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Interviews with David Wheeler, architect of CARMA, are available November 13 & 14.
For TV producers, a B-roll is available.
Carbon Monitoring for Action (CARMA) database is available at http://www.CARMA.org

CGD Ranks CO_2 Emissions from Power Plants Worldwide

It Answers: How Green is Your Power?

WASHINGTON: Now for the first time, the CO_2 emissions of 50,000 power plants worldwide, the globe's most concentrated source of greenhouse gases, have been compiled into a massive new data base, called CARMA—Carbon Monitoring for Action.

The on-line database, compiled by the Center for Global Development (CGD), an independent policy and research organization that focuses on how the actions of the rich world shape the lives of poor people in developing countries, lays out exactly where the CO_2 emitters are and how much of the greenhouse gas they are casting into the atmosphere. It also shows which companies own the plants.

A research team, led by David Wheeler, a senior fellow at CGD, constructed the enormous database to help speed the shift to less carbon-intensive power generation – with the objective of minimizing global warming which is and will hurt poor people in developing countries first and worst. The CARMA data is arrayed on a user-friendly website: www.CARMA.org.

The database and its website rank individual power plants, plotting their location by latitude and longitude. The data for total power-related emissions can be displayed by cities, states or provinces, and countries. For the U.S., emissions data are also available for Congressional

districts, counties and metro areas, making it possible for the first time to compare total power-related emissions by locality.

Rankings of the 4,000 electric power companies in the world show which are the biggest carbon polluters, globally, nationally, and at sub-national levels. Company-level data include emissions and power generation for 2000 and 2007, as well as estimates of future emissions and power generation from planned expansions. Data will be updated regularly as facility ownership changes and new plants come online.

Power generation accounts for about one-quarter of total emissions of CO_2, the main culprit in global warming. But, until now, people concerned about climate change lacked information about the emissions of particular power plants and the identities of the companies that own them.

"CARMA makes information about power-related CO_2 emissions transparent to people throughout the world," says Dr. Wheeler, an expert in the use of public information disclosure to reduce pollution. "Information leads to action. We know that this works for other forms of pollution and we believe it can work for greenhouse gas emissions, too."

"We expect that institutional and private investors, insurers, lenders, environmental and consumer groups and individual activists will use the CARMA data to encourage power companies to burn less coal and oil and to shift to renewable power sources, such as wind and solar," Dr. Wheeler says. Earlier research by Wheeler and his co-authors showed that highly-polluting plants in China and Indonesia responded to pressure from neighboring communities and lenders by reducing pollution significantly after public disclosure of their emissions.

On a per capita basis, Australians are some of the largest CO_2 emitters in the world, producing more than 11 tons of power sector CO_2 emissions per person every year. Americans aren't far behind at more than 9 tons per person. Populous developing nations have far lower per capita emissions. For example, the average Chinese citizen produces 2 tons of CO_2 emissions from power generation annually, and Indians emit about half of one ton per person.

A recent study by William Cline, a joint senior fellow at CGD and the Peterson Institute for International Economics, predicts that agricultural productivity in developing countries will decline sharply by 2080, as crops in areas closer to the equator suffer from the effects of increased heat and drought. Averting such a disaster would require rapid emission reductions in the first half of this century. CARMA is intended to help speed the necessary emission reductions.

CARMA data come from government reports and often from the plants themselves. Where directly reported emissions data are lacking, the CARMA team has estimated emissions, with 90 percent or greater confidence, using a statistical model based on the type and age of plant, the type of fuel, and the amount of power generated.

The resulting information is displayed using a five-color rating system and differently sized circles based on the amount of power produced. CARMA highlights low-carbon power producers and flags dangerous emitters. Rankings range from nearly zero emissions, Green, to extremely dirty, Red.

“CARMA is unique, one of a kind—a world standard,” says CGD president Nancy Birdsall. “Never before has this kind of detailed information been made available on a global scale. Not only is it likely to catalyze action to cut emissions now, it also strengthens the knowledge base for monitoring any future international market-based agreement, whether a carbon tax or cap-and-trade. Let us hope it speeds the way to an agreement – which matters immensely for the well-being of hundreds of millions of people in developing countries.”

The U.S. Dirty Dozen

Globally, power generation emits nearly 10 billion tons of CO_2 per year. The U.S., with over 8,000 power plants out of the more than 50,000 worldwide, accounts for about 25 percent of that total or 2.8 billion tons. CARMA shows that the U.S.’s biggest CO_2 emitter is Southern Co. with annual emissions of 172 million tons, followed by American Electric Power Company Inc., Duke Energy Corp., and AES Corp.

Annually, the 12 biggest CO_2 polluting power plants in the United States are:

- The Scherer plant in Juliet, GA — 25.3 million tons
- The Miller plant in Quinton, AL — 20.6 million tons
- The Bowen plant in Cartersville, GA — 20.5 million tons
- The Gibson plant in Owensville, IN — 20.4 million tons
- The W.A. Parish plant in Thompsons, TX — 20 million tons
- The Navajo plant in Page, AZ — 19.9 million tons
- The Martin Lake plant in Tatum, TX — 19.8 million tons
- The Cumberland plant in Cumberland City, TN — 19.6 million tons
- The Gavin plant in Cheshire, OH — 18.7 million tons
- The Sherburne County plant in Becker, MN — 17.9 million tons
- The Bruce Mansfield plant in Shippingport, PA — 17.4 million tons
- The Rockport plant in Rockport, IN — 16.6 million tons

All are coal-fired power plants.

Low-carbon power comes mostly from nuclear and hydro plants, which do not emit CO_2, but do pose other potential environmental problems. The largest U.S. power plant to win a green rating for nearly zero CO_2 emissions is the Palo Verde nuclear plant near Phoenix, Arizona; it produces about 26 million megawatt-hours (MWh) of electricity per year. Other large plants that are emitting zero CO_2 but produce substantial electricity are:

- The South Texas plant in Wadsworth, TX — 20.9 million MWh
- The Limerick plant in Pottstown, PA — 20.8 million MWh
- The Vogtle plant in Wanyesboro, GA — 20.1 million MWh
- The Byron plant in Byron, IL — 20 million MWh
- The Braidwood plant in Braceville, IL — 19.8 million MWh

All are nuclear power plants.

According to CARMA data, the Ohio River Valley, the southeastern U.S. and Texas are the dirtiest regions in terms of CO_2 emissions. The least dirty CO_2 region is the West Coast, where much of the electric power is generated by nuclear and hydroelectric plants.

The state with the greatest CO_2 emissions from electricity generation is Texas (290 million tons), followed by Florida (157 million tons), Indiana (137 million tons), Pennsylvania (136 million tons), Ohio (133 million tons), Illinois (113 million tons), Kentucky (98 million tons), Georgia (92 million tons), Michigan (91 million tons) and Alabama (91 million tons).

The District of Columbia has the lowest power-related emissions (113,000 tons), followed by Vermont (437,000 tons), Idaho (1 million tons), Rhode Island (2.6 million tons); South Dakota (4.7 million tons); and Alaska (6 million tons).

At the county level, Walker County in Alabama, where power plants produce over 28 million tons of CO_2 each year, heads the list of CO_2 emitters. Grundy County in Illinois, with two large nuclear plants, and Taylor County in Texas, which relies almost exclusively on renewable resources, have nearly zero CO_2 emissions.

Browsing CARMA offers some surprising contrasts that show how different approaches to power generation can make huge differences in emissions. For example: The CO_2 output from power plants in California, with some 36 million people, is nearly the same as that of North Carolina, which has only one-quarter of California's population. North Carolina gets about half its power from coal; California relies on a mix of natural gas, hydro, nuclear power, and renewable energy.

Residents of Austin, Texas, including faculty and students of the University of Texas at Austin, have the highest-emitting power facility of any university town in the country, emitting some 400,000 tons a year.

The International Burden

Although no single country comes close to the 2.8 billion tons of CO_2 produced annually by the U.S. power sector, other countries collectively account for three-quarters of the power-related CO_2 burden. China comes second after the U.S. with 2.7 billion tons; followed by Russia – 661 million tons; India – 583 million tons; Japan – 400 million tons; Germany – 356 million tons; Australia – 226 million tons; South Africa – 222 million tons; the United Kingdom – 212 million tons; and South Korea – 185 million tons.

CARMA shows low power sector CO_2 emissions from Hungary, Algeria, Kuwait, Singapore, Belarus, Portugal, Chile, Denmark, and Brazil.

"High U.S. emissions are partly the result of high living standards but they also reflect differences in energy policy. Europeans, with comparable living standards, emit less than half the power sector CO_2 of the average American", says Dr. Birdsall.

One surprise in the data is that the biggest emitters of CO_2 in the world in absolute terms are located not in the rich world but in rapidly emerging economies with massive coal-fired plants.

Indeed, new research by Dr. Wheeler shows that even without CO_2 emissions from the high income countries, rapidly rising emissions in developing countries would put them on track to produce their own climate crisis in just 20 years.

	Company	Country	Tons of CO_2
1	HUANENG POWER INTERNATIONAL	China	292,000,000
2	ESKOM	South Africa	214,000,000
3	NTPC LTD	India	182,000,000
4	CHINA HUADIAN GROUP CORP	China	176,000,000
5	CHINA POWER INVESTMENT CORP	China	173,000,000
6	SOUTHERN CO	United States	172,000,000
7	AMERICAN ELECTRIC POWER CO INC	United States	169,000,000
8	E.ON AG	Germany	144,000,000

9	NORTH CHINA GRID CO LTD	China	123,000,000
10	RWE AG	Germany	108,000,000
11	DATANG INTL POWER GEN CO	China	108,000,000
12	DUKE ENERGY CORP	United States	108,000,000

“The CARMA data are a vivid illustration of the fact that rich countries and developing countries must work together to overcome the challenge of climate change,” says Dr. Wheeler. “Our research shows that although the rich world is still responsible for 60 percent of the carbon dioxide in the atmosphere, developing countries are catching up very quickly – and they will suffer the worst of the effects.”

Carbon emissions impose a huge cost on society by threatening the basic elements of life — access to water, food production, health and the environment. Economists have estimated these “social costs” at anywhere from $8 per ton to as high as $100 per ton of CO_2.

Investors are expected to respond quickly to the CARMA data. Many are already concerned about the possible impact of future regulations on power company profits—whether or not they are worried about climate change. For such investors, CARMA provides an easy way to check the potential carbon liabilities of firms in which they invest. CARMA includes links to stock market information for many publicly traded companies.

Investors who believe that society will eventually insist that CO_2 polluters pay part of the costs can easily calculate power firms’ potential liability by multiplying the number of tons of CO_2 emitted annually by a per-ton charge they think likely and subtracting the result from the company’s profits.

“Even if you assume a fairly low charge of about $20 per ton of CO_2, power producers that rely heavily on fossil fuels will have to shift rapidly toward renewable energy if they are to remain profitable,” Dr. Wheeler says.

By comparison, power companies that rely heavily on low-carbon technologies—hydropower, nuclear, wind, and solar—face fewer potential climate-related liabilities. CARMA makes it easy to find these companies: large power producers with low-carbon emissions intensity earn a large Green circle, while large power producers that emit a lot of CO_2 get a large Red circle.

CARMA's maps and geographical interface will be useful for states, cities, and counties that have pledged to reduce their carbon footprint. For example, CARMA will assist the nearly 700 US mayors who have signed the Mayors Climate Protection Agreement.

Jacob Scherr, Senior Attorney at the Natural Resources Defense Council, says that the data will be helpful to states and cities that want to cut emissions from local power plants as part of their climate change strategies. "Across the U.S., in the absence of federal action, many states and cities are eager to take action," he says. "This data will help state and local leaders to measure their progress."

* * *

Annexes

Table 1. Top-100 Highest CO_2-Emitting Power Plants in the United States

Table 2. Power Sector CO_2 Emissions by State

Table 3. Top-25 CO_2-Free Power Plants in the United States

Table 4. Top-100 Highest CO_2-Emitting Power Sectors by U.S. County

Table 5. Top-25 CO_2-Free Power Sectors by U.S. County

Map. Power Plants in the Continental United States

Table 6. Top-25 Highest CO_2-Emitting Power Plants Worldwide

Table 7. Top-50 Countries with Highest CO_2-Emitting Power Sectors

Table 1. Top-100 Highest CO_2-Emitting Power Plants in the United States

	Plant	City	State	Tons of CO_2
1	SCHERER	Juliette	Georgia	25,300,000
2	MILLER	Quinton	Alabama	20,600,000
3	BOWEN	Cartersville	Georgia	20,500,000
4	GIBSON	Owensville	Indiana	20,400,000
5	WA PARISH	Thompsons	Texas	20,000,000
6	NAVAJO	Page	Arizona	19,900,000
7	MARTIN LAKE	Tatum	Texas	19,800,000
8	CUMBERLAND	Cumberland City	Tennessee	19,600,000
9	GAVIN	Cheshire	Ohio	18,700,000
10	SHERBURNE COUNTY	Becker	Minnesota	17,900,000
11	BRUCE MANSFIELD	Shippingport	Pennsylvania	17,400,000
12	ROCKPORT	Rockport	Indiana	16,600,000
13	JIM BRIDGER	Point Of Rocks	Wyoming	16,500,000
14	LABADIE	Labadie	Missouri	16,400,000
15	MONTICELLO	Mount Pleasant	Texas	16,300,000
16	JEFFREY	Saint Marys	Kansas	16,300,000
17	INTERMOUNTAIN	Delta	Utah	16,100,000
18	MONROE	Monroe	Michigan	15,900,000
19	JOHN E AMOS	Saint Albans	West Virginia	15,300,000
20	ROXBORO	Roxboro	North Carolina	15,100,000
21	CRYSTAL RIVER 4&5	Crystal River	Florida	15,100,000
22	CROSS	Cross	South Carolina	15,000,000
23	FOUR CORNERS	Fruitland	New Mexico	14,800,000
24	PARADISE	Drakesboro	Kentucky	14,500,000
25	BIG CAJUN TWO	Ventress	Louisiana	14,300,000
26	HARRISON	Haywood	West Virginia	14,200,000
27	WH SAMMIS	Stratton	Ohio	13,800,000
28	BELEWS CREEK	Belews Creek	North Carolina	13,600,000
29	BALDWIN	Baldwin	Illinois	13,600,000
30	JM STUART	Aberdeen	Ohio	13,400,000
31	LIMESTONE	Jewett	Texas	13,300,000
32	SAN JUAN	Waterflow	New Mexico	13,000,000
33	HOMER CITY	Homer City	Pennsylvania	12,800,000

34	BARRY	Bucks	Alabama	12,800,000
35	MOUNT STORM	Mount Storm	West Virginia	12,700,000
36	MARSHALL	Terrell	North Carolina	12,600,000
37	PETERSBURG	Petersburg	Indiana	12,500,000
38	WHITE BLUFF	Redfield	Arkansas	12,400,000
39	COLSTRIP 3&4	Colstrip	Montana	12,300,000
40	GHENT	Ghent	Kentucky	12,200,000
41	EC GASTON	Wilsonville	Alabama	12,200,000
42	INDEPENDENCE	Newark	Arkansas	12,200,000
43	CENTRALIA	Centralia	Washington	12,100,000
44	CONEMAUGH	New Florence	Pennsylvania	12,100,000
45	FAYETTE	La Grange	Texas	12,000,000
46	LA CYGNE	Lacygne	Kansas	11,900,000
47	WELSH	Pittsburg	Texas	11,900,000
48	WANSLEY	Roopville	Georgia	11,900,000
49	MANATEE	Parrish	Florida	11,700,000
50	KEYSTONE	Shelocta	Pennsylvania	11,500,000
51	CRAIG	Craig	Colorado	11,400,000
52	GERALD GENTLEMAN	Sutherland	Nebraska	11,100,000
53	RM SCHAHFER	Wheatfield	Indiana	11,000,000
54	BIG BEND	Tampa	Florida	10,700,000
55	HUNTER	Castle Dale	Utah	10,600,000
56	COAL CREEK	Underwood	North Dakota	10,600,000
57	MUSKOGEE	Muskogee	Oklahoma	10,600,000
58	LARAMIE RIVER	Wheatland	Wyoming	10,100,000
59	KINGSTON	Harriman	Tennessee	10,100,000
60	ST JOHNS RIVER	Jacksonville	Florida	10,100,000
61	CARDINAL	Brilliant	Ohio	10,100,000
62	WIDOWS CREEK	Stevenson	Alabama	9,976,111
63	POWERTON	Pekin	Illinois	9,899,173
64	BELLE RIVER	East China	Michigan	9,884,783
65	SHAWNEE	West Paducah	Kentucky	9,851,850
66	BIG BROWN	Fairfield	Texas	9,841,515
67	SPRINGERVILLE	Springerville	Arizona	9,733,431
68	JH CAMPBELL	West Olive	Michigan	9,703,140
69	PLEASANT PRAIRIE	Pleasant Prairie	Wisconsin	9,689,624

70	MILL CREEK	Louisville	Kentucky	9,638,247
71	MARTIN COUNTY	Indiantown	Florida	9,484,494
72	HARRINGTON	Amarillo	Texas	9,460,767
73	JOPPA	Joppa	Illinois	9,222,084
74	PPL BRUNNER ISLAND	York Haven	Pennsylvania	9,117,831
75	VJ DANIEL	Escatawpa	Mississippi	9,094,414
76	CONESVILLE	Conesville	Ohio	9,059,955
77	PPL MONTOUR	Washingtonville	Pennsylvania	8,964,147
78	HATFIELDS FERRY	Masontown	Pennsylvania	8,958,911
79	SEMINOLE	Palatka	Florida	8,709,828
80	ZIMMER	Moscow	Ohio	8,597,428
81	WINYAH	Georgetown	South Carolina	8,585,641
82	JOLIET	Joliet	Illinois	8,585,475
83	COLUMBIA	Pardeeville	Wisconsin	8,565,041
84	MITCHELL	Moundsville	West Virginia	8,478,185
85	THOMAS HILL	Clifton Hill	Missouri	8,348,213
86	GORGAS TWO	Parrish	Alabama	8,257,516
87	KINCAID	Kincaid	Illinois	8,245,385
88	ANTELOPE VALLEY	Beulah	North Dakota	8,109,317
89	CHOLLA	Joseph City	Arizona	8,025,604
90	CLIFTY CREEK	Madison	Indiana	8,012,940
91	BRANDON SHORES	Curtis Bay	Maryland	7,928,767
92	GRDA	Chouteau	Oklahoma	7,925,736
93	NEWTON	Newton	Illinois	7,798,570
94	ST CLAIR	East China	Michigan	7,769,158
95	TOLK	Earth	Texas	7,756,687
96	JOHNSONVILLE	New Johnsonville	Tennessee	7,735,183
97	MOUNTAINEER	New Haven	West Virginia	7,726,502
98	NEW MADRID	New Madrid	Missouri	7,647,257
99	HARLLEE BRANCH	Milledgeville	Georgia	7,550,829
100	MIAMI FORT	North Bend	Ohio	7,546,313

Table 2. Power Sector CO_2 Emissions by State

	State	Tons of CO_2
1	Texas	290,000,000
2	Florida	157,000,000
3	Indiana	137,000,000
4	Pennsylvania	136,000,000
5	Ohio	133,000,000
6	Illinois	113,000,000
7	Kentucky	98,300,000
8	Georgia	91,500,000
9	Michigan	91,400,000
10	Alabama	90,700,000
11	West Virginia	88,600,000
12	Missouri	82,500,000
13	California	79,200,000
14	North Carolina	77,700,000
15	New York	69,600,000
16	Arizona	64,500,000
17	Tennessee	63,300,000
18	Louisiana	61,000,000
19	Oklahoma	57,000,000
20	Wisconsin	54,800,000
21	South Carolina	52,500,000
22	Virginia	49,700,000
23	Colorado	47,200,000
24	Wyoming	45,900,000
25	Kansas	43,500,000
26	Minnesota	43,500,000
27	Utah	41,900,000
28	Iowa	38,800,000
29	North Dakota	37,600,000
30	Arkansas	35,400,000
31	Maryland	33,600,000
32	New Mexico	32,800,000
33	Mississippi	30,900,000

34	Massachusetts	29,400,000
35	Nebraska	24,400,000
36	New Jersey	22,100,000
37	Nevada	20,800,000
38	Montana	20,300,000
39	Washington	19,600,000
40	Connecticut	13,400,000
41	Oregon	12,600,000
42	Hawaii	9,805,652
43	New Hampshire	8,619,268
44	Maine	7,817,319
45	Delaware	7,313,223
46	Alaska	5,951,978
47	South Dakota	4,680,446
48	Rhode Island	2,614,260
49	Idaho	1,060,886
50	Vermont	436,856
51	District of Columbia	113,248

Table 3. Top-25 CO_2-Free Power Plants in the United States

	Plant	City	State	MWh per Year
1	PALO VERDE	Phoenix	Arizona	26,000,000
2	SOUTH TEXAS	Wadsworth	Texas	20,900,000
3	LIMERICK	Pottstown	Pennsylvania	20,800,000
4	VOGTLE	Waynesboro	Georgia	20,100,000
5	BYRON	Byron	Illinois	20,000,000
6	BRAIDWOOD	Braceville	Illinois	19,800,000
7	PEACH BOTTOM	Delta	Pennsylvania	19,100,000
8	OCONEE	Seneca	South Carolina	19,000,000
9	LASALLE COUNTY	Marseilles	Illinois	18,800,000
10	CATAWBA	York	South Carolina	18,400,000
11	BROWNS FERRY	Athens	Alabama	18,300,000
12	COMANCHE PEAK	Glen Rose	Texas	18,200,000
13	MCGUIRE	Huntersville	North Carolina	18,200,000
14	GRAND COULEE	Grand Coulee	Washington	18,100,000
15	SEQUOYAH	Soddy Daisy	Tennessee	18,100,000
16	DC COOK	Bridgman	Michigan	16,600,000
17	ARKANSAS ONE	Russellville	Arkansas	15,900,000
18	SUSQUEHANNA	Berwick	Pennsylvania	15,800,000
19	HATCH	Baxley	Georgia	15,300,000
20	BRUNSWICK	Southport	North Carolina	15,300,000
21	DIABLO CANYON	Avila Beach	California	15,100,000
22	ROBERT MOSES-NIAGARA	Lewiston	New York	15,000,000
23	SAN ONOFRE	San Clemente	California	14,900,000
24	NORTH ANNA	Mineral	Virginia	14,700,000
25	CALVERT CLIFFS	Lusby	Maryland	14,000,000

Note: This list contains a mix of hydroelectric dams and nuclear power plants. Although they emit no CO2, they may produce other environmental damage.

Table 4. Top-100 Highest CO_2-Emitting Power Sectors by U.S. County

	County	State	Tons of CO_2
1	Walker	Alabama	28,800,000
2	San Juan	New Mexico	28,400,000
3	Harris	Texas	28,000,000
4	Gallia	Ohio	26,000,000
5	Monroe	Georgia	25,300,000
6	Indiana	Pennsylvania	24,600,000
7	Jefferson	Ohio	24,200,000
8	Kern	California	22,200,000
9	Berkeley	South Carolina	21,900,000
10	Rusk	Texas	21,300,000
11	Fort Bend	Texas	21,300,000
12	Citrus	Florida	21,100,000
13	Person	North Carolina	20,600,000
14	Bartow	Georgia	20,500,000
15	Gibson	Indiana	20,400,000
16	Coconino	Arizona	19,900,000
17	Mercer	North Dakota	19,600,000
18	Stewart	Tennessee	19,600,000
19	Saint Clair	Michigan	19,400,000
20	Beaver	Pennsylvania	18,800,000
21	Monroe	Michigan	18,700,000
22	Sherburne	Minnesota	18,000,000
23	Duval	Florida	17,500,000
24	Rosebud	Montana	17,200,000
25	Kanawha	West Virginia	17,100,000
26	Emery	Utah	16,700,000
27	Spencer	Indiana	16,600,000
28	Sweetwater	Wyoming	16,500,000
29	Los Angeles	California	16,400,000
30	Franklin	Missouri	16,400,000
31	Titus	Texas	16,300,000
32	Pottawatomie	Kansas	16,300,000
33	Millard	Utah	16,100,000

34	Apache	Arizona	16,000,000
35	Will	Illinois	15,600,000
36	Muhlenberg	Kentucky	15,400,000
37	Westmoreland	Pennsylvania	15,400,000
38	Clermont	Ohio	14,900,000
39	Hillsborough	Florida	14,800,000
40	Lewis	Washington	14,600,000
41	Bexar	Texas	14,600,000
42	Clark	Nevada	14,500,000
43	Pointe Coupee	Louisiana	14,300,000
44	Harrison	West Virginia	14,200,000
45	Pike	Indiana	14,100,000
46	Mobile	Alabama	14,100,000
47	Forsyth	North Carolina	13,700,000
48	Randolph	Illinois	13,600,000
49	Grant	West Virginia	13,500,000
50	Jefferson	Arkansas	13,400,000
51	Brown	Ohio	13,400,000
52	Leon	Texas	13,300,000
53	Rogers	Oklahoma	13,300,000
54	Mason	West Virginia	13,100,000
55	Jefferson	Kentucky	12,900,000
56	Catawba	North Carolina	12,700,000
57	Carroll	Kentucky	12,200,000
58	Shelby	Alabama	12,200,000
59	Independence	Arkansas	12,200,000
60	Fayette	Texas	12,000,000
61	Freestone	Texas	12,000,000
62	Linn	Kansas	11,900,000
63	Carroll	Georgia	11,900,000
64	Martin	Florida	11,900,000
65	Camp	Texas	11,900,000
66	Manatee	Florida	11,800,000
67	Marshall	West Virginia	11,700,000
68	Anne Arundel	Maryland	11,600,000
69	Moffat	Colorado	11,400,000

70	Calcasieu	Louisiana	11,400,000
71	Lincoln	Nebraska	11,100,000
72	Maricopa	Arizona	11,000,000
73	Queens	New York	11,000,000
74	Wayne	Michigan	11,000,000
75	Jasper	Indiana	11,000,000
76	Brazoria	Texas	10,900,000
77	Ottawa	Michigan	10,700,000
78	Mclean	North Dakota	10,600,000
79	Muskogee	Oklahoma	10,600,000
80	Potter	Texas	10,200,000
81	Platte	Wyoming	10,100,000
82	York	Pennsylvania	10,100,000
83	Roane	Tennessee	10,100,000
84	Tazewell	Illinois	10,000,000
85	Warrick	Indiana	10,000,000
86	Polk	Florida	9,997,184
87	Jackson	Alabama	9,976,111
88	Chesterfield	Virginia	9,865,334
89	Mccracken	Kentucky	9,851,850
90	Kenosha	Wisconsin	9,691,582
91	Bay	Michigan	9,679,930
92	Contra Costa	California	9,672,508
93	Putnam	Florida	9,607,276
94	Massac	Illinois	9,393,236
95	Fayette	Pennsylvania	9,214,486
96	Milwaukee	Wisconsin	9,214,344
97	Jackson	Mississippi	9,094,414
98	Coshocton	Ohio	9,086,479
99	Washington	Ohio	9,038,868
100	Montour	Pennsylvania	8,964,147

Table 5. Top-25 CO_2-Free Power Sectors by U.S. County

	County	State	MWh per Year
1	Oconee	South Carolina	19,000,000
2	Hamilton	Tennessee	18,900,000
3	York	South Carolina	18,600,000
4	Limestone	Alabama	18,300,000
5	Somervell	Texas	18,200,000
6	Berrien	Michigan	16,700,000
7	Columbia	Pennsylvania	15,800,000
8	Appling	Georgia	15,300,000
9	Louisa	Virginia	14,700,000
10	Wasco	Oregon	14,600,000
11	Calvert	Maryland	14,000,000
12	Rhea	Tennessee	10,300,000
13	Douglas	Washington	10,200,000
14	Claiborne	Mississippi	9,656,302
15	Chelan	Washington	7,618,147
16	Nemaha	Nebraska	6,120,753
17	Lake	California	5,815,209
18	Hood River	Oregon	4,789,379
19	Baker	Oregon	4,357,426
20	Pend Oreille	Washington	4,165,685
21	Kewaunee	Wisconsin	4,110,068
22	Washington	Nebraska	4,027,674
23	Columbia	Washington	2,429,436
24	Garfield	Washington	2,234,874
25	Walla Walla	Washington	1,813,754

Power Plants in the Continental United States

Power Production (megawatt-hours, MWh)

- Greater than 20 million
- 10 million to 20 million
- 1 million to 10 million
- Not shown — Less than 1 million

Carbon Intensity (lbs CO_2 per MWh)

- **Red:** Greater than 1,750
- **Orange:** 1,250 to 1,750
- **Yellow:** 750 to 1,250
- **Blue:** 250 to 750
- **Green:** Less than 250

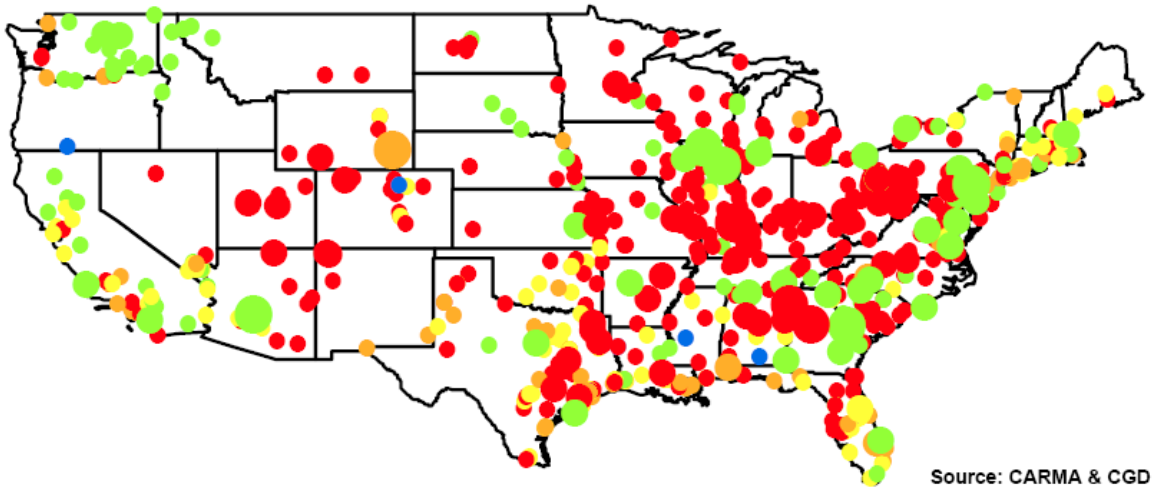

Table 6. Top-25 Highest CO_2-Emitting Power Plants Worldwide

	Plant	City	Country	Tons of CO_2
1	TAICHUNG	Lung-Ching Township	Taiwan (China)	41,300,000
2	PORYONG	Poryong-gun	South Korea	37,800,000
3	CASTLE PEAK	Tuen Mun NT	China	35,800,000
4	REFTINSKAYA SDPP	Reftinsky	Russia	33,000,000
5	TUOKETUO-1	Tuoketuo County	China	32,400,000
6	MAILIAO FP	Mailiao	Taiwan (China)	32,400,000
7	VINDHYACHAL	Sidhi Dist	India	29,000,000
8	HEKINAN	Hekinan	Japan	28,900,000
9	KENDAL	Witbank	South Africa	28,600,000
10	JANSCHWALDE	Peitz	Germany	27,400,000
11	SURALAYA	Serang - Merak	Indonesia	27,200,000
12	TANGJIN	Tangjin-kun	South Korea	26,900,000
13	MAJUBA	Volksrust	South Africa	26,500,000
14	TAEAN	Taean	South Korea	26,400,000
15	BEILUNGANG	Ningbo City	China	26,000,000
16	WAIGAOQIAO	Shanghai Pudong	China	26,000,000
17	TAISHAN	Tongluowan	China	26,000,000
18	BELCHATOW	Belchatow 5	Poland	25,500,000
19	MATIMBA	Ellisras	South Africa	25,500,000
20	SCHERER	Juliette	United States	25,300,000
21	HSINTA	Yungan Township	Taiwan (China)	25,300,000
22	SAMCHONPO	Kosung-gun	South Korea	25,200,000
23	DRAX	Selby	United Kingdom	23,700,000
24	NIEDERAUSSEM	Bergheim	Germany	23,600,000
25	JIANBI	Zhenjiang City	China	23,500,000

Table 7. Top-50 Countries with Highest CO_2-Emitting Power Sectors

	Country	Tons of CO_2
1	United States	2,790,000,000
2	China	2,680,000,000
3	Russia	661,000,000
4	India	583,000,000
5	Japan	400,000,000
6	Germany	356,000,000
7	Australia	226,000,000
8	South Africa	222,000,000
9	United Kingdom	212,000,000
10	South Korea	185,000,000
11	Poland	166,000,000
12	Italy	165,000,000
13	Taiwan (China)	153,000,000
14	Spain	148,000,000
15	Canada	144,000,000
16	Turkey	102,000,000
17	Mexico	101,000,000
18	Indonesia	92,900,000
19	Iran	86,200,000
20	Ukraine	79,100,000
21	Thailand	76,400,000
22	Saudi Arabia	75,900,000
23	Kazakhstan	62,300,000
24	Malaysia	61,100,000
25	Netherlands	58,900,000
26	Czech Republic	55,700,000
27	Greece	50,500,000
28	Israel	46,500,000
29	France	45,800,000
30	Egypt	45,000,000
31	Serbia	37,200,000
32	Philippines	35,900,000
33	Romania	34,500,000

34	Uzbekistan	34,000,000
35	Argentina	32,800,000
36	Finland	31,700,000
37	Belgium	31,100,000
38	United Arab Emirates	28,500,000
39	Vietnam	28,500,000
40	Pakistan	28,200,000
41	Bulgaria	25,200,000
42	Brazil	24,000,000
43	Denmark	23,600,000
44	Chile	23,100,000
45	Portugal	22,700,000
46	Belarus	21,500,000
47	Singapore	20,600,000
48	Kuwait	19,400,000
49	Algeria	17,200,000
50	Hungary	16,700,000