	6.1	6	B
EDP	8	5	12	5	7.2	7	C
GDF Suez	6	11	9	13	8.7	8	C
E.ON	11	10	4	6	9.1	9	C
Endesa	9	7	12	12	9.5	10	D
SSE	10	12	10	8	10.0	11	D
EnBW	12	8	11	11	10.9	12	E
RWE	13	13	7	10	11.8	13	E

Weighting:	50%	20%	10%	20%
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Source: CDP

¹³ Coal-fired generation emits more than twice as much carbon per unit of energy output than gas-fired generation.

% Production by resource types (RHS) and emission intensity (tCO₂/MWh) (LHS)

(i) includes lignite

Source: CDP data, company data

Metric 1) Carbon cover

Company	EU production % global (MWh)	2013 emissions under ETS	2013 free allowances	2013 Carbon deficit	EU intensity (t CO ₂ /MWh)	Cost of EUR 1 rise in carbon price	Adjusted EBIT 2013 (i)	Adjusted EBIT margin 2013 (i)	Carbon cover for EUR1 carbon price: Europe only (ii)	Rank
Centrica	89%	3,409,219	779,450	2,629,769	154	3	2,977	10%	1,132	1
Fortum	71%	6,000,000	3,000,000	3,000,000	123	3	1,620	27%	540	2
Verbund	100%	2,776,635	136,205	2,640,430	78	3	943	29%	357	3
Iberdrola	57%	15,273,000	41,684	15,231,316	196	15	4,345	13%	285	4
Enel	58%	66,550,000	-	66,550,000	403	67	11,891	15%	179	5
GDF Suez	30%	51,000,000	5,000,000	46,000,000	501	46	8,028	9%	175	6
EDF	95%	66,268,000	10,000,000	56,268,000	109	56	9,668	13%	172	7
EDP	69%	16,600,000	3,530,000	13,070,000	393	13	2,200	14%	168	8
Endesa	53%	30,906,000	-	30,906,000	438	31	4,436	14%	144	9
SSE	100%	20,156,578	107,514	20,049,064	552	20	2,059	6%	103	10
E.ON	66%	79,000,000	18,000,000	61,000,000	487	61	5,946	5%	97	11
EnBW	100%	22,700,000	657,520	22,042,480	388	22	1,432	7%	65	12
RWE	90%	163,800,000	7,400,000	156,400,000	835	156	6,561	13%	42	13

Notes:

(i) We have adjusted EBIT for exceptional/non-recurring items and the 2013 carbon cost (at EUR 4.35)

(ii) Carbon cover is number of times the company can pay its carbon cost through EBIT

Source: CDP data, company data

Metric 2) Emissions intensity in 2013 (tonne CO₂ per normalization factor)

Company	Normalized by revenue (USDm)	Rank	Normalized by production (MWh)	Rank	Weighted rank	Overall rank
Verbund	891	7	106	1	2.2	1
EDF	857	5	129	2	2.6	2
Iberdrola	744	3	241	3	3	3
Centrica	172	1	288	4	3.4	4
EDP	888	6	312	5	5.2	5
Fortum	3,122	13	320	6	7.4	6
Endesa	1,707	11	368	7	7.8	7
EnBW	973	8	404	8	8	8
Enel	1,102	9	407	9	9	9
E.ON	759	4	492	11	9.6	10
GDF Suez	1,265	10	436	10	10	11
SSE	580	2	708	12	10	12
RWE	2,530	12	772	13	12.8	13

Weighting:	20%	80%
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Source: CDP data, company data

Metric 3) Reduction in emissions intensity

Company	Normalized by revenue (USDm)	Rank	Normalized by production (MWh)	Rank	Weighted rank	Overall rank
Centrica	-28.6%	1	-10.1%	1	1.0	1
Fortum	-28.0%	2	-7.9%	2	2.0	2
Iberdrola	-24.9%	3	-3.2%	3	3.0	3
E.ON	-18.6%	4	1.8%	5	4.8	4
EDF	-13.8%	8	-2.0%	4	4.8	5
Enel	-15.2%	7	2.4%	6	6.2	6
RWE	-16.6%	5	2.7%	8	7.4	7
Verbund	-13.1%	10	2.5%	7	7.6	8
GDF Suez	-8.4%	11	5.7%	9	9.4	9
SSE	-16.2%	6	8.2%	11	10.0	10
EnBW	-7.3%	12	6.8%	10	10.4	11
Endesa	-13.7%	9	11.7%	13	12.2	12
EDP	-3.9%	13	10.7%	12	12.2	12

Weighting:	20%	80%
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Source: CDP data, company data

Metric 4) Emissions targets

Company	Meaningful target rank	On/off track to meet own targets	Weighted rank	Overall rank
Iberdrola	5.0	2.0	3.5	1
Centrica	8.0	1.0	4.5	2
EDF	9.0	3.3	6.1	3
Verbund	1.5	11.0	6.3	4
EDP	1.8	11.0	6.4	5
E.ON	6.3	7.0	6.6	6
Enel	9.5	3.8	6.6	6
SSE	2.8	11.3	7.0	8
Fortum	4.0	10.3	7.1	9
RWE	7.8	6.8	7.3	10
EnBW	13.0	5.3	9.1	11
Endesa	10.5	8.5	9.5	12
GDF Suez	12.0	10.0	11.0	13

Weighting:	50%	50%
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Source: CDP data, company data

Scenario analysis: carbon risk exposure and impact on earnings

We assess the carbon risk exposure and impact on earnings for the utilities' European assets, under a number of pricing scenarios.

- ▼ **2013:** we adopt the average carbon price for 2013 of EUR4.35
- ▼ **Scenario 1):** we use a carbon price of EUR18. This is considered by Sandbag, an NGO which lobbies for coal divestment, as a price needed for a large-scale switch from coal back to gas production (based on a EUR16/MWh gas price – with a USD75/tonne coal price and EUR6/tonne carbon price).
- ▼ **Scenario 2):** we use a carbon price of EUR30. This is cited by the EU electricity association as a carbon price that needs to be reached by 2020 in order to have any chance of achieving the EU's 2030 target of 45% of electricity generated from renewables. Eurelectric states that the continued low carbon price under the existing EU ETS is rendering the EU uninvestable from a power generation perspective.

In our analysis, we assume a constant emissions intensity (at 2013 levels). We appreciate that as the carbon price moves higher, the economics of gas improves relative to coal. At a certain price level (say

EUR18, according to Sandbag), utilities which own both of these power generation sources would start to switch from coal back to gas, lowering their emissions intensity; thus the utilities' carbon cost exposure would increase at a slower rate than the carbon price and in a non-linear fashion. We do not take this into account in our analysis and highlight this as a possible limitation, in particular, at a carbon price of EUR30. We use 2013 EBIT in our analysis.

- ▼ Three of the four companies with highest carbon cost exposure are German. RWE has the highest exposure with 43% of EBIT at risk at a carbon price of EUR18. EnBW and E.ON have potential exposure of 28% and 18% of EBIT respectively. We note that E.ON is expected to spin off its fossil fuel and nuclear generation business in 2016 and focus on renewables. This will create a successor company keeping the E.ON brand, which will focus on renewables, electricity distribution networks and services for customers. The spin-off company will combine conventional generation, global energy trading and exploration and production. RWE has indicated that it has no plans to pursue the same strategy.
- ▼ SSE also has cost exposure equating to 18% of EBIT. We note that it has one of the lowest EBIT margins (6% adjusted) and produces 100% of its electricity in the EU.

Scenario analysis for carbon cost exposure and impact on earnings

Company	2013 (carbon cost of EUR4.35)			Scenario 1 (carbon cost of EUR18)			Scenario 2 (carbon cost of EUR30)		
	Carbon cost (EURm)	Carbon cover (i),(ii)	Carbon cost as % EBIT (i),(ii)	Carbon cost (EURm)	Carbon cover (i),(ii)	Carbon cost as % EBIT (i),(ii)	Carbon cost (EURm)	Carbon cover (i),(ii)	Carbon cost as % EBIT (i),(ii)
RWE	680	9.6	10%	2,815	2.3	43%	4,692	1.4	72%
EnBW	96	14.9	7%	397	3.6	28%	661	2.2	46%
E.ON	265	22.4	4%	1,098	5.4	18%	1,830	3.2	31%
SSE	87	23.6	4%	361	5.7	18%	601	3.4	29%
Endesa	134	33.0	3%	556	8.0	13%	927	4.8	21%
EDP	57	38.7	3%	235	9.4	11%	392	5.6	18%
EDF	245	39.5	3%	1,013	9.5	10%	1,688	5.7	17%
GDF Suez	200	40.1	2%	828	9.7	10%	1,380	5.8	17%
Enel	289	41.1	2%	1,198	9.9	10%	1,997	6.0	17%
Iberdrola	66	65.6	2%	274	15.8	6%	457	9.5	11%
Verbund	11	82.1	1%	48	19.9	5%	79	11.9	8%
Fortum	13	124.1	1%	54	30.0	3%	90	18.0	6%
Centrica	11	260.2	0%	47	62.9	2%	79	37.7	3%

(i) We have adjusted EBIT for exceptional/non-recurring items and the 2013 carbon cost (at EUR 4.35)

(ii) Carbon cover is number of times the company can pay its carbon cost through EBIT

Source: Company data, CDP estimates

Declining load factor of gas-fired power generation in Europe

Gas emits around half the carbon per unit of energy produced than coal does and, compared to coal-fired power generation, gas-fired power plants (or CCGT) have a much shorter start-up rate and ramp rate which allows them to better respond to renewable energy's intermittency. As such, Europe has seen a significant increase in CCGT capacity in recent years (particularly pre-2012).

However, decreased electricity demand, depressed wholesale electricity prices, a low carbon price, increasing production from renewables together with their priority status in the grid, as well as a falling coal price versus a relatively expensive gas price have all negatively affected the profitability of gas while coal regained market share. Indeed, the clean spark spread – the profit margins of CCGT power plants – remains low and various companies, e.g. Centrica have reported losses from CCGT production.

Under these challenging market conditions, companies have started to mothball their CCGT power plants. Among the companies in this study, from 2010 to 2013, the average generation from CCGT witnessed a significant drop of 10% per annum while generation from coal grew by 8% per annum; and the average load factor of CCGT dropped from 45% in 2010 to 26% in 2013, versus coal plants which increased from 38% to 51%.

The market conditions for CCGT could improve in the coming years due to tightening EU regulations on coal. Under the Industrial Emissions Directive and Large Combustion Plant Directive, much of Europe's coal fleet is expected to close or can only operate within an allocated number of hours over the course of 2015-2023. During this period and beyond, currently mothballed CCGT power plants could possibly regain their market share and profitability.

Methodology

The carbon risk rank and grade are determined as follows:

- ▼ We combine the weighted rank of the four metrics defined above for carbon risk.
- ▼ The carbon risk grade is awarded according to the carbon risk rank.
- ▼ In determining the separate weighted ranks for carbon risk we apply the following weightings and methodologies to each metric:

Metric 1): Carbon cover

- ▼ We use carbon emissions, allowances and deficit data from annual reports. From this, we calculate the utilities' carbon cost exposure at a EUR1.00 carbon price.
- ▼ We adjust EBIT in 2013 by adding back the carbon cost at the average carbon price for 2013 of EUR4.40/t
- ▼ We then divide the adjusted EBIT by the utilities' carbon cost exposure at EUR1.00

Metric 2): Emissions intensity (in 2013)

- ▼ We normalize emissions intensity by revenue and by volume of electricity generated in 2013.
- ▼ We give a higher weighting to the normalization factor by volume to reflect the direct linkage between power generation and carbon emissions.
- ▼ We use emissions data from companies' responses to CDP, revenue data from Bloomberg and production data from annual reports in 2013.
- ▼ We consider both scope 1 and scope 2 emissions because they are related to emissions from in-house power generation. Although scope 2 emissions may consist of emissions from electricity consumed by offices and power generation facilities, emissions data at component-level is not available across all companies. In any case, scope 1 emissions account for the major share of scope 1 and 2 emissions in 2013 among the companies in our study, e.g. from 95% to 100%. The only exceptions are EDP and Verbund, at 88 % and 73% respectively.
- ▼ We do not take into consideration scope 3 emissions because they mainly comprise emissions produced through the generation of electricity procured from third parties for resale, of which the production process is out of the control of electricity purchasers.

Metric 3): Reduction in emissions intensity (over 2010-13)

- ▼ We normalize emissions intensity by revenue and by volume of electricity generated, for each of the years from 2010-2013.
- ▼ Then we apply a formula that takes account of the emissions intensity of the utilities over each of the years 2010-13 to calculate the implied annual reduction in emissions intensity.

Metric 4): Emissions targets

- ▼ We adopt the methodology of Science-Based Targets' Sector-based Decarbonisation Approach (SDA)¹⁴, which sets a meaningful emissions-reduction target in 2050 and suggests an emissions pathway for each company.
- ▼ According to SDA's methodology, each company's activity growth was estimated based on the International Energy Agency's projections for the region where the company is headquartered. The SDA provides an emissions pathway from the companies' 2010 carbon intensity and absolute emissions to a 2050 target which is aligned with a 2 degree decarbonisation scenario.
- ▼ For the first sub-metric - whether companies set meaningful targets - we look at the emissions pathway suggested by SDA and find the implied emissions intensity in the target year set by companies. Then we compare target-year emissions-intensity set by companies and those by SDA based on the difference in percentage and absolute terms.
- ▼ For the second sub-metric - whether companies are on or off track to meet their own targets - we use the tool developed by SDA to project the emissions intensity in the target year based on their emissions trend over 2009-2013. We then compare the target-year emissions intensity set by companies and those by SDA based on the difference in percentage and absolute terms. We recognise that the emissions trend over a five-year period does not necessarily reflect the future emissions pathway, as companies may now be planning and investing in decarbonising their power generation business.
- ▼ We take companies' emissions-reduction targets from their responses to CDP questionnaires; if they are not available in CDP's database or if the reported target was set to expire before the end of 2015, then we take the targets from publicly available sources.

¹⁴ Science Based Targets is a joint collaboration between CDP, the United Nations Global Compact, World Resources Institute and WWF. This initiative adopts a scientific approach to help companies establish meaningful and ambitious carbon emissions reduction targets that are in line with the emissions scenarios suggested by the Intergovernmental Panel on Climate Change (IPCC)'s latest report in order to decarbonise the economy. The methodology of Sectoral Decarbonisation Approach is currently available in draft stage and the final version that incorporates feedback from a public stakeholder consultation will be published in May 2015.

Renewable energy sources

-  Wind is the favoured utility-scale technology accounting for 87% of the utilities' renewable generating assets (excluding hydro).
-  EDP is ranked top and Iberdrola second, reflecting their position as global leaders in wind power generation. They are both ranked A-grade.
-  Fortum and Endesa are ranked bottom two due to their poor exposure to renewables (excluding hydro).

Overview

All the utilities in our study have electricity generation assets based on renewables. On average, they generated nearly 30% of their electricity from renewables in 2013. There was significant variation between different utilities. Verbund and EDP each generated 89% and 68% from renewables; however, Centrica and RWE both generated just 3% and 6%. We address hydro and other renewables in this chapter, however, we place a greater emphasis on other renewables, which include wind, solar, geothermal and biomass, as the growth opportunity in these technologies is considerably higher and so therefore is the opportunity for utilities grow their zero-emissions portfolio and mitigate carbon risk. We apply a weighting three-times greater for other renewables (than hydro) in calculating our renewables metric.

Other renewables account for 28% of production from renewables for the companies in our study, with wind accounting for 87% of other renewables. Wind is the most economic, utility-scale technology; thus far, solar PV has been better-suited to the retail market. Iberdrola, EDP and Enel are among the world's top five wind farm owners.

With various European and national-level policies supporting the generation of electricity from renewable energy sources (renewables), we assess the extent to which companies are capturing the opportunities in renewables, and in doing so mitigating their carbon risk exposure. We identify four key metrics, which we apply separately to (i) other renewables and (ii) hydro (except metric 3) is only applied to other renewables):

-  **Metric 1): Production from renewables (GWh):** expressed as a percentage of a company's total electricity production in 2013. A higher ranked company will produce a higher percentage of its electricity from renewables, thus reducing its carbon exposure (all else being equal). We calculate this metric separately for other renewables and hydro.
-  **Metric 2): % change in installed capacity of renewables (over 2010-13):** This is a measure of the rate of increase of the utilities' renewables portfolios. We calculate this metric separately for other renewables and hydro. We use installed capacity (MW) in this metric rather than production (GWh) in acknowledgment of the year-on-year fluctuations in renewable energy sources, such as wind, solar (sun), and hydro (rain).
-  **Metric 3): % Increase in installed capacity of renewables relative to increase in domestic market:** we note that the % increase in installed capacity of renewables as per metric 2) is, on average, much higher for other renewables (18% pa) than for hydro (-1% pa), for the utilities in our study; and that at a country level, there is also significant variation (e.g. 7% pa for Spain, versus 41% pa for the UK). As such, we calculate the relative increase in renewables production for the utilities compared to their domestic market growth rate. We calculate this metric only for other renewables.
-  **Metric 4): Renewables country attractiveness:** we reward those utilities which have a higher presence in countries that are more attractive for renewables, according to EY's renewable energy country attractiveness index (EY renewables attractiveness index). We calculate this metric separately for other renewables and hydro.

Highlights

- ▼ EDP is ranked top and Iberdrola second, reflecting their position as global leaders in wind power generation. They both have significance presence in the US which is ranked as the second most attractive country for renewables in the EY renewables attractiveness index.
- ▼ Endesa and Fortum are ranked bottom, despite hydropower accounting for more than a quarter of their total production in 2013. The rank reflects their low production from other renewables and the fact neither business is exposed to any of the top 10 countries in the EY renewables attractiveness index.

Summary of metrics used to determine the renewables grade

Company	Other renewables	Hydro	Overall weighted rank	Renewables Rank	Renewables Grade
EDP	1	2	1.3	1	A
Iberdrola	2	9	3.8	2	A
E.ON	3	11	5.0	3	B
Enel	5	5	5.0	3	B
SSE	4	10	5.5	5	B
GDF Suez	7	3	6.0	6	C
Centrica	6	13	7.8	7	C
EnBW	8	8	8.0	8	C
Verbund	11	1	8.5	9	D
EDF	10	7	9.3	10	D
RWE	9	12	9.8	11	D
Fortum	12	6	10.5	12	E
Endesa	13	4	10.8	13	E

Weighting:	75%	25%
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Source: CDP data, company data, Global Wind Energy Council, Eurostat

(i) Other renewables: summary

- ▶ EDP and Iberdrola, ranked first and second, have a significantly higher proportion of renewables production from other renewables in 2013; their increase in installed capacity of other renewables is also higher than that of their home markets.
- ▶ Although fossil fuels represent a major share of SSE's resource portfolio (more than three quarters in 2013), its high percentage of production from other renewables (15% and mainly wind) contributes greatly to its fourth rank.
- ▶ Endesa, ranked bottom, has the lowest percentage of production from other renewables. Additionally, it is the only company within our study that decreased its installed capacity of other renewables (over the period 2010-13). This compares to an increase in other renewable capacity (from wind) in its home market of 4% pa.
- ▶ RWE's country renewables attractiveness rank was negatively impacted as it was the only company in our study which did not respond to CDP's electric utilities module questionnaire to provide production data by country and by resource type (see methodology for more details).

Summary of other renewables

Company	Production as % total in 2013	Rank	Increase in installed capacity over 2010-2013	Rank	Increase in installed capacity versus domestic market	Rank	Renewables country attractiveness	Rank	Weighted rank	Overall rank
EDP	34%	1	7%	11	1.2	8	117	4	3.3	1
Iberdrola	25%	2	5%	12	1.5	5	115	5	3.9	2
E.ON	6%	5	19%	6	2.1	2	121	2	4.2	3
SSE	15%	3	13%	8	0.5	12	113	7	5.2	4
Enel	7%	4	20%	5	1.4	6	105	10	5.5	5
Centrica	3%	7	31%	2	1.2	7	120	3	5.7	6
GDF Suez	3%	8	17%	7	1.5	4	114	6	7.1	7
EnBW	3%	9	10%	9	1.1	9	133	1	7.4	8
RWE	5%	6	8%	10	0.9	10	89	12	8.0	9
EDF	2%	11	22%	4	2.0	3	111	8	8.9	10
Verbund	2%	12	77%	1	4.2	1	101	11	9.6	11
Fortum	2%	10	26%	3	0.8	11	87	13	10.0	12
Endesa	0.2%	13	n/a	13	n/a	13	106	9	12.2	13

Weighting:	60%	10%	10%	20%
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Source: CDP data, company data

(ii) Hydro: summary

- ▼ Verbund is ranked top as it is a clear leader in hydro production. Hydropower accounted for 87% of its total production in 2013, which is significantly higher than second-ranked EDP (34%).
- ▼ Centrica does not have any production from hydro so it is ranked bottom.
- ▼ In contrast to the increase in installed capacity of other renewables which increased by 12% pa over 2010-2013, hydro increased by just 1% pa over the same period. This is due to hydro being a mature technology, with only a small increase in capacity over the period.

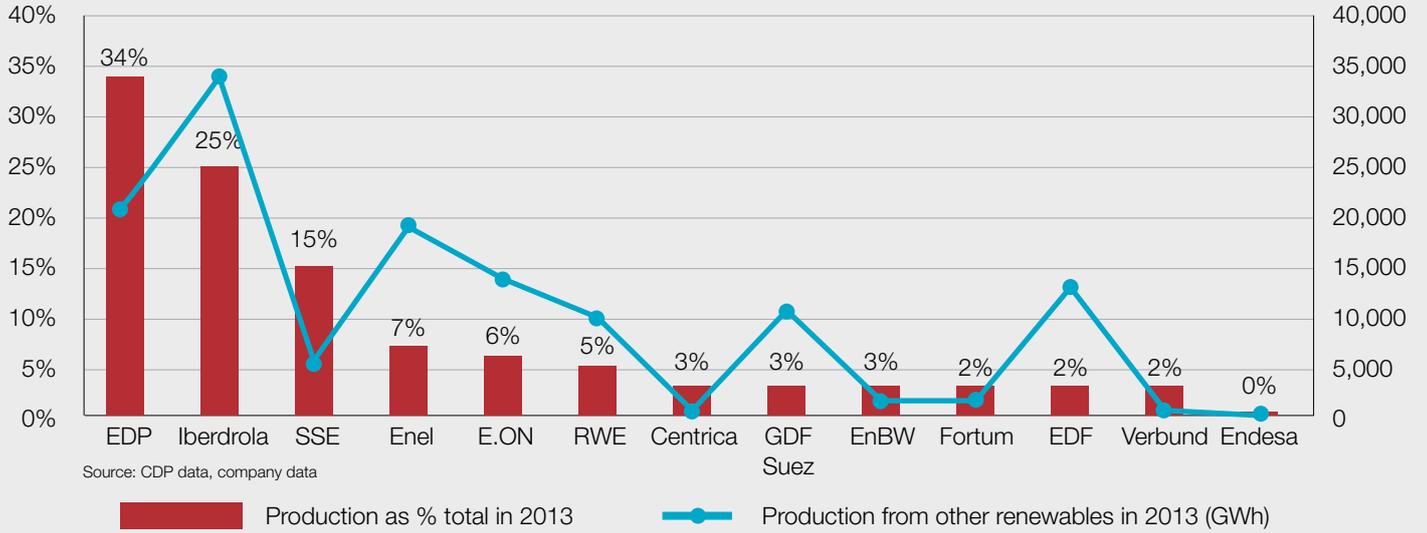
Summary of hydro

Company	Production as % total in 2013	Rank	Increase in installed capacity over 2010-2013	Rank	Renewables country attractiveness	Rank	Weighted rank	Overall rank
Verbund	87%	1	4.0%	2	28	3	1.6	1
EDP	34%	2	4.0%	3	26	5	2.8	2
GDF Suez	16%	6	6.5%	1	35	1	4.0	3
Endesa	30%	3	0.2%	5	22	8	4.4	4
Enel	26%	5	-0.6%	9	24	7	6.2	5
Fortum	26%	4	-0.4%	8	8	12	6.4	6
EDF	9%	9	0.7%	4	26	6	7.4	7
EnBW	11%	8	-6.3%	12	31	2	7.6	8
Iberdrola	13%	7	-0.1%	7	11	11	7.8	9
SSE	8%	10	0.0%	6	17	10	9.2	10
E.ON	6%	11	-3.6%	11	27	4	9.6	11
RWE	2%	12	-0.7%	10	21	9	11.0	12
Centrica	0%	13	n/a	13	0	13	13.0	13

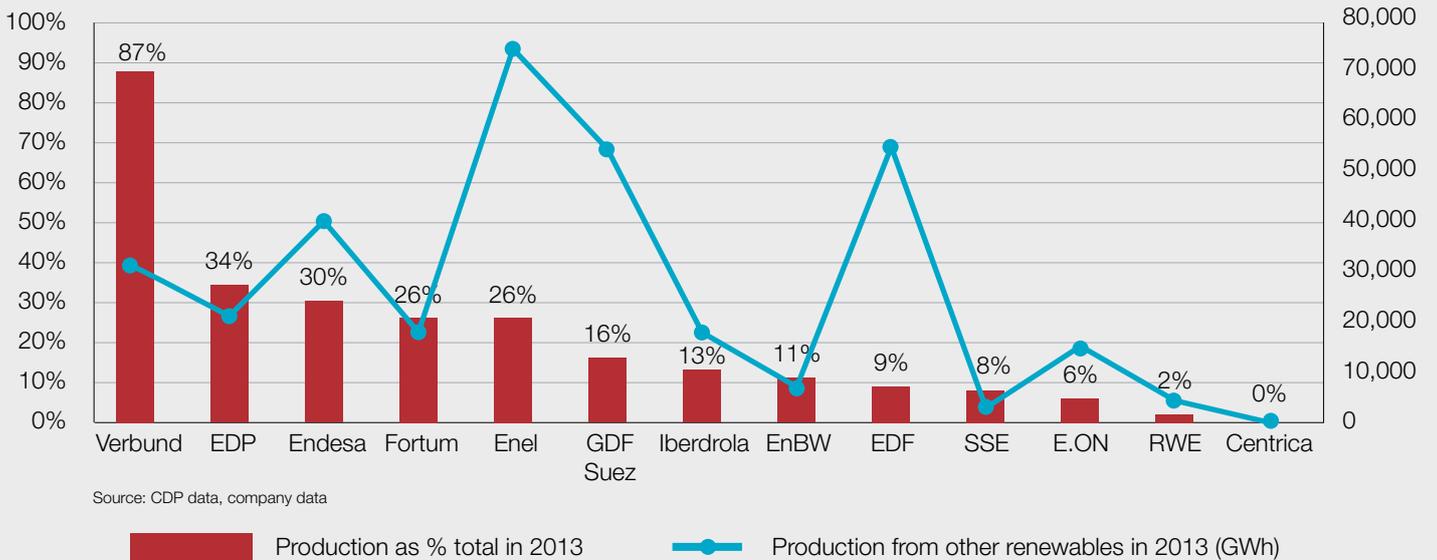
Weighting:	60%	20%	20%
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Source: CDP data, company data

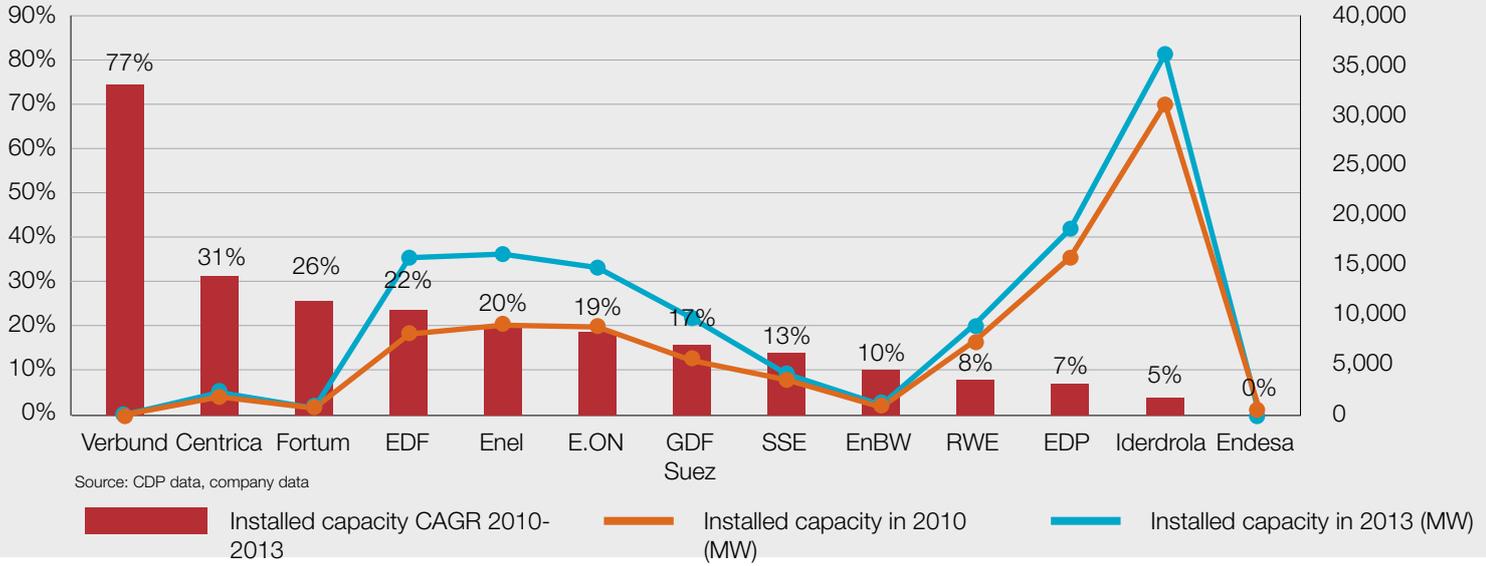
Metric 1)(i): % production from other renewables



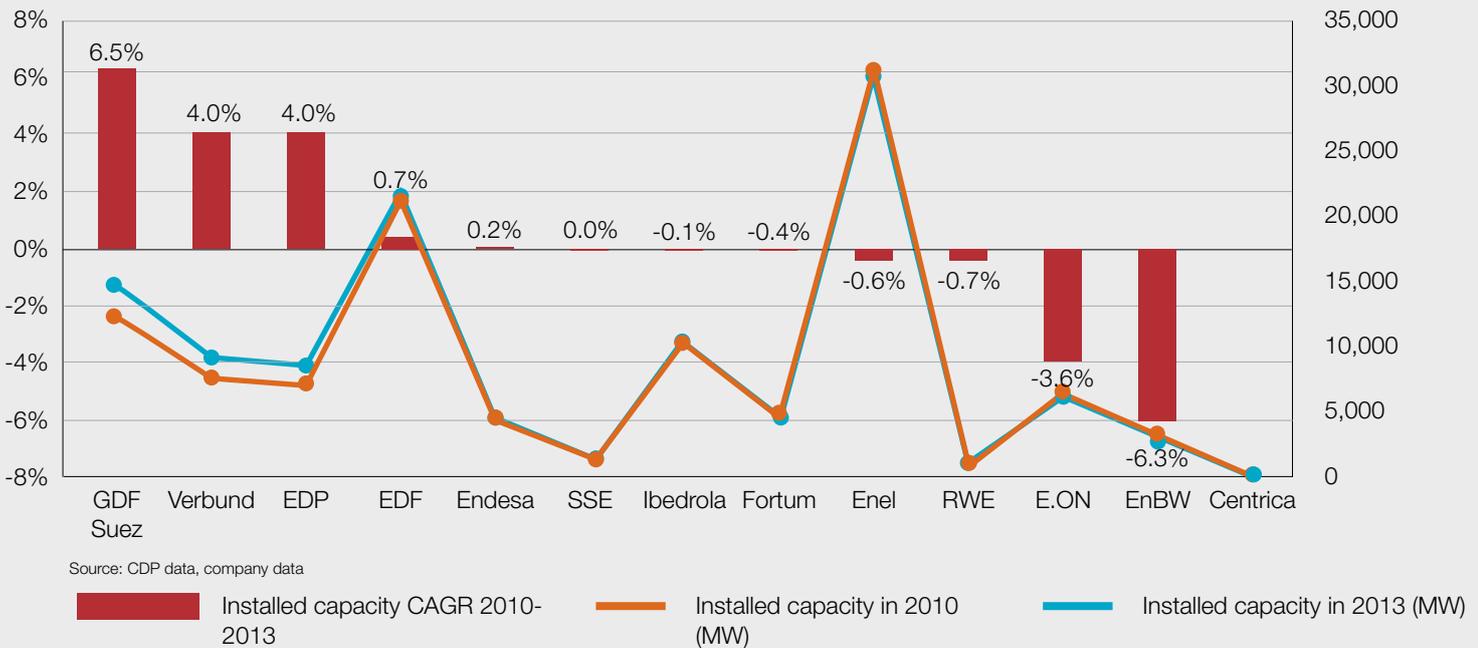
Metric 1)(ii): % production from Hydro

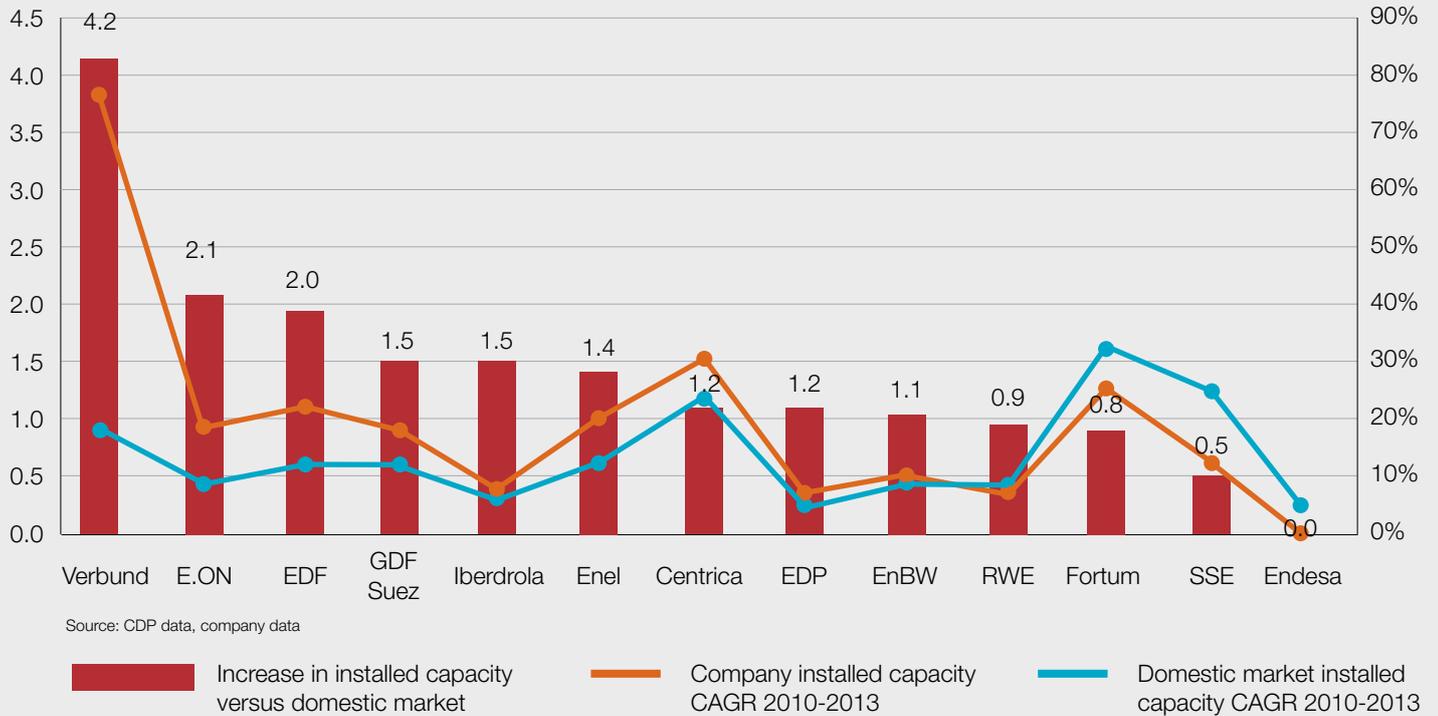


Metric 2(i): % Increase in installed capacity pa from other renewables



Metric 2(ii): Increase in installed capacity pa from hydro



Metric 3: % Increase in installed capacity from other renewables relative to increase in domestic market

Metric 4) (i): Country attractiveness for other renewables

Company	Renewables country attractiveness	Rank
EnBW	133	1
E.ON	121	2
Centrica	120	3
EDP	117	4
Iberdrola	115	5
GDF Suez	114	6
SSE	113	7
EDF	111	8
Endesa	106	9
Enel	105	10
Verbund	101	11
RWE	89	12
Fortum	87	13

Source: CDP data, company data

Metric 4) (ii): Country attractiveness for hydro

Company	Renewables country attractiveness	Rank
GDF Suez	35	1
EnBW	31	2
Verbund	28	3
E.ON	27	4
EDP	26	5
EDF	26	6
Enel	24	7
Endesa	22	8
RWE	21	9
SSE	17	10
Iberdrola	11	11
Fortum	8	12
Centrica	0	13

Source: CDP data, company data

Methodology

The renewables rank and grade are determined as follows:

- ▼ We combine the weighted-rank of the four metrics defined above for other renewables, and the weighted rank of the three metrics defined above for hydro. We apply a weighting three times higher for other renewables. This gives the renewables rank.
- ▼ The renewables grade is awarded according to the renewables rank.
- ▼ In determining the separate weighted ranks for other renewables and hydro we apply the following weightings and methodologies to each metric:

Metric 1): Production from renewables:

- ▼ We use a weighting of 60% for other renewables and hydro to reflect the importance of leadership in renewables in mitigating carbon risk.
- ▼ We use a combination of production figures from annual reports in 2013 and data reported to CDP.

Metric 2): % Increase in installed capacity of renewables

- ▼ We use a weighting of 10% for other renewables, in conjunction with a weighting of 10% for metric 3) below and a weighting of 20% for hydro.
- ▼ We calculate the CAGR for installed capacity of renewables over 2010-2013.
- ▼ We use a combination of capacity figures from annual reports in 2010-2013 and data reported to CDP.

Metric 3): % Increase in installed capacity of renewables relative to increase in domestic market:

- ▼ We use a weighting of 10% for other renewables, in conjunction with a weighting of 10% for metric 2) above.
- ▼ We calculate the CAGR for installed capacity of renewables over 2010-2013.
- ▼ We use a combination of capacity figures from annual reports in 2010-2013 and data reported to CDP.
- ▼ For the domestic market CAGR, we use wind consumption CAGR as a proxy (as wind is 87% of other renewables for the utilities), which we calculate from Eurostat data on electricity consumption by country and % share of wind production in total electricity production.
- ▼ We express the utility CAGR as a ratio of the domestic market CAGR.

Metric 4): Renewables country attractiveness:

- ▼ We use a weighting of 20% for other renewables and hydro.
- ▼ We use detailed data from CDP's database on utilities' production from other renewables and hydro on a country level combined with EY's renewables attractiveness index to assess the attractiveness of the countries where each utility has a presence.
- ▼ For other renewables, we apply the EY renewables attractiveness index score for each country to the utilities % exposure to other renewables (by production) in that country, and also to the utilities % overall business exposure (by production) to that country, and sum over all 40 countries in EY's index.
- ▼ For hydro, we apply EY's hydro rank for each country to the utilities % exposure to hydro in that country and sum over all 40 countries in EY's index.
- ▼ In both case the sum gives a normalized score. This is the country renewable market attractiveness metric.
- ▼ RWE was the only company that did not respond to CDP's electric utility module questionnaire 2014, hence we do not have data on renewables production split by country. We have assumed a reduced exposure of 67%, purely to the German market.

Coal exposure

- Coal accounts for 70% of the utilities' emissions from power generation¹⁵, and therefore represents the biggest risk to future earnings of any power generation source.
- The utilities reduced their combined installed capacity by 3% pa over 2010-13; however, favourable economics for coal plants meant that operating hours and therefore coal production increased over the period.
- Centrica and Verbund are ranked top two and each receives an A-grade. SSE and RWE ranked bottom two and receive an E-grade and D-grade respectively.

Overview

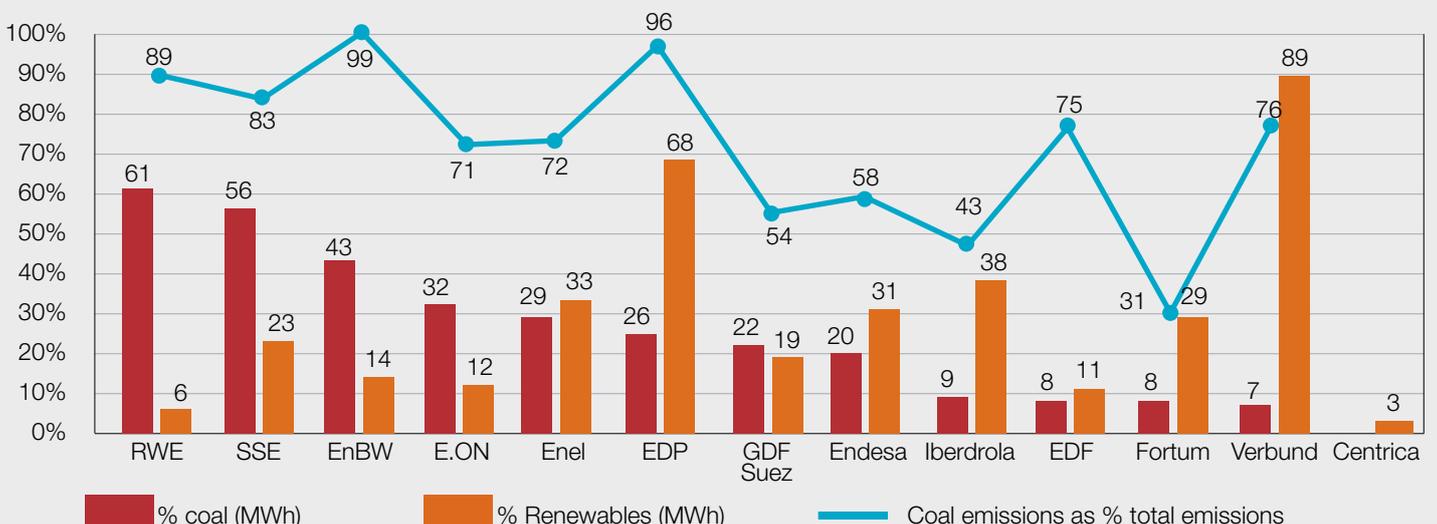
All the electric utilities in our study, except Centrica, have coal (including lignite) generation assets. Lignite, which is formed from compressed peat, its emissions intensity is as high as that of coal. In 2013, coal emissions alone contributed to 18% of total EU CO₂ emissions, which is as much as all road transport¹⁶.

On average, the utilities in our study generate 25% of their electricity from coal; however, due to coal's high emissions intensity, this represents 70% of emissions¹⁵. There was significant variation between different utilities. EDF, Iberdrola, Verbund and Fortum each generate less than 10% of their electricity from coal; however, SSE and RWE both generate more than 50%.

In this chapter, we assess the utilities based on 3 metrics:

- Metric 1): Production from coal (GWh):** expressed as a percentage of a company's total electricity production in 2013. A higher-ranked company will produce a lower percentage of its electricity from coal, thus reducing its carbon exposure (all else being equal).
- Metric 2): Change in installed capacity of coal (MW):** we calculate the CAGR for installed capacity of coal plants over 2010-2013. We assign higher ranks to companies that decommission a higher percentage of their coal capacity over the period.
- Metric 3): Proportion of subcritical coal power plants:** we calculate the percentage of subcritical coal power plants in a company's coal fleet (by both production and installed capacity) and assign the best rank to the company with the lowest percentage. A subcritical coal plant (SCP) is the least efficient and most polluting coal-fired generation as it consumes more fuel and water to generate the same amount of electricity.

Coal and renewables as a % of electricity production



¹⁵ Modelled for the utilities in our study based on CDP data and company data.

¹⁶ Source: Sandbag's report, "Europe's failure to tackle coal Risks for the EU low-carbon transition", dated July 2014.

Highlights

- ▼ Centrica is ranked top as it does not have coal in its generation portfolio.
- ▼ Verbund is ranked second and is notably ahead of the rest. It only has two coal plants, which account for just 7% of total generation in 2013. Only one of the plants is subcritical and it accounts for just 24% of the coal production - the other plant just missed the IEA classification (see methodology below).
- ▼ EDF is ranked third as it has relatively low exposure to coal (8% of total generation in 2013). We note that EDF is the largest coal plant owner in our study (with 24GW); however, it has been running its portfolio of coal plants at a significantly lower capacity than some of its peers (load factor of 25% versus E.ON, RWE and GDF Suez, all on more than 60% load factors).
- ▼ The utilities reduced their combined installed capacity by 3% pa over 2010-13; however, favourable economics for coal plants¹⁷ drove a 9% pa increase in operating hours at the remaining coal plants, leading to an increase in coal production of 6% pa.
- ▼ Endesa, Fortum and GDF Suez are the only three companies that increased their installed capacity of coal over 2010-13. The largest increase was 4.4GW by GDF Suez, which contributed to its bottom-three rank.
- ▼ SSE and RWE are ranked bottom. They produce the highest percentage of coal-generated electricity at 56% and 61% respectively. However, since the end of 2013, SSE has decommissioned two of its three coal plants; it now has coal exposure through just one 2GW sub-critical coal plant.
- ▼ Of the companies in our study, RWE, E.ON, Enel and GDF Suez account for 70% of the electricity produced by coal. However, RWE, E.ON and Enel only increased their exposure to coal by 1-4% pa over 2010-13, below industry trends. GDF increased its exposure by 30% pa.

Summary of metrics used to determine the coal exposure grade

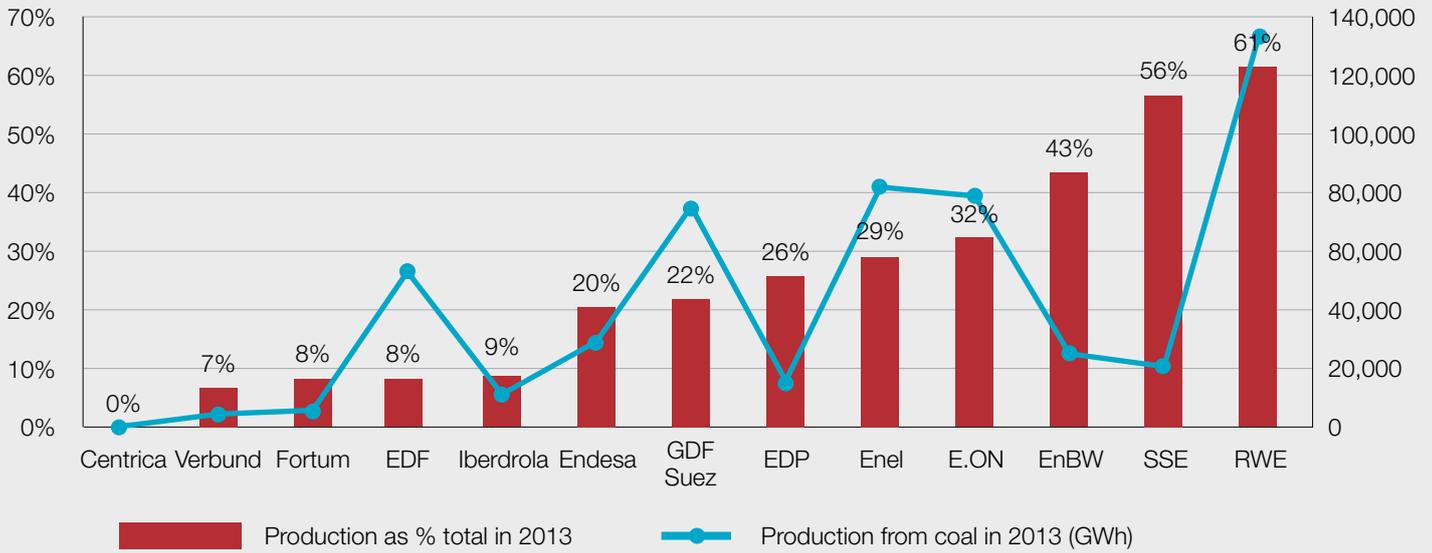
	Production as % total in 2013 (GWh)	Installed capacity CAGR 2010-2013	% SCP production (GWh)	% SCP installation (MW)	Overall weighted rank	Coal Rank	Coal Grade
Centrica	1	1	1	1	1.0	1	A
Verbund	2	9	2	2	3.4	2	A
EDF	4	6	10	10	5.6	3	B
Iberdrola	5	2	11	12	5.7	4	B
Fortum	3	12	12	13	6.7	5	B
Endesa	6	11	5	7	7.0	6	C
Enel	9	7	4	4	7.6	7	C
GDF Suez	7	13	6	3	7.7	8	C
EDP	8	9	7	9	8.2	9	C
EnBW	11	5	3	6	8.5	10	D
E.ON	10	3	9	11	8.6	11	D
RWE	13	4	8	5	9.9	12	E
SSE	12	8	12	8	10.8	13	E

Weighting:	60%	20%	10%	10%
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Source: CDP data, company data, CARMA, ENIPEDIA

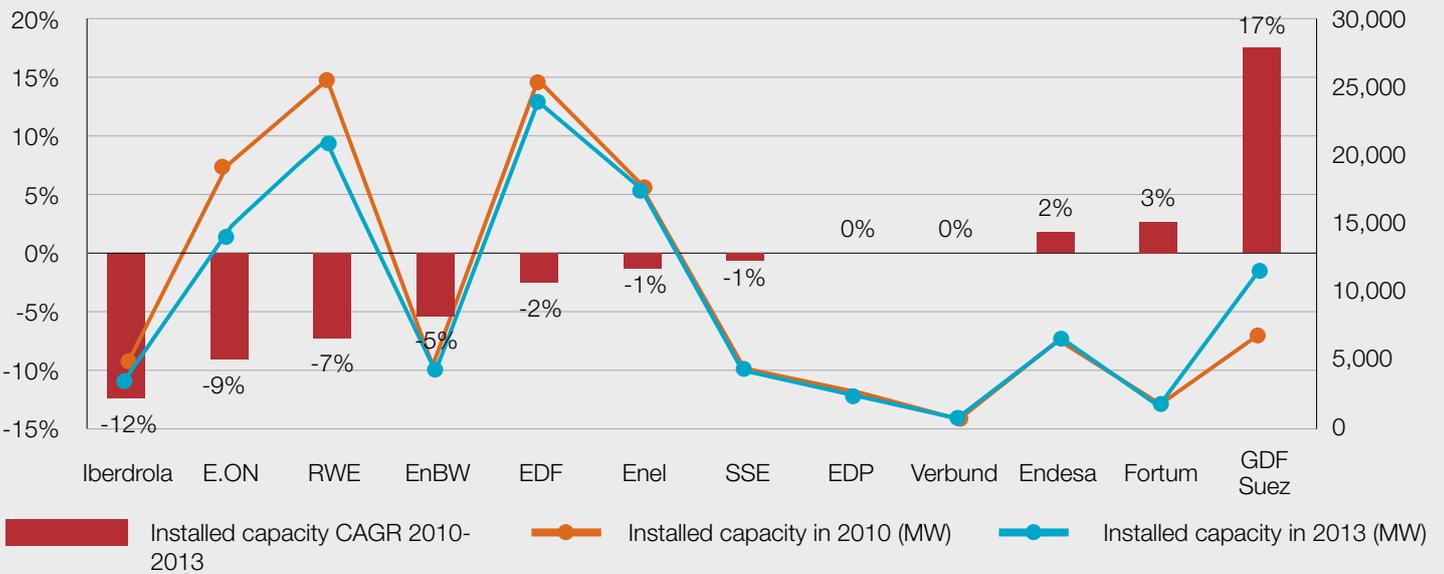
¹⁷ Due to relatively low coal commodity prices and a low carbon price

Metric 1): Production from coal



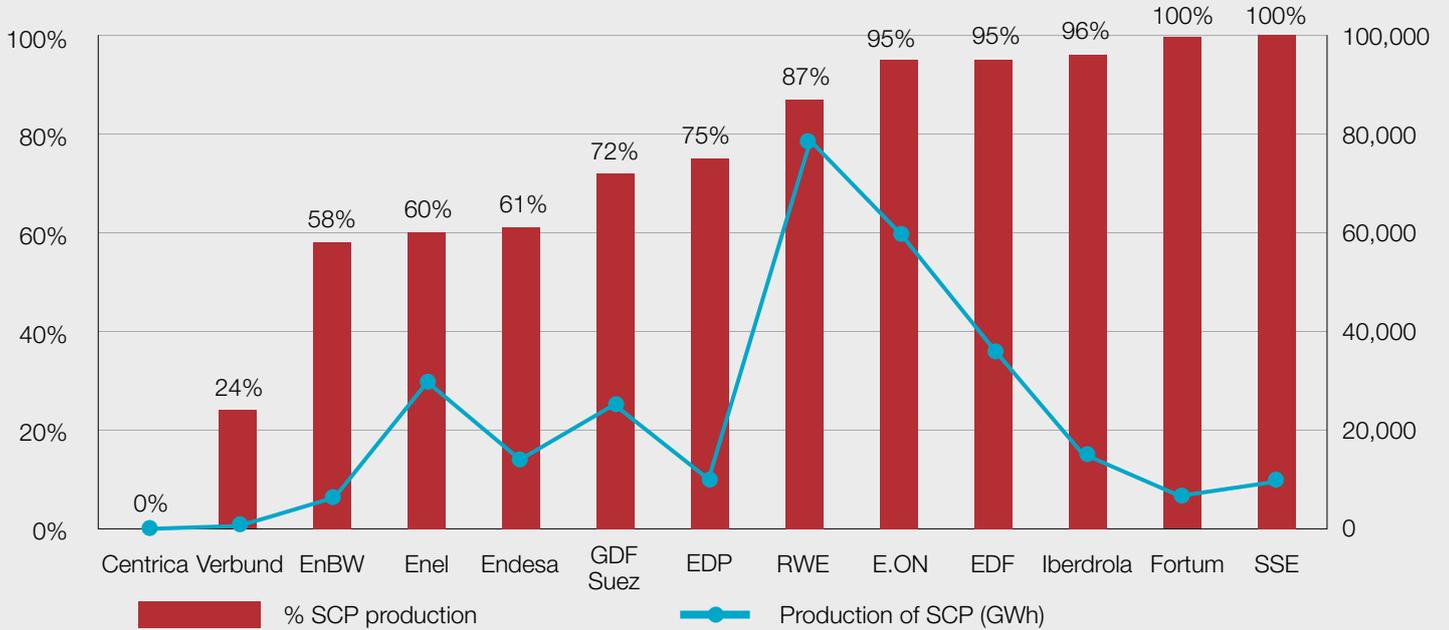
Source: CDP data, company data

Metric 2): Change in installed capacity of coal over 2010-2013



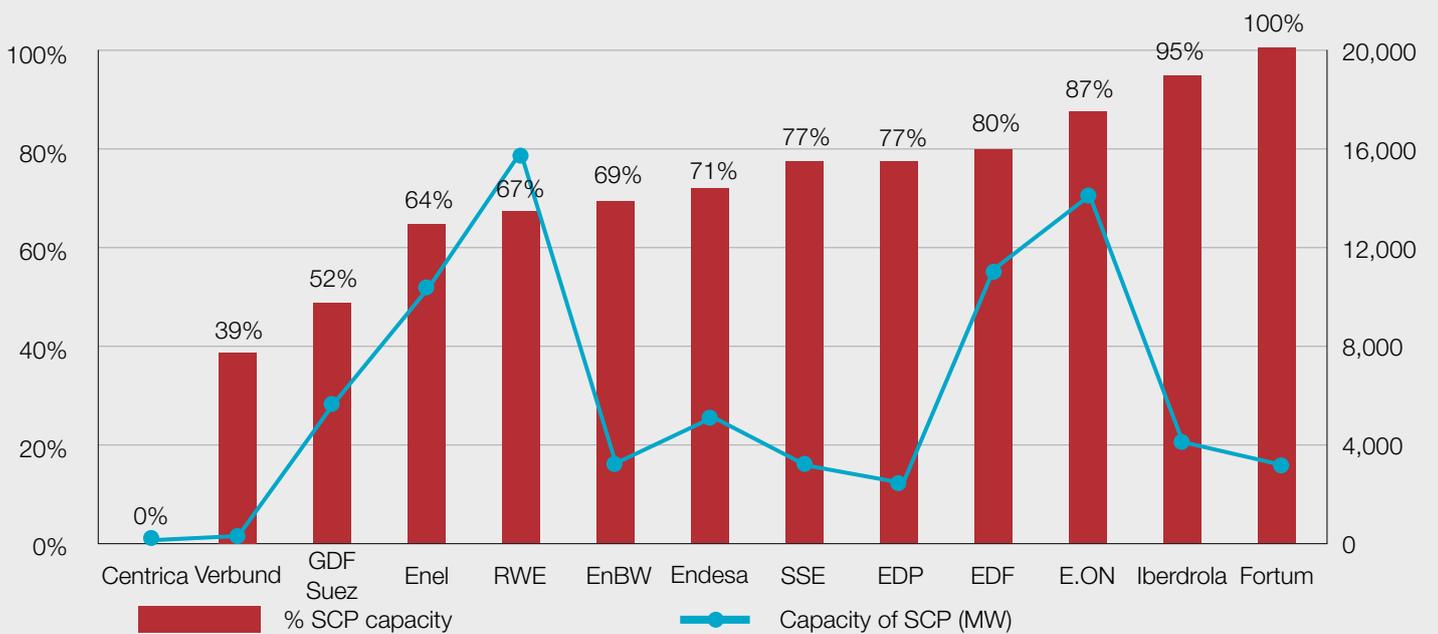
Source: CDP data, company data

Metric 3): Proportion of subcritical coal plants in coal fleet by production



Source: CDP data, company data, CARMA, ENIPEDIA

Metric 4): Proportion of subcritical coal plants in coal fleet by capacity



Source: CDP data, company data, CARMA, ENIPEDIA

Methodology

The coal rank and grade is determined as follows:

- ▼ We first rank the companies based on the three metrics defined above. We then apply a weighting to each rank to determine the coal rank.
- ▼ The coal grade is awarded based on the weighted-coal rank.

Metric 1): Production from coal (GWh):

- ▼ The utilities production from coal in 2013 is expressed as a percentage of its total electricity production (MWh).
- ▼ We use a weighting of 60% to reflect the importance of producing a smaller proportion of electricity from coal.
- ▼ We use a combination of production figures from annual reports and data reported to CDP.

Metric 2): Change in installed capacity of coal (MW):

- ▼ We calculate the CAGR for installed capacity of coal plants over 2010-2013. We assign higher ranks to companies that decommission a higher percentage of their coal capacity over the period.
- ▼ We use a weighting of 20%.
- ▼ We use a combination of production figures from annual reports in 2010-2013 and data reported to CDP.

Metric 3): Proportion of subcritical coal power plants:

- ▼ We use the International Energy Agency's definition of a subcritical coal power plant, i.e. plants with carbon intensity of $\geq 880\text{kg CO}_2/\text{MWh}$, which are considered as the most polluting and least efficient coal-fired generation.
- ▼ We adopt similar methodology to that used in the Smith School's report on *Stranded Assets and Subcritical Coal*, dated March 2015, and note the limitations to the analysis set out in that report.
- ▼ We highlight that the proportion of SCP plants is based on the total plants that we could get data for. In some cases, the total capacity of plants we could get data for differed notably to the capacity disclosed in annual reports for 2013. The biggest difference occurred for EDF, Iberdrola, Fortum and SSE.
- ▼ We calculate the carbon intensity of each power plant in order to determine those that fall into the category of subcritical coal power plant.
- ▼ We obtain data for emissions and production of the utilities' coal-fired power plants from CARMA (Carbon Monitoring for Action). The latest data available is for 2009. We use this in our % SCP by MWh calculation. For our % SCP by capacity calculation we use 2013 data from annual reports.

Water risk

-  85% of respondents in the utilities sector report that worsening water security poses a substantive, short-term risk to their business, some with costs as high as US\$1 billion.
-  Almost half (48%) of the 132 risks across 26 categories are expected to materialise within the next three years.
-  Iberdrola is a clear leader in managing and mitigating water risk. It is ranked top in all metrics.

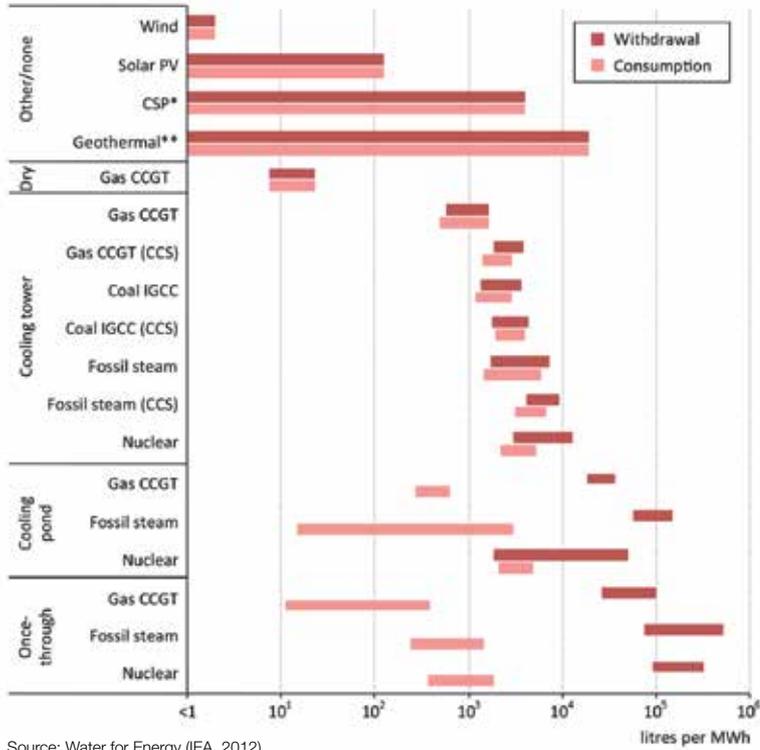
Overview

Water is a key input in the production of electricity. The UN has reported around 90% of global power generation is heavily dependent on water in both direct production and throughout the fuel supply chain¹⁸, and estimates that the global water demand for power generation will increase by 140% by 2050. Electric utilities that use steam turbines fired by fossil fuels or nuclear energy are dependent on a sufficient and stable supply of water for cooling (see the top of next page). All thermal power generation plants withdraw and consume significant quantities of water. Further, the fuel sources employed at a plant can expose a company to water-related supply chain risks; the future security of water and electric supply appear ultimately inseparable. As competition for this finite resource is only set to increase, the question is not whether worsening water security is a risk, but rather how to mitigate the risk now and adapt to a world that is increasingly water constrained, while continuing to grow and provide reliable power.

Key findings from responses to CDP's water questionnaire:

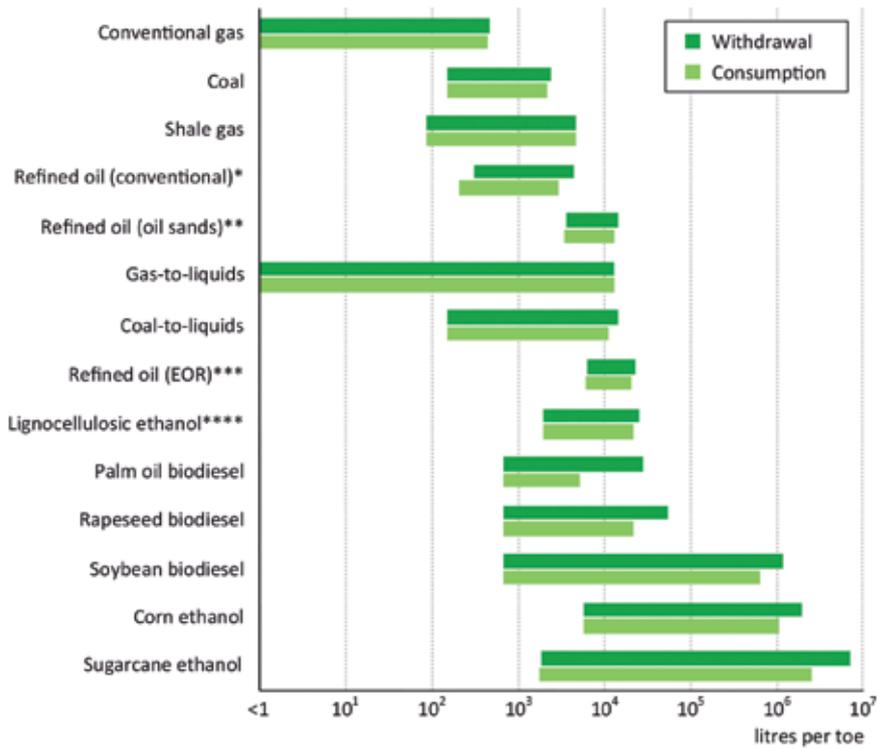
-  Water regulations are changing: reviewing, revising and reforming regulation and policy is on the agenda of many national and local governments as threats to water security worsen. In Europe for example, companies are anticipating tightening water withdrawal and discharge requirements enforced under the Water Framework Directive (introduced in 2000); and in the UK where reforms to the abstraction licencing system are likely to result in changes to terms and costs of licences for power utilities.
-  Supply chain disruption driven by worsening water security has become one of the top risks identified by European electric utilities. This risk is reported not only for hydropower, but also for conventional producers (see the bottom of next page).
-  Water can impact power generators' valuation (at each stage of the DCF), from an increase in operating costs, to impacts on revenue due to commodity price inflation and from increases in capital expenditure, to a decrease in the useful life of assets due to environmental legislation.

Water use for electricity generation by cooling technology



Source: Water for Energy (IEA, 2012)

Water withdrawal and consumption for fuel production (l/kWh)



Source: Water for Energy (IEA, 2012)

Highlights

- ▼ Fortum and SSE are ranked bottom because they did not respond to investor requests for transparency via CDP's 2014 water questionnaire.
- ▼ Iberdrola is the clear leader of the water risk as it is ranked top in 4 out of 5 categories assessed.
- ▼ EDP was consistently among the top performers across all metrics, finishing first for targets and goals, water use intensity and supply chain management.
- ▼ Centrica was average in some categories but was pulled up by a strong performances on the risks and opportunities assessment and water use intensity metrics.
- ▼ The two French utilities (GDF Suez and EDF) and Enel group (Enel and Endesa) are in the middle of the table mostly due to poor risks and opportunities assessment, and water use intensity.
- ▼ Finally, amongst companies that responded to CDP's water questionnaire in 2014, the two German power generators came last. RWE finished 8th due primarily to a lack of disclosure on the power generation, and for not setting water management targets. E.ON was positioned 9th overall, despite having a water strategy and policy. This is primarily due to an ambiguous policy and a failure to engage suppliers on water, despite disclosing that their supply chain is at risk.

Summary of metrics used to determine the water risk grade

Company	Water strategy	Supply chain management	Risks and opportunities	Water use intensity	Targets and goals	Overall weighted rank	Water rank	Water grade
Iberdrola	1	2	1	1	1	1.2	1	A
EDP	5	1	6	2	1	3.1	2	B
Centrica	8	3	3	2	1	3.4	3	B
Enel	3	5	7	6	1	4.5	4	B
Endesa	4	5	8	7	1	5.1	5	C
EDF	7	4	2	10	1	5.1	5	C
GDF Suez	1	5	9	5	7	5.4	7	C
RWE	5	5	5	9	7	6.4	8	D
E.ON	9	9	4	7	7	7.1	9	D
Fortum	10	10	10	4	10	8.5	10	E
SSE	10	10	10	11	10	10.3	11	E

Weighting:	20%	15%	20%	25%	20%
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Source: CDP

Metric 1): Water strategy

Company	Evaluation of water impact on business strategy rank	Water policy rank	Weighted score
Iberdrola	1	1	1
GDF	1	1	1
Enel	1	3	2
Endesa	1	6	3.5
EDP	6	3	4.5
RWE	1	8	4.5
EDF	8	3	5.5
Centrica	6	6	6
E.ON	8	8	8
SSE	10	10	10
Fortum	10	10	10

Weighting:	50%	50%
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Source: CDP data

Metric 2): Supply chain management grade

Company	Water risk reported by suppliers rank	% of key suppliers rank	% of spendings rank	Weighted score
EDP	1	1	1	1.0
Iberdrola	1	1	2	1.3
Centrica	3	3	3	3.0
EDF	3	4	4	3.5
Enel	5	4	4	4.5
Endesa	5	4	4	4.5
RWE	5	4	4	4.5
GDF	5	4	4	4.5
E.ON	9	4	4	6.5
SSE	10	4	4	7.0
Fortum	10	4	4	7.0

Weighting:	50%	25%	25%
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Source: CDP data

Metric 3): Risks and Opportunities

Company	Water risks procedure Rank	Geographical scale rank	Stakeholder analysis rank	Opportunities rank	Weighted score
Iberdrola	1	1	1	1	1.0
EDF	1	1	2	1	1.4
Centrica	1	1	2	7	2.0
E.ON	1	1	6	1	2.8
RWE	1	1	5	7	3.0
EDP	1	1	8	1	3.5
Enel	7	1	4	1	4.5
Endesa	7	1	7	1	5.5
GDF	9	9	8	1	7.9
Fortum	10	10	10	7	9.7
SSE	10	10	10	7	9.7

Weighting:	40%	15%	35%	10%
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Source: CDP data

Metric 4): Water use intensity

Company	Financial intensity rank	Generation intensity rank	Weighted score
Iberdrola	1	1	1.0
Centrica	2	3	2.5
EDP	3	2	2.5
Fortum	4	4	4.0
GDF	5	5	5.0
Enel	6	8	7.0
E.ON	8	7	7.5
Endesa	9	6	7.5
RWE	7	10	8.5
EDF	10	9	9.5
SSE	11	10	10.5

Metric 5): Targets and goals grade

Company	Targets and goals rank
Centrica	1
EDF	1
EDP	1
Endesa	1
Enel	1
Iberdrola	1
E.ON	7
GDF	7
RWE	7
Fortum	10
SSE	10

Source: CDP data

Weighting:	50%	50%
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Source: CDP data

Methodology

The water risk rank and grade is determined as follows:

- We first rank the companies based on the five metrics defined above. We then apply a weighting to each rank to determine the water risk rank.
- The water risk grade is awarded based on the weighted water risk rank.

Metric 1): Water Strategy assessment

- We evaluate the strength of companies' water policy (Question 6.3 of CDP's water questionnaire) and how they evaluate the impact of worsening water security on business strategy (Question 1.2 of CDP's water questionnaire).
- To obtain the maximum number of points, companies need to have a publicly available, company-wide water policy. This must contain performance standards for direct and indirect operations. In addition, companies need to evaluate the impact of water on their business strategy over the next 10 years.

Metric 2): Supply Chain Management assessment

- We identify whether the company was exposed to supply chain risks (Question 3.1 of CDP's water questionnaire) and check whether the company asks suppliers to report their water risks.
- To obtain the maximum number of points, the company has to ask suppliers to disclose their risks if exposed to supply chain risks.
- We analyse the % of key suppliers (in number and spending) asked to disclose their water risks – the higher the better (question 2.5a of CDP's water questionnaire).

Metric 3): Risks and Opportunities assessment

- On the risk side we analyse the water risk assessment procedure (question 2.1 of CDP's water questionnaire). In order to receive the maximum number of points, water has to be incorporated into a comprehensive, company-wide risk assessment process incorporating both direct operations and supply chain.
- We then analyse the geographic scale of risk assessment (question 2.2 of CDP's water questionnaire). Maximum points were awarded for river basin, followed by facility and business unit. Finally we analyse how the utilities integrate stakeholders in their risk assessment (question 2.4a of CDP's water questionnaire). The greater the integration of stakeholders the higher the score.
- On the opportunity side we only analyse whether utilities identified water-related opportunities. Points were awarded when they identified at least one.

Metric 4): Water use intensity

- We assess the efficiency with which each utility uses water by analysing the investment intensity and the electricity production intensity.
- In order to calculate the intensity, we used the data disclosed in question 5.1 of CDP's water questionnaire. Where there was no data (or inaccurate data) disclosed by the companies, we used the water withdrawal data available from Bloomberg (classified as "consumption" in Bloomberg terminals).

Metric 5): Targets and goals assessment

- Maximum points are given to companies that set both targets and goals regarding water.

Appendix: engagement themes for electric utilities

Sector engagement themes: Company engagement: traffic light system

In order to ensure robust and resilient business strategies and encourage a smooth transition to a lower carbon energy system, we are recommending some areas of engagement for investors to raise in their discussions with board and management of Electric Utilities companies. These are intended as proxies under which to 'stress test' business strategy to prepare for the medium and long term.

CDP is actively supporting institutional investors in their discussion with Electric Utilities companies and will provide additional information, support and coordination when needed.

A) Carbon risk: Exposure to carbon risk is directly linked to cost of meeting regulatory demand

- 1) Set up clear, strong, long term emission reduction targets, both absolute and intensity, in line with the methodology of Science-Based Targets' Sector-based Decarbonisation Approach (SDA), which sets a meaningful emissions-reduction target in 2050 and suggests an emissions pathway for each company. Emission reductions are key to meeting existing regulatory requirements, being prepared for future requirements and providing economic solutions for customers;
- 2) Demonstrate targets and progress to achieve emission reductions;
- 3) Demonstrate a strategic use of an internal price of carbon.

B) Renewable Energy Sources (renewables) Assessment of utilities' renewables portfolio to capture the opportunity of renewables

- 1) Demonstrate a clear strategy to increase production from renewables;

C) Coal exposure: Exposure to coal, especially inefficient coal, and the risk of stranded coal assets

- 1) Demonstrate a clear strategy to shift from coal fired assets to lower carbon assets;
- 2) Increase disclosure on the different grades of coal plants, including the sub-critical coal plants .

D) Water risk: Potential physical risks may constrain the growth of the power generation business

- 1) Demonstrate your awareness of water risks and opportunities and how these could affect the success of your organization's growth strategy;
- 2) Set up clear, strong, long-term water targets and increase the quality and availability of water accounting data at river basin level.

For engagement facilitation support please contact us at investor@cdp.net.

We use a traffic light system for each metric to highlight areas of engagement focus for each utility:

Green = good performance

Amber = monitor performance, possible concern

Red = area of concern, engage with company

We have not assigned a uniform number of green, amber and red across the metrics according to rank. Instead, we have reviewed the results of each metric in detail and assigned the above colours according to the underlying quantities for each metric.

Hydro is included in the renewables analysis for the SLT from a technical perspective; however, there are no specific actions for engagement (as it is a mature industry), so we exclude it from our traffic light system below.

Engagement area:		Carbon risk				Renewable Energy Sources				Coal exposure				Water risk				Number of RGA								
SLT rank	Company	Country	Overall carbon risk rank	Carbon cover	Emissions intensity	Reduction in emissions intensity	Progress towards targets	Renewables weighted rank	Production as % total	Increase in installed capacity	Increase in installed capacity versus domestic market	Renewables country attractiveness	Overall coal exposure rank	Production as % total	Reduction in installed capacity	% sub-critical coal plant by production	% sub-critical coal plant by capacity	Overall water risk rank	Water strategy	Supply chain management	Risks and opportunities	Water accounting	Targets and goals	Green	Amber	Red
1	Iberdrola	Spain	2	4	3	3	1	2	2	12	5	5	4	5	2	11	12	1	1	2	1	1	1	14	0	3
2	Centrica	UK	1	1	4	1	2	6	7	2	7	3	1	1	1	1	1	3	8	3	3	2	1	14	2	1
3	Verbund	Austria	3	3	1	8	4	11	12	1	1	11	2	2	9	2	2	n/a	n/a	n/a	n/a	n/a	n/a	7	2	3
4	Enel	Italy	6	5	9	6	6	5	4	5	6	10	7	9	7	4	4	4	3	5	7	6	1	2	13	2
5	EDP	Portugal	7	8	5	12	5	1	1	11	8	4	9	8	9	7	9	2	5	1	6	2	1	5	9	3
6	EDF	France	5	7	2	5	3	10	11	4	3	8	3	4	6	10	10	5	7	4	2	10	1	7	6	4
7	Fortum	Finland	4	2	6	2	9	12	10	3	11	13	5	3	12	12	13	10	10	10	10	4	10	4	3	10
8	GDF Suez	France	8	6	11	9	13	9	8	7	4	6	8	7	13	6	3	7	1	5	9	5	7	3	9	5
9	E.ON	Germany	9	11	10	4	6	4	5	6	2	2	11	10	3	9	11	9	9	9	4	7	7	3	7	7
10	Endesa	Spain	10	9	7	12	12	13	13	13	13	9	6	6	11	5	7	5	4	5	8	7	1	2	8	7
11	SSE	UK	11	10	12	10	8	3	3	8	12	7	13	12	8	12	8	11	10	10	10	11	10	1	5	11
12	EnBW	Germany	12	12	8	11	11	8	9	9	9	1	10	11	5	3	6	n/a	n/a	n/a	n/a	n/a	n/a	2	4	6
13	RWE	Germany	13	13	13	7	10	7	6	10	10	12	12	13	4	8	5	8	5	5	5	5	7	1	9	7

Weighting: Metric 50% 20% 10% 20% 60% 10% 10% 20% 60% 20% 10% 10% 20% 15% 20% 20% 25% 20%

Area (i) 50% **10%**

Adjusted area (ii) 55% **15%** **17%**

Notes:

- (i) Does not equal 100% as we have excluded hydro (overall weight 5%) and CDP performance band (5%) from our engagement topics
- (ii) Slightly different weighting applied for EnBW and Verbund as they are not assessed in water risk

Source: CDP

Coal exposure: engagement areas through traffic light system

SLT rank	Company	Country	Overall coal exposure rank	Production as % total	Reduction in installed capacity	% SCP by production	% SCP by capacity
2	Centrica	UK	1	1	1	1	1
3	Verbund	Austria	2	2	9	2	2
6	EDF	France	3	4	6	10	10
1	Iberdrola	Spain	4	5	2	11	12
7	Fortum	Finland	5	3	12	12	13
10	Endesa	Spain	6	6	11	5	7
4	Enel	Italy	7	9	7	4	4
8	GDF Suez	France	8	7	13	6	3
5	EDP	Portugal	9	8	9	7	9
12	EnBW	Germany	10	11	5	3	6
9	E.ON	Germany	11	10	3	9	11
13	RWE	Germany	12	13	4	8	5
11	SSE	UK	13	12	8	12	8
Weighting:	Metric			60%	20%	10%	10%
	Area (i)		15%				

Notes:

(i) 17% weighting for EnBW and Verbund as they are not assessed in water risk

Source: CDP

Water risk: engagement areas through traffic light system

SLT rank	Company	Country	Overall water risk rank	Water strategy	Supply chain management	Risks and opportunities	Water use intensity	Targets and goals
1	Iberdrola	Spain	1	1	2	1	1	1
5	EDP	Portugal	2	5	1	6	2	1
2	Centrica	UK	3	8	3	3	2	1
4	Enel	Italy	4	3	5	7	6	1
10	Endesa	Spain	5	4	5	8	7	1
6	EDF	France	5	7	4	2	10	1
8	GDF Suez	France	7	1	5	9	5	7
13	RWE	Germany	8	5	5	5	9	7
9	E.ON	Germany	9	9	9	4	7	7
7	Fortum	Finland	10	10	10	10	4	10
11	SSE	UK	11	10	10	10	11	10
12	EnBW (i)	Germany	n/a	n/a	n/a	n/a	n/a	n/a
3	Verbund (i)	Austria	n/a	n/a	n/a	n/a	n/a	n/a
Weighting:	Metric			20%	15%	20%	25%	20%
	Area		10%					

Notes:

(i) EnBW and Verbund are not assessed in water risk

Source: CDP

Design and production



www.productionstudios.co.uk

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