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The Carbon Underground 2015 Edition

The World's Top 200 Public Companies,
Ranked by the Carbon Content of their Fossil Fuel Reserves

February 2015



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Executive Summary

The Carbon Underground 2015 identifies the 200 largest public coal, oil, and gas companies based on estimates of the potential CO₂ emissions of their reported reserves as of October 31, 2014. The reserves of these companies total 555 gigatons (Gt) of potential CO₂ emissions, almost five times more than can be burned for the world to have an 80% chance of limiting global temperature rise to 2°C (3.6° F).

In the year since we introduced The Carbon Underground 200™, an increasing number of institutions and individuals have recognized the growing risk that most fossil fuel reserves cannot be used and thus could become “stranded,” and have taken steps to reduce their holdings of coal, oil, and gas investments. These actions coincided with a collapse in oil prices in 2014, which impacted capital expenditures on high-cost energy projects and increased stranded asset risks. The oil price decline also increased the possibility of the introduction of carbon taxes and cuts in subsidies to the fossil fuel industry.

The CO₂ emissions potential of the reserves of the world's 200 largest public fossil fuel companies grew during 2014 by 9 Gt CO₂. This is equivalent to adding another PetroChina - the world's third largest public oil and gas company – to the industry. Since year-end 2010, total reserves-based emissions increased by more than 10%, rising by 52 Gt CO₂. A handful of companies accounted for more than the full share of this gain. In the coal industry, 10 companies expanded reserves-based emissions by a combined 50 Gt CO₂ since 2010. Meanwhile, 10 oil and gas companies together increased reserves-based emissions by 11 Gt CO₂ during the same period.

Historically low oil prices will likely reduce the portion of resources defined as proven reserves, and consequently the composition of The Carbon Underground 200 will change this year. Reserves are typically reported on an annual basis and oil prices have not yet had a major impact on list composition except in the case of mergers and acquisitions.

Introduction

In the past year, investors have focused increasingly on the climate and financial risks of investing in oil, gas, and coal companies. More institutions are examining their stranded asset risks, measuring the carbon intensity of their portfolios, and reducing exposure to fossil fuel companies. Asset managers are developing solutions to reduce carbon risks and to realign investments with the transition to a low carbon economy. Among the developments in recent months that helped advance the thinking on carbon risks and fossil fuel investments:

- More than 180 institutions and over 650 individuals holding over \$50 billion of assets publicly have committed to divest from fossil fuel investments as of September 2014. Divestment is increasingly perceived as a way to reduce financial risks and to protect the long-term results of investment portfolios, in line with fiduciary responsibilities of asset owners and managers.
- The sharp decline in the price of oil during 2014 has impacted capital expenditure plans in high-cost oil projects, hurt the value of fossil fuel investments within portfolios, and magnified stranded asset risks. It also opened an opportunity to cut subsidies to the fossil fuel industry and introduce carbon taxes, which would transform the economics of fossil fuel investments.¹ At least 27 nations are decreasing or ending their subsidies to lower the cost of fossil fuels to generate electricity.²
- Concern for stranded asset risks has spread to key decision-makers. Most notably, the Bank of England widened its inquiry into stranded assets related to fossil fuel reserves and their potential financial stability risks.³
- Governments are taking meaningful action to tackle climate change, increasing the likelihood of stranded assets for the fossil fuel industry. The US and China announced a climate agreement to address emissions and increase the share of non-fossil fuels in energy consumption. In addition, the US Environmental Protection Agency proposed the Clean Power Plan to reduce carbon emissions from power plants by 30% by 2030, which will accelerate the shift from fossil fuel power generation to renewable energies.
- Institutions are pushing to measure carbon footprints and to reduce the carbon intensity of their portfolios, which will reduce exposure to fossil fuel investments. The Portfolio Decarbonisation Coalition – comprised of major asset owners and managers and steered by The United Nations Environment Programme Finance Initiative – aims to decarbonize \$100 billion of equity investments in time for the United Nations Climate Conference (COP21) in Paris at the end of 2015.⁴
- Along similar lines, a group of institutional investors with \$500 billion in combined assets took the Montreal Carbon Pledge, promising to measure and disclose the carbon footprint of their portfolios, and take action using that information. The Montreal Pledge, sponsored by the Principles for Responsible Investment (PRI), intends to attract \$3 trillion in commitments by the time of the COP21.
- Climate change awareness is evolving rapidly and influencing stranded asset risks. Recent examples of this evolution include an October 2014 Pentagon report asserting that climate change poses an immediate threat to national security;⁵ Pope Francis warning on dangers of climate change and urging 1.2 billion Catholics to take action;⁶ and not least, the attendance of hundreds of thousands at the People's Climate March in New York in September.⁷

As these changes take place, the potential CO₂ emissions from the reserves of public coal, oil, and gas companies continue to grow. In the following sections, we focus on some of the key developments mentioned above that are driving greater attention to the reserves of fossil fuel companies. On page 9, we detail The Carbon Underground 200 list and the activities of constituent companies in recent years.

UNBURNABLE CARBON AND STRANDED ASSETS

The carbon budget and the potential for stranded assets in the energy sector continue to attract attention from climate scientists, financial analysts, and investors. A “carbon budget” is the volume of CO₂ emissions that cannot be exceeded in order to avoid global warming in excess of a target threshold. A “stranded asset” is an asset that becomes obsolete or non-performing but must be recorded on the balance sheet as a loss— in this case, fossil fuel deposits that cannot be extracted and sold due to regulation, market forces, legislation, disruptive innovation, or societal norms.

According to new research from University College London, one-third of oil reserves, one-half of gas reserves, and over 80% of coal reserves must remain unused through 2050 to have a 50% chance of meeting the 2°C warming limit.⁸ If we want a more comfortable 66% chance of meeting the target, or an even better 80% chance, the amount of reserves that must remain unburned is even higher.

The research identifies the sources of reserves that are most likely to be stranded. Higher cost fuels would be priced out of use. As a result, a larger proportion of inexpensive conventional oil will be burned, but higher cost unconventional sources such as Canadian tar sands, Chinese shale gas, and practically all of the oil in the Arctic Circle cannot be used. Also, 85% of Canadian oil and 92% of US coal reserves cannot be burned, while 66% of Chinese and Indian coal reserves cannot be burned.

Stranded assets are expected not only if oil prices stay low – which renders high cost projects uneconomic – but also in a scenario of sustained higher oil prices, which would accelerate the transition to renewable energy.⁹ The British energy secretary suggested that fossil fuels could be the “sub-prime assets of the future” and a risk to pension funds, while the former head of BP, Lord Browne, stated that the traditional energy industry faces an “existential threat” from climate change.¹⁰

THE DIVESTMENT MOVEMENT

The growth of the fossil fuel divestment movement, mobilized by advocacy groups such as 350.org, has raised awareness of the risks of owning oil, gas, and coal companies, and encouraged many institutional investors to take action.

Divest-Invest, an initiative comprising of foundations and individuals committing to divest from fossil fuels – and to reinvest in renewables, clean tech, and other climate-change-mitigating innovations – has grown to more than 70 philanthropies with nearly \$5 billion in assets.¹¹

The movement is also accelerating outside of the foundation world. As of September 2014, 180 institutions and more than 650 individuals representing over \$50 billion in assets either had divested or had committed to divest from fossil fuels; the number of institutions jumped from just 74 at the beginning of 2014.¹² According to 350.org, 25 universities, 39 cities and counties, and 69 religious institutions had plans to divest as of February 2015.¹³

Among these commitments, the Rockefeller Brothers Fund announced a two-step process to divest from fossil fuels, focusing first on coal and tar sands – some of the most intensive sources of carbon emissions – and then analyzing their exposure to any remaining fossil fuel investments for further divestment over the next few years.¹⁴

The movement is expanding not only in the US but also in Europe and around the world. In October 2014, Glasgow University became the first European academic endowment to divest from fossil fuels.¹⁵ Norway’s largest pension fund, KLP, also announced it would divest from coal companies,

pulling \$70 million from the segment.¹⁶ Sweden's \$33 billion Second AP Fund said it was reducing its financial risk in fossil-fuel based energy, excluding 12 coal and eight oil and gas production companies that accounted for more than \$100 million in holdings, "to protect its long-term return on investment".¹⁷

At the climate change summit in Copenhagen in November, UN Secretary- General Ban Ki-moon urged pension funds, insurance companies, and similar companies to reduce their investments in a fossil fuel based economy and shift to renewable sources of energy.¹⁸

Most recently, Norway's Government Pension Fund Global (GPF), the world's largest sovereign wealth fund controlling \$850 billion in assets, revealed in its first responsible investing report that it had sold off 32 coal mining companies from its portfolio in 2014, noting the risk they face from regulatory action on climate change. In total, 114 companies were removed for environmental and climate reasons, which included tar sands producers, cement makers and gold miners, in addition to the coal producers.¹⁹

PORTFOLIO DECARBONISATION AND THE MONTREAL PLEDGE

Two initiatives announced in September 2014 support the development of portfolio carbon footprint analysis, reductions in the carbon intensity of managed assets, and the reallocation of assets away from fossil fuel companies.

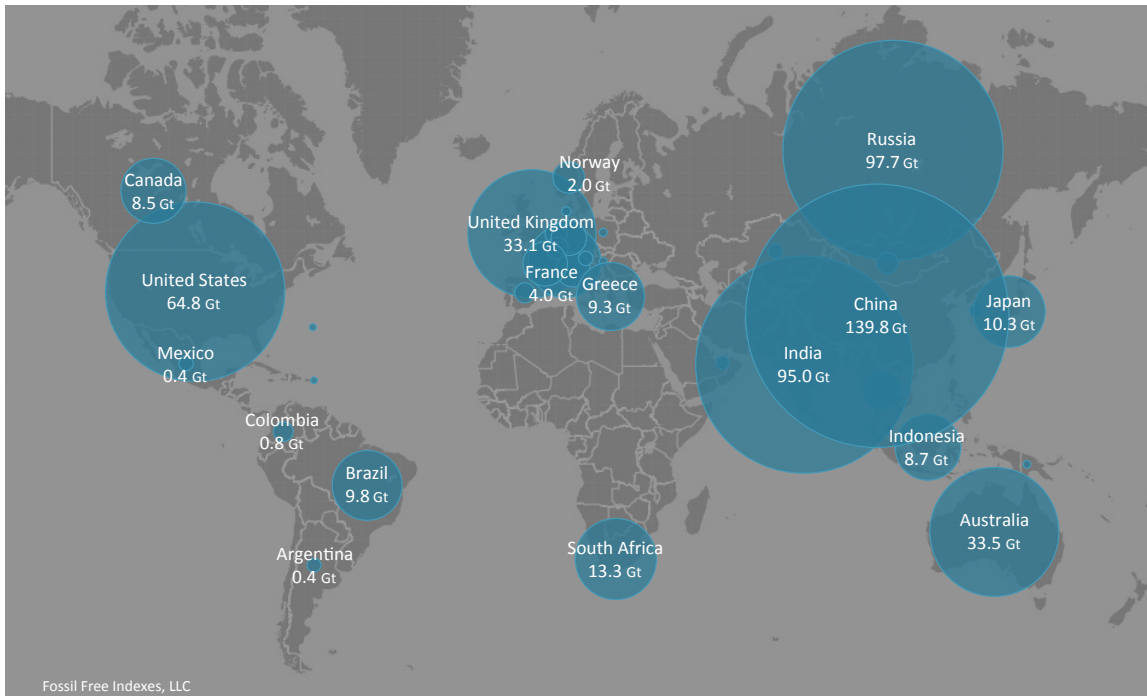
The Portfolio Decarbonisation Coalition (PDC) was formed by a group of institutional investors and asset managers along with the United Nations Environment Programme Finance Initiative (UNEP FI). It seeks to promote the measurement and disclosure of carbon footprints, and to reduce the carbon intensity of investment portfolios. The PDC intends to get commitments to decarbonize at least \$100 billion of institutional equity investments before the end of 2015.²⁰

Several institutional investors also signed the Montreal Carbon Pledge at the Principles for Responsible Investment (PRI) summit, committing themselves to measure and disclose the carbon footprint of their investments annually, and to develop an engagement strategy and/or set carbon footprint reduction targets.²¹ Overseen by the PRI, the Montreal Carbon Pledge aims to attract \$3 trillion of portfolio commitment before the end of the year. Signatories now represent more than \$1 trillion in assets under management, and include institutional investors such as CalPERS, the University of California, PGGM Investments in the Netherlands, Sweden's national pension funds (AP4, AP3, and AP1), Fonds de Reserve pour les Retraites (FRR) in France, and Australian Ethical Investment.

Carbon footprint analyses would be more comprehensive if they included not only current emissions of companies across industries, but also potential future emissions from the reserves of fossil fuel companies. As suggested by UNEP FI, carbon footprinting could be enhanced by incorporating a potential "Scope 4" measurement for carbon embedded in reserves.²² In September, FFI published [The CalPERS Portfolio and Fossil Fuel Reserve-Related Emissions, 2004-2013](#), an example of ways to use data on The Carbon Underground 200 to deepen the analysis of carbon risks and reserves-based footprints in portfolios.

Developments in The Carbon Underground 200

Figure 1. Top Countries Mapped by Company Headquarters 2015
Total Coal, Gas, and Oil Reserve Emissions Potential (GT CO₂)



The Carbon Underground 200 represents the top publicly traded companies globally, ranked by the carbon emissions potential of their reported fossil fuel reserves. The total potential CO₂ emissions from these reserves now exceed 555 Gt, 1.7% higher than last year and almost 10% greater than year-end 2010. Potential emissions from coal reserves increased by 5.6 Gt in the past year, compared with a 3.8 Gt rise in potential emissions from oil and gas reserves. The methodology used in the construction of the list can be found on page 16.

Figure 2. Potential Emissions from the Reserves of The Carbon Underground 200 (Gt CO₂)

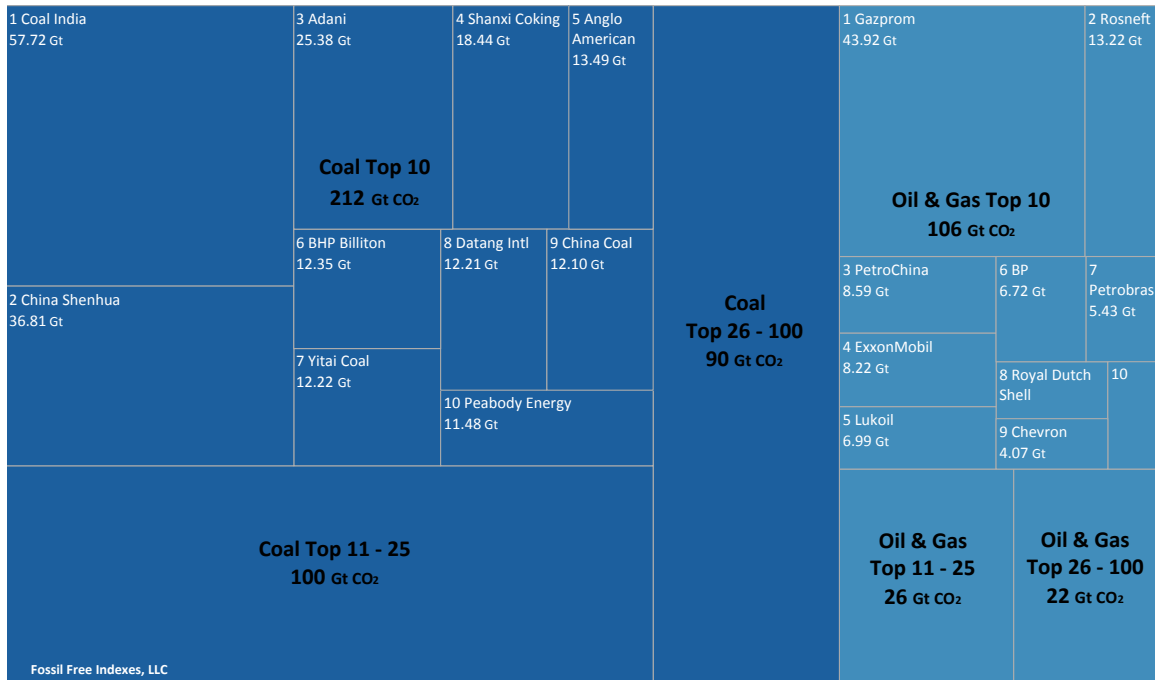
	2010	2014	2015	1 Yr Chg	1 Yr % Chg	Chg from 2010	% Chg from 2010
Coal	358	396	402	5.6	1.4%	43.6	12.2%
Oil & Gas	146	150	154	3.8	2.5%	8.1	5.6%
Total	504	546	555	9.4	1.7%	51.7	10.3%

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Significant movement and changes in the companies on the current list has occurred over the years. Merger and acquisition activity, bankruptcy, privatization, and nationalization, along with ongoing reserves discoveries and better reserves reporting, have all impacted the rankings. During the past year, three companies have changed on the coal list, and seven companies have changed on the oil and gas list.

Overall, a total of 29 companies have entered the list since year-end 2010, with 26 companies already on the list moving up in the rankings by 10 or more spots, and 11 companies already on the list moving down 10 or more.

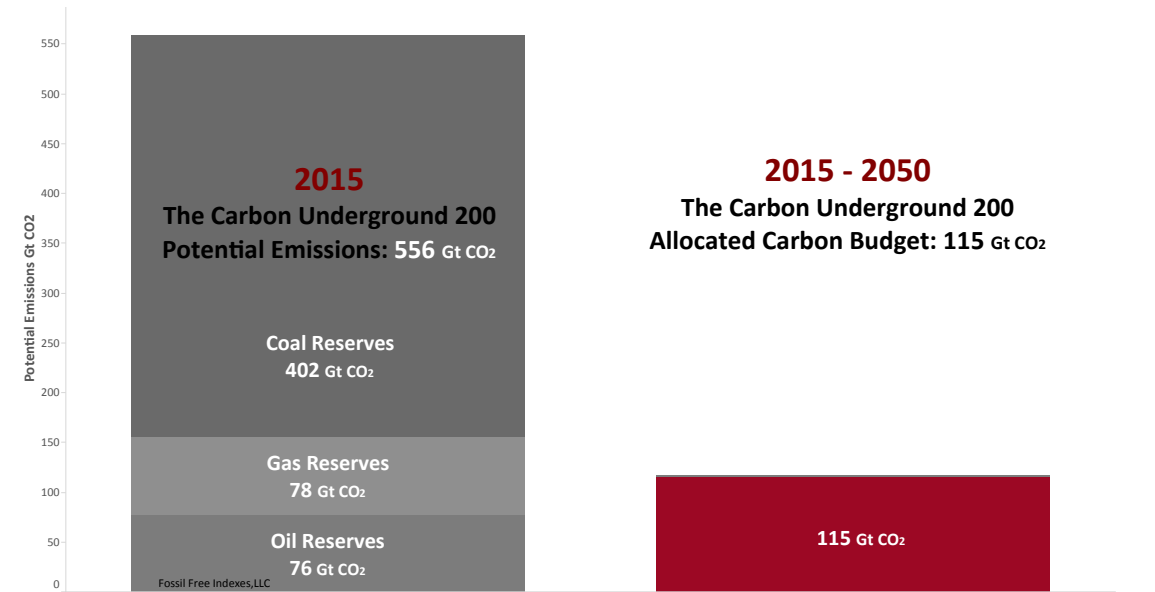
Figure 3. Relative Rankings of the Carbon Underground 200



Comparing the reserves held by the top 200 public fossil fuel companies, with total global fossil fuel reserves, yields an allocated global carbon budget of 115 Gt CO₂ for The Carbon Underground 200. This budget is based on IPCC models and assumptions that will limit global warming to 2° C above preindustrial levels with an 80% probability.

The total CO₂ emissions potential of the reserves of the 200 largest oil and gas and coal companies in this report is 556 Gt. These potential CO₂ emissions embedded in the reported reserves of The Carbon Underground 200 exceed the allocated carbon budget by almost 500%.

Figure 4. 2015 Carbon Underground 200 Potential Emissions vs Allocated Carbon Budget



The Carbon Underground 200™

Rank	Coal Companies	Coal Gt CO ₂	Rank	Oil and Gas Companies	Oil Gt CO ₂	Gas Gt CO ₂	Total O&G Gt CO ₂
1	Coal India	57.722	1	Gazprom	6.749	37.166	43.915
2	China Shenhua	36.807	2	Rosneft	10.666	2.558	13.224
3	Adani	25.383	3	PetroChina	4.790	3.801	8.591
4	Shanxi Coking	18.445	4	ExxonMobil	4.307	3.916	8.223
5	Anglo American	13.488	5	Lukoil	5.699	1.288	6.988
6	BHP Billiton	12.351	6	BP	4.214	2.506	6.719
7	Yitai Coal	12.223	7	Petrobras	4.707	0.724	5.432
8	Datang Intl	12.206	8	Royal Dutch Shell	2.229	2.315	4.544
9	China Coal	12.103	9	Chevron	2.485	1.588	4.073
10	Peabody Energy	11.484	10	Novatek	0.497	3.356	3.853
11	Glencore Xstrata	10.698	11	Total	2.002	1.800	3.802
12	Datong Coal	10.281	12	ConocoPhillips	1.687	1.111	2.798
13	Yanzhou Coal	9.788	13	Tatneft	2.556	0.064	2.620
14	DEH	9.339	14	ONGC	1.594	0.862	2.457
15	Exxaro	8.793	15	ENI	1.366	0.990	2.356
16	Yangquan Coal	7.298	16	Statoil	0.981	1.004	1.985
17	Mechel	6.739	17	Sinopec	1.340	0.381	1.722
18	Arch Coal	6.513	18	CNOOC	1.175	0.373	1.548
19	Alpha Natural Resources	5.458	19	Occidental	1.024	0.303	1.327
20	EVRAZ	4.855	20	BG Group	0.533	0.588	1.122
21	Mitsubishi	4.738	21	Canadian Natural Resources	0.788	0.208	0.995
22	Vale	4.401	22	Anadarko Petroleum	0.482	0.502	0.984
23	Raspadskaya	4.084	23	Apache	0.569	0.400	0.969
24	Rio Tinto	3.696	24	Chesapeake Energy	0.269	0.639	0.909
25	Asia Resource	3.181	25	Inpex	0.541	0.367	0.908
26	Rusal	3.081	26	Bashneft	0.892	0.000	0.892
27	Neyveli Lignite	3.035	27	Devon Energy	0.381	0.507	0.889
28	Pingdingshan	3.023	28	BHP Billiton	0.333	0.521	0.854
29	Cloud Peak	2.753	29	Repsol	0.271	0.551	0.823
30	Sasol	2.731	30	Ecopetrol	0.607	0.167	0.774
31	Tata Steel	2.709	31	EOG Resources	0.497	0.275	0.772
32	AGL	2.704	32	Suncor Energy	0.713	0.003	0.715
33	Teck	2.603	33	Marathon Oil	0.538	0.146	0.683
34	Severstal	2.577	34	Hess	0.457	0.108	0.565
35	Coalspur	2.545	35	Imperial Oil	0.527	0.025	0.552
36	Kuzbass Fuel	2.504	36	Encana	0.081	0.467	0.548
37	Polyus Gold	2.294	37	Noble Energy	0.173	0.318	0.490
38	Energy Ventures	2.184	38	BASF	0.134	0.348	0.483
39	Whitehaven Coal	2.055	39	EQT	0.037	0.412	0.449
40	Banpu	2.040	40	Range Resources	0.134	0.309	0.443
41	Bayan	1.957	41	Continental Resources	0.312	0.113	0.426
42	RWE	1.943	42	OMV	0.269	0.151	0.420
43	Consol Energy	1.887	43	Antero Resources	0.042	0.368	0.410
44	WHSP	1.851	44	KazMunaiGas EP	0.382	0.018	0.400
45	Westmoreland	1.835	45	YPF	0.250	0.139	0.389
46	Resource Generation	1.818	46	Southwestern Energy	0.000	0.380	0.380
47	Churchill Mining	1.745	47	Cenovus Energy	0.326	0.048	0.374
48	NTPC	1.740	48	Linn Energy	0.199	0.164	0.364
49	Adaro	1.607	49	Woodside Petroleum	0.049	0.311	0.360
50	Nacco	1.557	50	Husky Energy	0.215	0.128	0.343

The Carbon Underground 200™

Rank	Coal Companies	Coal Gt CO ₂	Rank	Oil and Gas Companies	Oil Gt CO ₂	Gas Gt CO ₂	Total O&G Gt CO ₂
51	Idemitsu Kosan	1.530	51	PTT	0.106	0.211	0.317
52	ARLP	1.468	52	Consol Energy	0.000	0.312	0.312
53	Huolinhe Opencut	1.387	53	Pioneer Natural Resources	0.198	0.104	0.302
54	Golden Energy	1.354	54	Cabot Oil & Gas	0.011	0.289	0.300
55	Mitsui & Co	1.344	55	WPX Energy	0.072	0.203	0.275
56	CoAL	1.339	56	SK Innovation	0.263	0.000	0.263
57	NLMK	1.288	57	Whiting Petroleum	0.219	0.025	0.244
58	Tata Power	1.062	58	Murphy Oil	0.179	0.063	0.242
59	MMK OJSC	1.046	59	QEP Resources	0.094	0.139	0.233
60	Wesfarmers	1.011	60	Newfield Exploration	0.134	0.090	0.223
61	Kazakhmys	0.998	61	Dragon Oil	0.159	0.043	0.202
62	New World Resources	0.972	62	Sasol	0.115	0.085	0.201
63	MMC	0.903	63	Ultra Petroleum	0.014	0.186	0.200
64	Itochu	0.878	64	Santos	0.027	0.167	0.195
65	Cockatoo	0.800	65	Concho Resources	0.130	0.064	0.194
66	Shanxi Meijin Energy	0.784	66	Denbury Resources	0.164	0.027	0.190
67	Jizhong Energy	0.742	67	Freeport-McMoRan	0.152	0.031	0.183
68	Bandanna	0.731	68	Maersk Group	0.174	0.000	0.174
69	Polo Resources	0.726	69	MEG Energy	0.173	0.000	0.173
70	Allete	0.723	70	SandRidge Energy	0.081	0.076	0.157
71	CLP Holdings	0.696	71	Crescent Point Energy	0.146	0.011	0.157
72	Aspire	0.670	72	GDF SUEZ	0.044	0.111	0.155
73	Marubeni	0.568	73	Pacific Rubiales Energy	0.124	0.030	0.154
74	China Resources	0.567	74	SM Energy	0.084	0.065	0.148
75	Walter Energy	0.556	75	JX Holdings	0.146	0.000	0.146
76	Coal Energy	0.503	76	Cimarex Energy	0.074	0.070	0.144
77	Indika	0.485	77	Mitsui & Co	0.048	0.095	0.142
78	Arcelor Mittal	0.464	78	Penn West Petroleum	0.100	0.036	0.137
79	FirstEnergy	0.458	79	Polish Oil & Gas	0.033	0.100	0.132
80	Black Hills	0.431	80	MOL	0.076	0.055	0.131
81	Wescoal	0.430	81	Energen	0.088	0.039	0.128
82	Grupo Mexico	0.420	82	TAQA	0.066	0.057	0.123
83	ARM	0.383	83	Oil Search	0.026	0.088	0.114
84	Shanxi Coal	0.376	84	Oil India	0.062	0.051	0.113
85	Capital Power	0.367	85	ARC Resources	0.046	0.066	0.112
86	PTT	0.359	86	Genel Energy	0.107	0.000	0.107
87	Shanxi Lanhua Sci-Tech	0.338	87	Canadian Oil Sands	0.102	0.000	0.102
88	Fortune	0.328	88	Energy XXI	0.076	0.020	0.096
89	Cardero	0.323	89	PDC Energy	0.055	0.040	0.095
90	Zhengzhou Coal	0.319	90	Oasis Petroleum	0.084	0.010	0.094
91	SAIL	0.307	91	Tourmaline Oil	0.014	0.079	0.093
92	JSPL	0.301	92	Rosetta Resources	0.056	0.037	0.093
93	Shougang Fushan	0.299	93	RWE	0.030	0.063	0.093
94	Jingyuan	0.297	94	National Fuel Gas	0.018	0.071	0.088
95	Stanmore	0.287	95	Peyto E&D	0.008	0.079	0.088
96	Prophecy Coal	0.272	96	Xcite Energy	0.086	0.001	0.088
97	Cliffs Natural Resources	0.247	97	Tullow Oil	0.077	0.010	0.087
98	James River	0.195	98	Energi Mega Persada	0.016	0.069	0.085
99	CESC	0.185	99	Breitburn Energy Partners	0.053	0.028	0.081
100	Alcoa	0.180	100	Enerplus	0.043	0.037	0.080

The Carbon Underground Oil and Gas 100

Reserves-Based Emissions Rise 2.5% during a Year of Big Change for Oil

World energy markets have undergone drastic changes since the last publication of The Carbon Underground 200. Historically low oil prices will very likely reduce the share of resources defined as proven, and also shuffle the companies on the Carbon Underground list as deposits which are costly to extract are redefined from proven to probable or possible.

Total potential emissions for The Carbon Underground Oil and Gas 100 grew 2.5% in the past year to reach 154 Gt CO₂. Reserves are typically reported on an annual basis and oil prices have not yet had a major impact on list composition except in the case of mergers and acquisitions.

Emissions and Growth Concentrated at the Top

The oil and gas industry remains highly concentrated. The top five ranked companies, Gazprom, Rosneft, PetroChina, ExxonMobil and Lukoil account for over 50% of overall list emissions and much of the emissions growth. The bottom half of The Carbon Underground companies account for just over 5%. Industry concentration is likely to increase as low oil prices cause companies stressed due to high debt to become acquisition targets.

Rosneft increased potential emissions by a remarkable 1.19 Gt CO₂ during the past year, an amount that itself would rank #20 on The Carbon Underground Oil and Gas 100. The growth was achieved through the introduction of multistage hydraulic fracturing (i.e., fracking) – illustrating the impact of new technologies on reserves – as well as on the opening of new sections of existing fields and increased stakes in its Eastern Siberia Taas-Yuryakh project. In the past half decade, Rosneft has increased potential emissions by roughly 7 Gt CO₂.

Gazprom was a distant second in growth, with an increase of 0.375 Gt CO₂ last year—this amount on its own would rank it in the top 50 Carbon Underground companies. Gazprom's growth is attributable to developing offshore deposits off Sakhalin, a large island north of Japan with access to Asian markets. Sixth-ranked BP followed Gazprom in potential emissions growth, mostly attributable to a 19.75% stake in Rosneft.

Russia Leads Growth Despite Sanctions

The three companies with the greatest growth in emissions – Rosneft, Gazprom, and BP – are all affected by Western sanctions on Russia due to its military intervention in Ukraine. Sanctions bar western companies from participating in exploration or production in water deeper than 150 meters, or north of the Arctic Circle, and prevent them from production of non-conventional shale oil (any variety of fracking). Gazprom's Sakhalin project does not fall under the sanctions since it is offshore but not in deep water; nevertheless, the project is expected to have difficulty securing financing, as sanctions also bar Russian firms from access to international funds. BP has reduced dividends due to Rosneft's financial stress.

Western sanctions have impacted Rosneft more than Gazprom. Anxious to project a strong financial position, Rosneft has touted its capabilities with fracking existing fields and ordered a new fleet of Italian helicopters to service Arctic projects. Much of Rosneft's extraordinary growth over the last few years was fueled by borrowing, but the collapse of the ruble complicates Rosneft's ability to service its debt. Despite having made a \$7 billion debt payment in December, its bonds have been downgraded, and another \$6.9 billion payment is due in February. However, the weak ruble favors exporters, which earn in foreign currencies and expense in rubles: 77% of Rosneft's reserves are in oil and 93% of 2013 oil production was exported.

BP has increased its stake in Rosneft's Taas-Yuryakh field, which has made strong contributions to the reserves of both companies. However, Russian well-head tariffs are scheduled to increase this year, and domestic demand for petroleum products is expected to be flat.

Movers: Indonesia and Marcellus Shale

Energi Mega Persada (EMP) experienced the largest change in position, moving from #36 to #98. EMP is the star of the Bakrie group of consolidated companies, but consistently poor debt management has forced the sale of assets. Southwestern Energy, on the other hand, climbed upward, though its move was less drastic. Acquisitions in the Marcellus Shale gas field in the Eastern United States increased potential emissions 75% and moved Southwestern from #58 to #46. Interestingly, Italian multinational ENI reduced potential emissions more than Southwestern Energy increased potential emissions and only moved one place, ending up at #15. ENI's decrease is due to a reduction in Indonesian reserves and an exit from the Russian Arctic. Comparing the two companies, Southwestern's absolute emissions change was 20% less than ENI's but moved the company twelve spots. This demonstrates the concentration of potential emissions toward the top of the list.

Adds and Drops: Financially Driven

Antero Resources joins the list at #43 after an IPO on the New York Stock Exchange. Antero exploits Marcellus shale deposits in the Eastern US and Utica shale deposits in Ohio to extract natural gas primarily through fracking. Talisman Energy dropped from The Carbon Underground 200 after being acquired by Spanish multinational Repsol. The Talisman acquisition is the first change in the list caused by the drop in oil prices. Talisman's shale gas and conventional oil potential emissions moved Repsol up nine places to #29.

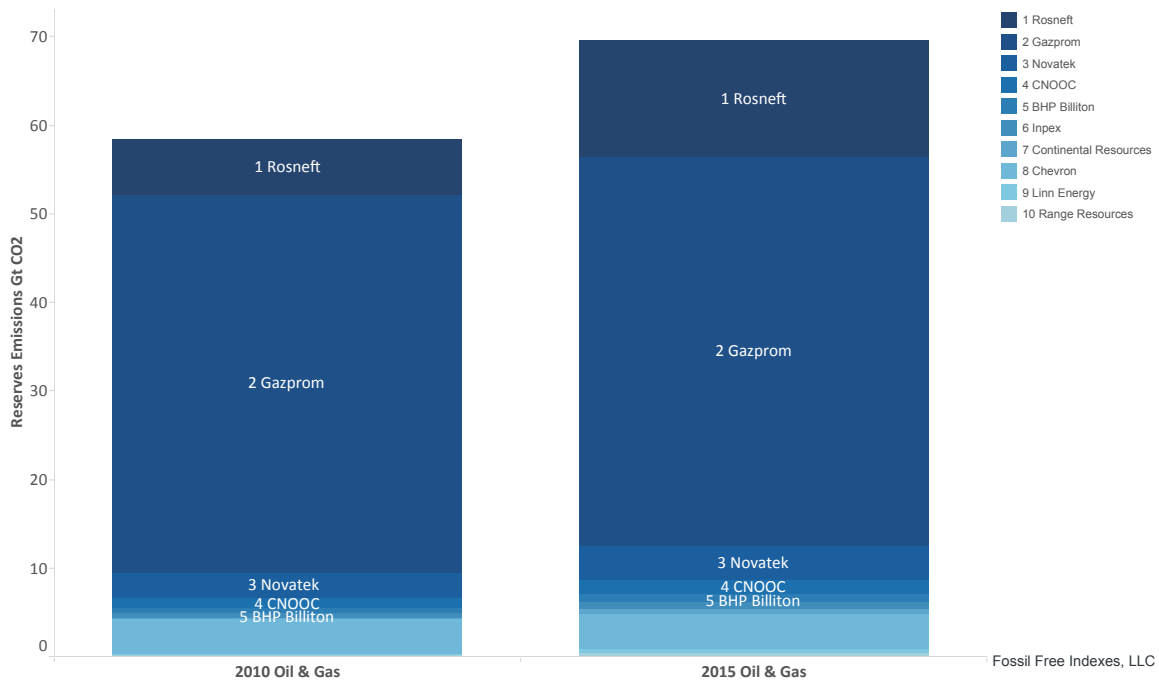
There were five additional company changes to The Carbon Underground Oil and Gas list. Breitburn Energy Partners rejoined the list at #99 after falling below #100 since 2007. Similarly, Enerplus Corporation rejoined at #100 after being absent since 2011. New to the list are Rosetta Resources at #92, Oasis Petroleum at #90, PDC Energy at #89 and Energy XXI at #88. All the companies dropped from the list were previously ranked in the 90's: Pengrowth Energy, Vermilion Energy, Quicksilver Resources, Petroceltic International, Forest Oil and Bonavista Energy.

Ten Oil and Gas Companies Drive More than 100% of Emissions Growth

Reserves-based emissions for The Carbon Underground Oil and Gas 100 have increased 6% since 2010, rising by 8 Gt CO₂. However, the 10 individual companies with the greatest increase together recorded an 11 Gt CO₂ addition to reserves-based emissions, representing a 19% expansion. Rosneft and Gazprom accounted for almost two-thirds of the top 10 companies' combined addition to reserves-based emissions.

Overall, since 2010, 69 oil and gas companies either increased reserves-based emissions or were added to The Carbon Underground list, representing 16 Gt CO₂ of additional reserves-based emissions. Meanwhile, 31 companies reduced emissions by a combined total of 2 Gt CO₂ and another 13 companies with 6 Gt CO₂ of reserve emissions fell off the list.

**Figure 5. Top 10 Oil & Gas Companies
Greatest Increase in Reserves-Based Emissions 2010-2015**



Conclusion: Reserves are Likely to Continue Growing

Reserves continue to grow, even though low oil prices are likely to shrink proven reserves and further consolidate the industry through mergers and acquisitions in the coming quarters. Over the last year, total emissions for the Carbon Underground Oil and Gas 100 grew primarily through the expansion of Russian reserves, which had a much greater effect than mergers and acquisitions or growth by smaller companies. In the coming year, mergers and acquisitions are likely to have a greater impact on total list emissions than shrinking reserves, or growth by smaller companies. As larger companies consolidate, spots open up further down the list for firms currently falling below 100.

The Carbon Underground Coal 100

Proposed Energy Shifts Putting Coal Fundamentals In Flux

China, along with other Asian countries (India, ASEAN), account for the majority of coal demand. Industry sources suggest that global coal demand will slow to a near halt in the 2020s, with demand reaching a peak in China, dropping by one-third in the United States, but continuing to grow in India.²³ Others note that forecasts have often been revised downward,²⁴ and that measures to reduce consumption and improve efficiency, a rapid increase in renewable and alternative energies, and slower economic growth are leading to a drop in China's coal consumption.²⁵

Thus, future coal mine development is considered to be at risk of becoming stranded, with high cost new mines unable to break-even at current prices.²⁶ Companies most exposed are those with new projects focused on the export market, with China as and India as key importers. China's intention to reduce coal imports could affect prices and asset values for export mines worldwide.

In other global markets, coal demand in the US and Europe will continue to decline, but this is offset by growth in Turkey, Korea, and Japan. The governments of China as well as Indonesia, Korea, Germany and India have announced policy changes that could affect coal market fundamentals, but the pace and impact of these changes remain uncertain for the near term.

Meanwhile, potential emissions by The Carbon Underground Coal 100 increased compared to last year, along with a net increase in the number of mines where reserves were reported. Although coal prices have declined mainly due to oversupply, some companies continue to operate mines at a loss, whereas others have offset the price decline by increasing operating efficiencies. In addition, many projects are ready to start or ramp up production when more economically favorable to do so.

Among the top 16 coal companies on the list, excluding Coal India with its reported reserves for 234 mines, the majority of mine ownership is highly concentrated in Asia and Australia, with South Africa a close third. Specifically, of the 356 mines reporting reserves owned by the top 16 coal companies excluding Coal India: 38% are in China, Indonesia and Mongolia; 32% are in Australia; 21% are in South Africa; 7% are in North America; and 2% are elsewhere.

Reserves-based Emissions Rise by Almost 6 Gt CO₂ in the Past Year

The potential emissions from coal reserves of The Carbon Underground increased by 5.6 Gt CO₂ last year, more than the amount from oil and gas reserves. However, because of the much higher base of existing potential emissions from coal reserves, this increase was a smaller 1.4% change from levels a year ago.

This gain can be primarily attributed to China Shenhua (#2 on the Carbon Underground Coal 100) reporting reserves for the Haerwusu Coal Mine in Inner Mongolia for the first time in 2014, which resulted in an increase of 5.3 Gt CO₂ in potential reserves-based emissions. The Haerwusu Mine has been in production since 2008.

Adds and Drops and Movers in 2014

Adds and drops during 2014 include the removal of Aquila Resources, which was acquired by Baosteel of China, a private company and the removal of Sherritt, which was purchased by Westmoreland. There was slight movement at the bottom of the list with the removal of NSSMC

and the addition of Alcoa (on the Carbon Underground Coal 100 from 2004 – 2012), CESC, and James River Coal (on The Carbon Underground Coal 100 from 2004-2012, then briefly again at the beginning of 2014).

Three companies on the list both years moved more than 10 places – Westmoreland from #65 to #45, Coalspur from #57 to #35, and Marubeni from #98 to #73.

Coal Emissions and Growth Remain Concentrated at the Top

While not as concentrated as the oil and gas industry –the top 10 companies combined account for 50% of total emissions in The Carbon Underground Coal 100 – the coal industry remains highly concentrated from a reserves-based emissions standpoint, with virtually all the emissions growth coming from #2 ranked China Shenua. The top 5 coal companies – Coal India, China Shenhua, Adani, Shanxi Coking, and Anglo American represent 38% of total list emissions and the bottom 50 on the list represent 8% of total list emissions.

The Galilee Basin: At Risk of Becoming the Largest Stranded Asset?

Continued efforts to develop new coal mines in the Galilee Basin in Australia are on a path to tap production from one of the largest coal deposits in the world. The implications for global coal supply, coal prices, and potentially stranded assets are enormous.

Although the Australian government has approved the development of coal mines in the Galilee Basin, the most recent election has paved the way toward a Labor party government which has vowed to stop coal-mine development in the Galilee Basin. However, the loss of public subsidies will not necessarily halt development, as Adani, #3 on The Carbon Underground Coal 100 list, has commented that it will continue to go forward.

Two of the coal mines under development in the Galilee Basin are owned by public companies: the Carmichael Coal Mine owned by Adani and the South Galilee Coal Mine, which is a joint venture between AMCI and Bandanna. The larger of these is the Carmichael mine. Infrastructure impediments to the transport of coal from the Carmichael mine may have been resolved with the approval of port and railroad projects, in addition to Australia's Queensland state commenting that it will pick up a "substantial stake" to fund these projects. In addition, the Queensland Government is reported to view the decision of Adani Group and Queensland Railway to work on an integrated east-west rail proposal for the Galilee Basin as providing an efficient supply chain for the region.

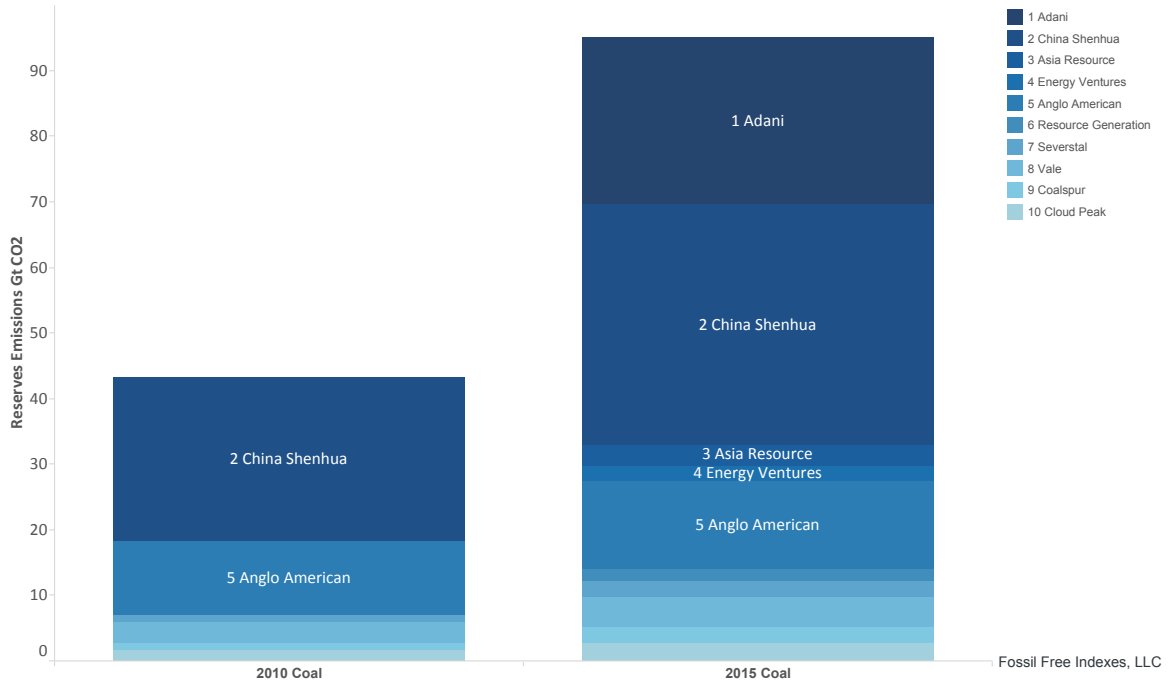
Concerns regarding the potential impact of the Galilee projects on the Great Barrier Reef have not subsided; nevertheless, the Australian government has granted the Carmichael Coal Mine and Rail infrastructure project environmental clearance. The US-based Institute for Energy Economics and Financial Analysis continues to raise issues pertaining to the development of coal mines in the Galilee basin, such as the Carmichael mine, whose purpose is specifically to export coal to India. With the development of domestic renewable energy in India and the relatively high cost of production of Australian coal, the risk of coal mine development for export to India is cited as a significant risk for investors.

Port facilities at Abbot Point are expected to serve as the port of export for coal sourced from the Galilee Basin. However, in October, three US investment banks ruled out financing the Abbot Point coal export project in Queensland, Australia, following the lead of five European banks earlier in the year – Deutsche Bank, Royal Bank of Scotland, HSBC, Barclays, and Credit Agricole.²⁷ In December, Societe Generale suspended its mandate to raise financing for another Galilee Basin project, GVK's Alpha Coal mine.²⁸

Ten Coal Companies Grew Reserves-Based Emissions by 50 Gt CO₂ Since 2010

The 10 companies on The Carbon Underground Coal 100 with the greatest increase in reserves-based emissions since 2010 together added 50 Gt CO₂ to the list. Adani Enterprises Ltd, a company headquartered in India that was not on the list in 2010, accounted for half of this increase, with the acquisition of coal mines in Australia’s Galilee basin. China Shenhua accounted for almost a quarter of the top 10 companies’ increase in reserves-based emissions. Energy Ventures and Resource Generation, like Adani, represent new additions to the list.

**Figure 6. Top 10 Coal Companies
Greatest Increase in Reserves-Based Emissions 2010-2015**



Methodology

INTRODUCTION

Fossil Free Indexes has used a reserves-based methodology to create The Carbon Underground 200™, a consistent listing of the top 100 public coal companies globally and the top 100 public oil and gas companies globally, ranked by the potential carbon emissions content of their reported reserves. This approach follows that of Meinshausen from the Potsdam Institute for Climate Impact Research.²⁹ It is largely consistent with the methodology reported to be the basis of the original list published by the Carbon Tracker Initiative in 2011 and used by the fossil fuel divestment campaign when it was launched in 2012.³⁰

RESERVES DATA SOURCES

The core data underlying The Carbon Underground 200 is based on reported reserves. For coal, SNL Metals & Mining (formerly IntierraRMG) with its Raw Materials Data Coal Database (“RMD Coal Database”) was selected as the primary provider of reserves information. For oil and gas, Evaluate Energy with its Global Oil & Gas Database (“EE Oil & Gas Database”) and CANOILS Database (“EE CANOILS Database”) was selected as the primary provider of reserves information.

In each case, data from these primary providers were checked against, and in some cases supplemented during the analysis with, data from publicly available primary sources and from other secondary data providers. The primary use of supplemental data was to provide support for estimating the kind of coal predominating in a mine.

RESERVES DEFINITIONS AND APPROACH

Coal reserves are reported in the RMD Coal Database as the sum of proven and probable reserves. Reserves are the economically mineable portion of a measured or indicated resource. The distinction between proven and probable reserves is the likelihood of extraction.

The reporting of reserves by coal mine on an annual basis is not consistent among companies with exchange listings, nor is it consistent for each mine in which a company has a controlling interest. Due to the sporadic reporting of reserves by listed companies, this analysis uses the last reported reserves amount by mine. Reserves were allocated to listed companies based on percentage ownership of individual mines.

Oil and gas reserves are distinguished between proven (1P) and proven and probable (2P). Proven reserves are defined in the oil and gas industry as having a 90% probability of near-term extraction, generally accepted to be within 10-15 years. Probable reserves are defined as having a 50% probability of extraction. This analysis uses proven reserves (1P) as the basis for ranking the top 100 oil and gas companies. Most oil and gas companies report proven reserves, while fewer than half of the public oil and gas companies report proven plus probable reserves. This research does not include any portion of probable oil and gas reserves, nor does it include any status quo assumptions of continued discovery and development to replenish oil reserves as they are utilized, both of which would increase the potential CO₂ emissions from these firms.

In order to maintain a consistent data set, oil and gas reserves data are represented net of royalty payments. Royalties are the government’s share of a company’s reserves, and vary by country and by project. The convention to represent reserves data net of royalties is consistent across all Evaluate Energy databases.

DATA COVERAGE

The calculations used to produce this second edition of The Carbon Underground 200™ are based on reserves data available as of October 31, 2014. Corporate actions through January 31, 2015 are included to ensure that all companies on the list were investable as of January 31, 2015.

The Carbon Underground Coal 100 covers 98% of proven and probable coal reserves from listed companies. The Carbon Underground Oil and Gas 100 covers 98% of proven gas reserves and 97% of proven oil reserves held by investable companies.

The majority of proven oil and gas reserves are held by state-controlled companies, whose data are unavailable to investors. However, some state-controlled companies do turn to the equity markets to raise capital. There are 21 state-controlled companies, accounting for about 60% of the total CO₂ emissions, in The Carbon Underground Oil and Gas 100.

EMISSIONS CALCULATION PROCESS

The Carbon Underground 200™ relies on the IPCC Revised 1996 Guidelines for National Greenhouse Gas Inventories³¹ as a methodological framework. The calculation of CO₂ emission potential requires several conversions to the raw reserves figures.

Categorization: Coal reserves are divided into five categories and petroleum reserves into four categories as follows:

Coal

- anthracite
- coking coal (metallurgical)
- other bituminous coal (thermal, PCI)
- sub-bituminous coal
- lignite

Petroleum

- oil
- natural gas liquids
- oil sands
- gas

In cases where the RMD database does not indicate the coal rank³² for a specific mine, all available sources of information are used to estimate the coal rank, including the coal use and the predominant rank of coal in the basin, the coalfield, the state or province, the region, and/or the country. In cases where none of these sources provided sufficient information to estimate the coal rank, the most common global coal rank, bituminous, was assumed.

Evaluate Energy reports oil and natural gas liquids in aggregate. Reported annual production figures for oil and for natural gas liquids are used to estimate the relative proportion of oil reserves to natural gas liquids reserves. Additionally, where proven (1P) reserves are unavailable (five of the top 100), they are estimated using proven and probable (2P) reserves and a ratio based on the mean relationship between 1P and 2P for the companies that report both.

Normalization: Coal reserves are universally reported in millions of tons. Petroleum reserves are reported in a variety of volume units. All reserves figures are converted into gigagrams using average factors specific to each type of fossil fuel.

Energy and Carbon Content Factors: Fossil fuels vary widely in energy potential and carbon content across reserve types. Following the IPCC framework, net calorific values are assigned to each reserve type, to convert mass into energy units. IPCC carbon content factors indicating the amount of carbon released during combustion are assigned based on reserve type.³³

CO₂ Emissions Calculation: Potential CO₂ emissions for reserves reported by each company are calculated based on the IPCC framework and the Potsdam Institute for Climate Impact Research formula $E = R \times V \times C \times F$,³⁴ where E = emissions, R is reserves, V is net calorific value, and C is carbon content. F is a conversion factor accounting for transforming carbon into carbon dioxide and converting grams to gigatons.

LISTED COMPANIES

Given the continual mergers and acquisitions, closures, delistings, and IPO activities in the coal, oil, and gas industries, this work is an ongoing best-efforts attempt at researching listed companies and basing the analysis on the latest available information. If subsidiaries are listed separately from their parent, and their reserves are reported separately from their parent, they are eligible to be included in The Carbon Underground 200™. Companies that publicly trade only a portion of their overall shares are eligible to be included, as well.

CONSTRUCTING THE CARBON UNDERGROUND 200 LIST

Separate rankings have been created for the top 100 public coal companies globally and the top 100 public oil and gas companies globally.³⁵ The rankings are based on calculated carbon emissions data using reserves reported as of October 31, 2014. The ranking is then adjusted based on company mergers and acquisitions following the most recent reserve reports.

DATA ACCURACY

Fossil Free Indexes has utilized best efforts to include the most recent and consistent data available. Reserves data and company ownership interest data are only as accurate and as timely as the data contained within company reports. While starting with reserves database suppliers, a data verification process including a check of a sample of data points against primary sources was conducted. Going forward, each update to the list will incorporate the most recent data available at the time.

Notes

1. See Lawrence Summers, "Oil's swoon creates the opening for a carbon tax," Washington Post, January 4, 2015. http://www.washingtonpost.com/opinions/oils-swoon-creates-the-opening-for-a-carbon-tax/2015/01/04/3db11a3a-928a-11e4-ba53-a477d66580ed_story.html
2. According to the International Energy Agency (IEA), at least 27 nations are decreasing or ending their subsidies to lower the cost of fossil fuels to generate electricity. <http://www.worldenergyoutlook.org/publications/weo-2014/>
<http://www.bloomberg.com/news/articles/2015-01-30/fossil-fuel-subsidies-fall-in-gain-for-renewables>
3. The Bank of England's position on stranded asset risks were communicated through letters from Mark Carney, the Governor of the Bank of England, to Joan Walley, Chair of the Environmental Audit Committee. <http://www.bankofengland.co.uk/pr/Pages/supervision/activities/climatechange.aspx>
4. To learn more about the UN's portfolio decarbonization initiative, see <http://unepfi.org/pdc/>
5. Department of Defense, "Strategic Sustainability Performance Plan" FY 2014. http://www.denix.osd.mil/sustainability/upload/DoD-SSPP-FY14-FINAL-w_CCAR.pdf
6. See, for example, Philip Pullella, "Papal text says man betrays God by destroying the environment," January 18, 2014. <http://www.reuters.com/article/2015/01/18/pope-philippines-environment-idUSL6N0UX00B20150118>
7. Haley Munguia, "How Many People Really Showed Up to the People's Climate March?" September 30, 2014. <http://fivethirtyeight.com/features/peoples-climate-march-attendance/>
8. McGalde and Ekins, "The geographical distribution of fossil fuels unused when limiting global warming to 2°C," Nature 517, 187-190, January 8, 2015. A preview of the report is available at <http://www.nature.com/nature/journal/v517/n7533/full/nature14016.html>
9. "Toil for oil spells danger for majors", Kepler Cheuvreux, September 2014. http://www.mayorsinnovation.org/images/uploads/pdf/Lewis_doc.pdf
10. Emily Gosden, "Fossil fuel investing a risk to pension funds, says Ed Davey," December 6, 2014. <http://www.telegraph.co.uk/finance/newsbysector/energy/11277546/Fossil-fuel-investing-a-risk-to-pension-funds-says-Ed-Davey.html>
11. The signatories are listed at <http://divestinvest.org/philanthropy/signatories/>
12. Arabella Advisors, "Measuring the Global Fossil Fuel Divestment Movement", 2014 <http://www.arabellaadvisors.com/wp-content/uploads/2014/09/Measuring-the-Global-Divestment-Movement.pdf>
13. 350.org maintains a list of institutions that have committed to divestment at <http://gofossilfree.org/commitments/>
14. Rockefeller Brothers Fund, "Divestment Statement," September 2014. <http://www.rbf.org/content/divestment-statement>
15. KLP press release, "KLP boosts investment in renewables and reduces in coal", November 20, 2014. <http://english.klp.no/about-klp/klp-boosts-investment-in-renewables-and-reduces-in-coal-1.28994>

16. KLP press release, "KLP boosts investment in renewables and reduces in coal", November 20, 2014. <http://english.klp.nott/about-klp/klp-boosts-investment-in-renewables-and-reduces-in-coal-1.28994>
17. AP press release, "Second AP Fund to divest holdings in a number of fossil-fuel based energy companies," October 20, 2014. <http://www.ap2.se/en/Financial-information/Press-releases/2014/second-ap-fund-to-divest-holdings-in-a-number-/>
18. Lindsay Sharman, "UN secretary advises pension funds to divest from fossil fuels," Pension Funds Insider, June 11, 2014. <http://unepfi.org/pdc/un-secretary-general-advises-pension-funds-to-divest-from-fossil-fuels/>
19. "World's biggest sovereign wealth fund dumps dozens of coal companies," The Guardian, February 2015. <http://www.theguardian.com/environment/2015/feb/05/worlds-biggest-sovereign-wealth-fund-dumps-dozens-of-coal-companies>
20. See the PDC website, <http://unepfi.org/pdc/>
21. See The Montreal Pledge website, <http://montrealpledge.org/>
22. UNEP FI, "Portfolio Carbon: Measuring, disclosing and managing the carbon intensity of investments and investment portfolios," June 2013. http://www.unepfi.org/fileadmin/documents/UNEP_FI_Investor_Briefing_Portfolio_Carbon.pdf
23. International Energy Agency (IEA), "World Energy Outlook 2014", November 2014. <http://www.worldenergyoutlook.org/publications/weo-2014/>
24. The Institute for Energy Economics and Financial Analysis (IEEFA). <http://www.carbon-tracker.org/wp-content/uploads/2014/09/Coal-Demand-IEEFA-complete.pdf>
25. Greenpeace Energy Desk, "Comment: China coal peak, what the IEA missed," December 2014. <http://energydesk.greenpeace.org/2014/12/17/china-coal-peak-iea-missed/>
26. Carbon Tracker Initiative, "Carbon supply cost curves: Evaluating financial risk to coal capital expenditures," September 2014. <http://www.carbontracker.org/report/carbon-supply-cost-curves-evaluating-financial-risk-to-coal-capital-expenditures/>
27. The Tree, "US banks join EU counterparts to steer clear of Australian coal," October 2014. <http://treealerts.org/type/alerts/2014/10/us-banks-join-eu-counterparts-to-steer-clear-of-australian-coal/>
28. The Australian Business Review, "Societe Generale 'suspends mandate' on Galilee coal project," December 2014. <http://www.theaustralian.com.au/business/latest/societe-generale-exits-galilee-coal-project/story-e6frg90f-1227148417588?nk=f02713b4d4d3648bcb-3307c805c77e50>
29. Malte Meinshausen, et. al., "Greenhouse gas emissions targets for limiting global warming to 2 degrees centigrade," Nature, 458:7242, April 30, 2009. A preview of the report is available at <http://www.nature.com/nature/journal/v458/n7242/full/nature08017.html>
30. Carbon Tracker, "Unburnable Carbon – Are the world's financial markets carrying a carbon bubble?" 2011. <http://www.carbontracker.org/report/carbon-bubble/>
31. The IPCC guidelines are available at: http://http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf
32. Coal rank is the industry term for type of coal based on the level of organic metamorphism or carbonization.

33. Both calorific and carbon content factors come from the IPCC Revised 1996 guidelines: http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf

34. The formula can be found in "Greenhouse gas emission targets for limiting global warming to 2°C," Nature 458 1158-1162, April 30, 2009. <http://www.nature.com/nature/journal/v458/n7242/extref/nature08017-s1.pdf>

35. Some of the top 100 coal and top 100 oil and gas companies are actually conglomerates and not fossil fuel companies, but their reserve ownership places them in the top 100.

Updates

Fossil Free Indexes will update The Carbon Underground 200™ quarterly and publish the updated list annually. Between annual publications, updates to the list will be available on a subscription basis, as will electronic versions of The Carbon Underground 200™ in Excel (including tickers and primary exchanges).

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For More Information

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- For information on portfolio-specific research that drills deeper into the risks associated with these owners of fossil fuel reserves, email Fossil Free Indexes at CU200@fossilfreeindexes.com.
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About Fossil Free Indexes

Fossil Free Indexes provides benchmarks, tools and research that support carbon-responsible investing. The company's focus is on climate risk and the development of broad market indexes ex-fossil fuels, defined in line with the divestment movement.

In June of 2014, FFI released the Fossil Free Indexes US (FFIUS). Based on the S&P 500 and screened to exclude the largest oil, gas, and coal companies as identified by The Carbon Underground 200™ list, the FFIUS is the first index to leverage the long-term growth of US large cap indexes while addressing the risk of a carbon bubble.

FFI indexes are used as benchmarks and licensed for funds, ETFs, and separate accounts, as the basis for investable products and strategies.



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