

# BENCHMARKING AIR EMISSIONS

OF THE  
100 LARGEST  
ELECTRIC POWER  
PRODUCERS  
IN THE  
UNITED STATES

JULY 2015





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# Preface

The 2015 Benchmarking report is the eleventh collaborative effort highlighting environmental performance and progress in the nation's electric power sector. The Benchmarking series began in 1997 and uses publicly reported data to compare the emissions performance of the 100 largest power producers in the United States. The current report is based on 2013 generation and emissions data.

Data on U.S. power plant generation and air emissions are available to the public through several databases maintained by state and federal agencies. Publicly- and privately-owned electric generating companies are required to report fuel and generation data to the U.S. Energy Information Administration (EIA). Most power producers are also required to report air pollutant emissions data to the U.S. Environmental Protection Agency (EPA). These data are reported and recorded at the boiler, generator, or plant level, and must be combined and presented so that company-level comparisons can be made across the industry.

The Benchmarking report facilitates the comparison of emissions performance by combining generation and fuel consumption data compiled by EIA with emissions data on sulfur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), carbon dioxide (CO<sub>2</sub>) and mercury compiled by EPA; error checking the data; and presenting emissions information for the nation's 100 largest power producers in a graphic format that aids in understanding and evaluating the data. The report is intended for a wide audience, including electric industry executives, environmental advocates, financial analysts, investors, journalists, power plant managers, and public policymakers.

The report is available in PDF format on the Internet at <http://www.ceres.org> and <http://www.nrdc.org>. Plant and company level data used in this report are available on the Internet at <http://www.mjbradley.com>.

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# Emissions of the 100 Largest Electric Power Producers

This report examines and compares the stack air pollutant emissions of the 100 largest power producers in the United States based on their 2013 generation, plant ownership, and emissions data. Table 1 lists the 100 largest power producers featured in this report ranked by their total electricity generation from fossil fuel, nuclear, and renewable energy facilities. These producers include public and private entities<sup>1</sup> (collectively referred to as “companies” or “producers” in this report) that own roughly 2,800 power plants and account for 85 percent of reported electric generation and 87 percent of the industry’s reported emissions.

TABLE 1

**100 Largest Electric Power Producers in the U.S. (in order of 2013 electric generation)**

RANK	PRODUCER NAME	2013 MWh (million)	RANK	PRODUCER NAME	2013 MWh (million)	RANK	PRODUCER NAME	2013 MWh (million)	RANK	PRODUCER NAME	2013 MWh (million)
1	Duke	243.4	26	Great Plains Energy	26.9	51	NISource	14.2	76	Entegra Power	10.4
2	Exelon	195.1	27	Pinnacle West	26.7	52	Occidental	14.1	77	Energy Investors Funds	10.3
3	Southern	180.2	28	Salt River Project	26.3	53	IDACORP	13.8	78	EDP	10.2
4	NextEra Energy	175.7	29	Westar	26.3	54	Riverstone	13.7	79	PUD No 2 of Grant County	10.1
5	AEP	153.1	30	Energy Capital Partners	26.0	55	Rockland Capital	13.6	80	East Kentucky Power Coop	9.9
6	Tennessee Valley Authority	144.1	31	New York Power Authority	24.9	56	Dow Chemical	13.4	81	Big Rivers Electric	9.8
7	Entergy	129.4	32	San Antonio City	24.7	57	Sempra	13.3	82	CLECO	9.6
8	Calpine	103.0	33	OGE	24.0	58	Omaha Public Power District	13.2	83	PUD No 1 of Chelan County	9.5
9	NRG	99.4	34	General Electric	23.0	59	Tri-State	13.0	84	BP	9.4
10	FirstEnergy	96.5	35	Wisconsin Energy	22.8	60	JEA	12.8	85	Buckeye Power	9.4
11	Dominion	93.9	36	NV Energy	22.1	61	Intermountain Power Agency	12.4	86	El Paso Electric	9.3
12	MidAmerican	91.9	37	SCANA	22.0	62	Los Angeles City	12.3	87	Invenergy	9.2
13	PPL	88.6	38	Oglethorpe	21.7	63	Puget Holdings	12.2	88	Energy Northwest	8.8
14	Energy Future Holdings	73.4	39	Santee Cooper	21.4	64	ArcLight Capital	11.8	89	TransAlta	8.7
15	US Corps of Engineers	69.0	40	EDF	21.3	65	Municipal Elec. Auth. of GA	11.7	90	UniSource	8.7
16	Xcel	68.8	41	CMS Energy	21.0	66	Arkansas Electric Coop	11.6	91	Austin Energy	8.6
17	Dynegy	60.8	42	Basin Electric Power Coop	19.6	67	Integrys	11.5	92	J-Power	8.4
18	PSEG	54.4	43	Alliant Energy	18.6	68	Exxon Mobil	11.4	93	E.ON	8.3
19	DTE Energy	43.9	44	TECO	18.4	69	ALLETE	11.1	94	International Paper	7.5
20	Ameren	43.8	45	NE Public Power District	18.0	70	Portland General Electric	11.0	95	Brazos Electric Power Coop	7.2
21	US Bureau of Reclamation	42.7	46	Edison International	17.2	71	Lower CO River Authority	10.9	96	Avista	7.1
22	AES	41.1	47	Iberdrola	16.3	72	PNM Resources	10.8	97	LS Power	7.1
23	Edison Mission Energy	33.0	48	Tenaska	16.2	73	Seminole Electric Coop	10.6	98	Grand River Dam Authority	7.0
24	PG&E	31.7	49	Associated Electric Coop	15.9	74	Great River Energy	10.5	99	Hoosier Energy	6.9
25	GDF Suez	31.1	50	NC Public Power	15.4	75	Brookfield	10.4	100	Sacramento Municipal Util Dist	6.8

The report focuses on four power plant pollutants for which public emissions data are available: sulfur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), mercury (Hg), and carbon dioxide (CO<sub>2</sub>). These pollutants are associated with significant environmental and public health problems, including acid deposition, global warming, fine particle air pollution, mercury deposition, nitrogen deposition, ozone smog, and regional haze. The report benchmarks, or ranks, each company's absolute emissions and its emission rate (determined by dividing emissions by electricity produced) for each pollutant against the emissions of the other companies.

In 2013, the 100 largest power producers in the U.S. generated 87 percent of the industry's air pollution emissions. The 100 largest power producers emitted in aggregate approximately 2.9 million tons of SO<sub>2</sub>, 1.46 million tons of NO<sub>x</sub>, 20.7 tons of mercury, and 1.95 billion tons of CO<sub>2</sub>. Air pollution emissions from power plants are highly concentrated among a small number of producers. The top ten producers were responsible for 41 percent of the SO<sub>2</sub>, 36 percent of the NO<sub>x</sub>, 34 percent of the mercury, and 38 percent of the CO<sub>2</sub> emissions of the 100 largest producers.

Electric power producers' emission levels and emission rates vary significantly due to the amount of power produced, the efficiency of the technology used in producing the power, the fuel used to generate the power, and installed pollution controls. The average and median emission rates (pounds per megawatt hour (lb/MWh)) shown in Table 2 provide benchmark measures of overall industry emissions that can be used as reference points to evaluate the emissions performance of individual power producers.

FIGURE 1

## Environmental Concerns Associated with Power Plant Emissions



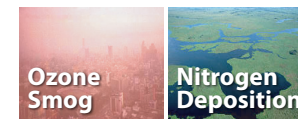
## CO<sub>2</sub>

- Extreme weather
- Sea level rise and impacts to natural systems



## Hg

- Bioaccumulation
- Toxic to humans



## NO<sub>x</sub>

- Excess nitrogen loading in sensitive water bodies
- Harms aquatic plants & animals
- Respiratory harm
- Crop damage



## NO<sub>x</sub> + SO<sub>2</sub>

- Premature mortality
- Lung & heart disease
- Acidifies lakes & streams
- Forest damage
- Reduced visibility in areas of national interest, such as national parks

Across the industry, power plant emissions of SO<sub>2</sub> and NO<sub>x</sub> have decreased and CO<sub>2</sub> emissions have increased since 1990. The power industry has dramatically reduced its SO<sub>2</sub> and NO<sub>x</sub> emissions. In 2013, power plant SO<sub>2</sub> and NO<sub>x</sub> emissions were 80 percent and 74 percent lower, respectively, than they were in 1990. In 2013, power plant CO<sub>2</sub> emissions were 14 percent higher than they were in 1990. In recent years, from 2008 through 2013, power plant CO<sub>2</sub> emissions decreased by 12 percent. Mercury emissions from power plants have decreased 50 percent since 2000 (the first year that mercury emissions were reported by the industry under the Toxics Release Inventory). Collectively, power plants are responsible for a declining share of U.S. air pollution emissions. In 2013, power plants were responsible for about 63 percent of SO<sub>2</sub> emissions, 13 percent of NO<sub>x</sub> emissions, 38 percent of mercury emissions, and 61 percent of CO<sub>2</sub> emissions.

TABLE 2

Emissions Data for 100 Largest Power Producers  
in order of 2013 generation

Rank	Owner	Ownership Type*	2013 Generation (MWh)			2013 Emissions (ton)				Emission Rates (lb/MWh)									
			Total	Fossil Fuel	Coal	SO <sub>2</sub>	NOx	CO <sub>2</sub>	Hg**	All Generating Sources			Fossil Fuel Plants †			Coal Plants ††			
										SO <sub>2</sub>	NOx	CO <sub>2</sub>	SO <sub>2</sub>	NOx	CO <sub>2</sub>	SO <sub>2</sub>	NOx	CO <sub>2</sub>	Hg†††
1	Duke	investor-owned corp.	243,353,097	168,200,141	102,338,834	203,403	101,866	136,952,436	0.68	1.7	0.8	1,126	2.4	1.2	1,628	3.9	1.9	2,104	0.01
2	Exelon	investor-owned corp.	195,054,967	30,721,290	9,363,453	14,812	14,908	19,530,597	0.10	0.2	0.2	200	1.0	1.0	1,271	2.9	2.8	1,987	0.02
3	Southern	investor-owned corp.	180,221,040	142,694,193	70,293,969	228,573	70,689	107,556,354	1.22	2.5	0.8	1,194	3.2	1.0	1,506	6.5	1.9	2,177	0.03
4	NextEra Energy	investor-owned corp.	175,676,789	99,052,840	5,187,397	4,745	17,422	48,781,601	0.07	0.1	0.2	555	0.1	0.4	985	1.3	2.4	2,895	0.03
5	AEP	investor-owned corp.	153,097,228	134,620,398	115,113,002	280,480	103,780	134,102,045	2.05	3.7	1.4	1,752	4.2	1.5	1,992	4.9	1.7	2,140	0.04
6	Tennessee Valley Authority	federal power authority	144,059,275	69,603,175	57,119,280	123,911	46,769	68,724,445	0.63	1.7	0.6	954	3.6	1.3	1,975	4.3	1.6	2,210	0.02
7	Entergy	investor-owned corp.	129,404,678	50,799,802	14,795,295	47,571	39,634	38,429,818	0.38	0.7	0.6	594	1.9	1.5	1,493	6.4	2.6	2,262	0.05
8	Calpine	investor-owned corp.	103,040,845	96,698,976	-	314	7,293	41,996,312	-	0.0	0.1	815	0.0	0.1	865	-	-	-	-
9	NRG	investor-owned corp.	99,374,142	88,716,313	62,330,456	203,512	62,083	83,761,255	1.40	4.1	1.2	1,686	4.6	1.4	1,888	6.5	1.8	2,219	0.04
10	FirstEnergy	investor-owned corp.	96,480,658	65,335,231	60,430,553	90,950	65,487	67,046,238	0.47	1.9	1.4	1,390	2.8	2.0	2,052	2.9	2.1	2,109	0.02
11	Dominion	investor-owned corp.	93,924,999	47,994,504	24,808,466	33,516	19,715	36,564,733	0.25	0.7	0.4	779	1.4	0.8	1,524	2.7	1.3	2,093	0.02
12	MidAmerican	privately held corp.	91,864,963	71,245,136	62,184,999	80,516	75,242	73,769,571	0.85	1.8	1.6	1,606	2.3	2.1	2,071	2.6	2.4	2,234	0.03
13	PPL	investor-owned corp.	88,630,487	67,132,456	57,000,317	113,996	73,350	66,768,135	0.66	2.6	1.7	1,507	3.4	2.2	1,989	4.0	2.5	2,172	0.02
14	Energy Future Holdings	privately held corp.	73,408,162	52,921,022	51,884,369	178,750	32,379	61,210,925	2.00	4.9	0.9	1,668	6.8	1.2	2,313	6.9	1.2	2,329	0.08
15	US Corps of Engineers	federal power authority	68,994,761	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	Xcel	investor-owned corp.	68,834,675	55,681,360	41,275,618	65,061	48,608	53,414,813	0.58	1.9	1.4	1,552	2.3	1.7	1,919	3.1	2.1	2,206	0.03
17	Dynegy	investor-owned corp.	60,842,907	60,842,907	44,326,658	57,564	23,318	57,145,225	0.19	1.9	0.8	1,878	1.9	0.8	1,878	2.6	1.0	2,248	0.01
18	PSEG	investor-owned corp.	54,409,386	24,819,610	6,480,856	9,907	11,378	15,335,378	0.07	0.4	0.4	564	0.8	0.9	1,236	2.6	2.8	2,248	0.02
19	DTE Energy	investor-owned corp.	43,863,826	35,628,952	33,991,682	123,452	39,991	38,691,141	0.76	5.6	1.8	1,764	6.9	2.2	2,162	7.2	2.3	2,207	0.04
20	Ameren	investor-owned corp.	43,785,058	34,011,776	33,292,440	66,745	18,893	33,045,776	0.74	3.0	0.9	1,509	3.9	1.1	1,943	4.0	1.1	1,962	0.04
21	US Bureau of Reclamation	federal power authority	42,745,149	4,111,623	4,108,722	1,117	4,189	4,284,378	0.07	0.1	0.2	200	0.5	2.0	2,084	0.5	2.0	2,084	0.03
22	AES	investor-owned corp.	41,129,090	38,294,449	35,216,385	111,077	34,974	40,036,728	0.49	5.4	1.7	1,947	5.8	1.8	2,091	6.3	2.0	2,155	0.03
23	Edison Mission Energy	privately held corp.	33,020,207	27,291,117	22,952,871	51,558	14,259	28,402,318	0.10	3.1	0.9	1,720	3.8	1.0	2,071	4.5	1.2	2,337	0.01
24	PG&E	investor-owned corp.	31,675,793	6,093,591	-	12	133	2,641,601	-	0.0	0.0	167	0.0	0.0	867	-	-	-	-
25	GDF Suez	foreign-owned corp.	31,050,342	29,392,818	5,298,053	15,325	5,358	16,730,581	0.11	1.0	0.3	1,078	1.0	0.4	1,136	5.8	1.2	2,150	0.04
26	Great Plains Energy	investor-owned corp.	26,946,616	23,053,882	22,675,778	24,319	15,060	24,945,054	0.35	1.8	1.1	1,851	2.1	1.3	2,164	2.1	1.3	2,174	0.03
27	Pinnacle West	investor-owned corp.	26,680,373	17,317,620	11,292,238	8,018	22,105	14,958,001	0.23	0.6	1.7	1,121	0.9	2.6	1,727	1.4	3.8	2,173	0.04
28	Salt River Project	power district	26,337,482	20,833,998	15,862,380	6,036	22,800	19,529,071	0.18	0.5	1.7	1,483	0.6	2.2	1,875	0.8	2.8	2,194	0.02
29	Westar	investor-owned corp.	26,304,512	22,508,492	20,736,969	14,367	17,828	25,406,531	0.39	1.1	1.4	1,932	1.3	1.6	2,258	1.4	1.6	2,343	0.04
30	Energy Capital Partners	privately held corp.	26,022,545	26,022,545	8,954,234	17,902	7,902	17,535,470	0.02	1.4	0.6	1,348	1.4	0.6	1,348	4.0	1.6	2,229	0.00
31	New York Power Authority	state power authority	24,939,513	5,170,696	-	27	263	2,368,063	-	0.0	0.0	190	0.0	0.1	916	-	-	-	-
32	San Antonio City	municipality	24,718,579	17,587,437	12,161,770	12,759	6,876	15,589,928	0.15	1.0	0.6	1,261	1.5	0.8	1,773	2.1	0.9	2,112	0.02
33	OGE	investor-owned corp.	23,961,116	22,330,656	12,759,335	31,078	25,229	20,048,061	0.20	2.6	2.1	1,673	2.8	2.3	1,796	4.9	3.1	2,315	0.03
34	General Electric	investor-owned corp.	22,962,985	22,303,092	10,810,968	114,414	18,183	16,353,326	0.28	10.0	1.6	1,424	10.3	1.6	1,466	21.2	3.2	2,111	0.05
35	Wisconsin Energy	investor-owned corp.	22,809,690	21,707,762	18,188,820	11,163	10,632	22,808,245	0.10	1.0	0.9	2,000	1.0	1.0	2,101	1.2	1.1	2,334	0.01
36	NV Energy	investor-owned corp.	22,084,046	22,084,046	4,064,486	4,265	6,726	12,349,673	0.08	0.4	0.6	1,118	0.4	0.6	1,118	2.1	2.5	2,249	0.04
37	SCANA	investor-owned corp.	21,954,354	15,626,669	9,533,223	11,516	6,284	12,755,776	0.05	1.0	0.6	1,162	1.5	0.8	1,633	2.4	1.2	2,107	0.01
38	Oglethorpe	cooperative	21,737,502	11,866,668	6,682,028	9,775	4,541	9,490,762	0.09	0.9	0.4	873	1.6	0.8	1,600	2.9	1.3	2,166	0.03
39	Santee Cooper	state power authority	21,430,425	18,267,107	13,916,289	7,165	5,485	16,160,930	0.05	0.7	0.5	1,508	0.8	0.6	1,769	1.0	0.7	2,040	0.01
40	EDF	foreign-owned corp.	21,303,577	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
41	CMS Energy	investor-owned corp.	20,978,689	19,023,708	16,002,394	51,705	15,115	20,444,753	0.48	4.9	1.4	1,949	5.4	1.5	2,060	6.4	1.8	2,237	0.06
42	Basin Electric Power Coop	cooperative	19,589,295	18,604,467	17,974,508	25,947	24,095	21,482,582	0.50	2.6	2.5	2,193	2.8	2.6	2,309	2.9	2.7	2,350	0.06
43	Alliant Energy	investor-owned corp.	18,640,181	16,764,548	14,483,297	49,803	13,100	17,809,186	0.40	5.3	1.4	1,911	5.9	1.6	2,125	6.9	1.7	2,306	0.06
44	TECO	investor-owned corp.	18,351,408	18,351,408	10,732,747	11,898	5,556	14,821,557	0.02	1.3	0.6	1,615	1.2	0.6	1,615	2.0	0.9	2,123	0.00
45	NE Public Power District	power district	17,971,017	10,912,637	10,747,094	31,266	12,611	11,974,610	0.30	3.5	1.4	1,333	5.7	2.3	2,195	5.8	2.3	2,212	0.06
46	Edison International	investor-owned corp.	17,164,407	9,891,746	4,213,375	3,717	12,376	6,896,073	0.07	0.4	1.4	804	0.8	2.5	1,394	1.8	5.8	2,119	0.03
47	Iberdrola	foreign-owned corp.	16,298,737	953,172	-	2	59	403,271	-	0.0	0.0	49	0.0	0.1	846	-	-	-	-
48	Tenaska	privately held corp.	16,161,599	15,970,472	-	95	1,788	7,349,385	-	0.0	0.2	909	0.0	0.2	920	-	-	-	-
49	Associated Electric Coop	cooperative	15,867,296	15,867,296	12,429,800	27,721	28,629	14,585,467	0.13	3.5	3.6	1,838	3.5	3.6	1,838	4.5	4.6	2,103	0.02
50	NC Public Power	municipality	15,354,762	821,815	813,997	1,210	805	990,073	0.00	0.2	0.1	129	2.9	2.0	2,409	3.0	2.0	2,413	0.01
51	NiSource	investor-owned corp.	14,153,141	14,143,205	11,563,943	29,322	9,875	14,659,277	0.13	4.1	1.4	2,072	4.1	1.4	2,073	5.1	1.7	2,341	0.02
52	Occidental	investor-owned corp.	14,093,903	14,020,208	-	10	587	6,491,309	-	0.0	0.1	921	0.0	0.1	919	-	-	-	-

\* Breakdown of ownership categories provided in endnote 2 ■ privately/investor owned ■ public power ■ cooperative

\*\* Mercury emissions are based on 2013 TRI data for coal plants

†† Coal emission rate = pounds of pollution per MWh of electricity produced from coal

† Fossil fuel emission rate = pounds of pollution per MWh of electricity produced from fossil fuel

††† Mercury emission rate = pounds of mercury per gigawatt hour (GWh) of electricity produced from coal

Rank	Owner	Ownership Type*	2013 Generation (MWh)			2013 Emissions (ton)				Emission Rates (lb/MWh)									
			Total	Fossil Fuel	Coal	SO <sub>2</sub>	NO <sub>x</sub>	CO <sub>2</sub>	Hg**	All Generating Sources			Fossil Fuel Plants †			Coal Plants ††			
										SO <sub>2</sub>	NO <sub>x</sub>	CO <sub>2</sub>	SO <sub>2</sub>	NO <sub>x</sub>	CO <sub>2</sub>	SO <sub>2</sub>	NO <sub>x</sub>	CO <sub>2</sub>	Hg†††
53	IDACORP	investor-owned corp.	13,829,871	8,107,610	6,519,614	8,341	7,452	7,918,953	0.13	1.2	1.1	1,145	2.1	1.8	1,953	2.6	2.3	2,209	0.04
54	Riverstone	privately held corp.	13,738,411	13,455,532	6,950,808	16,035	6,509	10,939,268	0.02	2.3	0.9	1,593	2.4	0.9	1,626	4.6	1.6	2,272	0.00
55	Rockland Capital	privately held corp.	13,565,458	13,565,458	165,381	719	818	5,911,134	0.00	0.1	0.1	871	0.1	0.1	871	7.8	4.7	2,423	0.01
56	Dow Chemical	investor-owned corp.	13,372,349	12,022,166	-	10	509	5,746,793	-	0.0	0.1	860	0.0	0.1	847	-	-	-	-
57	Sempra	investor-owned corp.	13,258,115	11,063,925	-	25	369	4,965,089	-	0.0	0.1	749	0.0	0.1	898	-	-	-	-
58	Omaha Public Power District	power district	13,213,333	13,102,864	12,917,188	29,148	12,742	14,189,151	0.24	4.4	1.9	2,148	4.4	1.9	2,166	4.5	2.0	2,176	0.04
59	Tri-State	cooperative	13,029,809	13,029,809	12,209,522	7,904	15,763	14,047,696	0.13	1.2	2.4	2,156	1.2	2.4	2,156	1.3	2.5	2,220	0.02
60	JEA	municipality	12,794,926	12,794,707	6,734,426	13,754	12,110	12,032,668	0.07	2.1	1.9	1,881	2.1	1.9	1,881	4.1	3.4	2,320	0.02
61	Intermountain Power Agency	power district	12,387,224	12,387,224	12,380,465	4,724	23,697	12,336,037	0.00	0.8	3.8	1,992	0.8	3.8	1,992	0.8	3.8	1,992	0.00
62	Los Angeles City	municipality	12,337,751	9,380,957	3,595,132	1,000	3,824	6,831,361	0.06	0.2	0.6	1,107	0.2	0.8	1,456	0.5	2.0	2,084	0.03
63	Puget Holdings	privately held corp.	12,189,373	9,505,688	4,184,481	4,203	5,759	7,267,192	0.02	0.7	0.9	1,192	0.9	1.2	1,529	2.0	2.6	2,283	0.01
64	ArLight Capital	privately held corp.	11,756,197	7,561,252	377,701	422	579	3,932,094	0.00	0.1	0.1	669	0.1	0.2	1,040	2.2	0.9	2,460	0.00
65	Municipal Elec. Auth. of GA	municipality	11,716,254	4,897,043	3,361,261	4,915	2,230	4,274,814	0.05	0.8	0.4	730	2.0	0.9	1,746	2.9	1.3	2,166	0.03
66	Arkansas Electric Coop	cooperative	11,566,145	10,982,044	9,317,024	25,561	12,754	11,066,112	0.23	4.4	2.2	1,914	4.7	2.3	2,015	5.5	2.6	2,201	0.05
67	Integrus	investor-owned corp.	11,524,777	10,790,906	8,868,777	17,446	5,274	10,652,430	0.15	3.0	0.9	1,849	3.2	1.0	1,974	3.9	1.2	2,207	0.03
68	Exxon Mobil	investor-owned corp.	11,388,564	10,463,320	-	24	1,186	4,740,664	-	0.0	0.2	833	0.0	0.1	792	-	-	-	-
69	ALLETE	investor-owned corp.	11,079,012	9,873,294	9,856,675	8,886	9,421	11,704,892	0.19	1.6	1.7	2,113	1.8	1.8	2,371	1.8	1.8	2,370	0.04
70	Portland General Electric	investor-owned corp.	10,970,237	8,128,987	4,750,450	12,939	5,722	6,632,526	0.01	2.4	1.0	1,209	3.2	1.4	1,632	5.4	2.3	2,170	0.01
71	Lower CO River Authority	state power authority	10,858,719	10,792,502	7,039,178	1,790	5,005	9,839,665	0.09	0.3	0.9	1,812	0.3	0.9	1,823	0.5	1.3	2,326	0.03
72	PNM Resources	investor-owned corp.	10,787,793	7,589,055	5,993,187	3,817	11,373	7,362,609	0.02	0.7	2.1	1,365	1.0	3.0	1,940	1.3	3.7	2,200	0.01
73	Seminole Electric Coop	cooperative	10,624,361	10,624,361	7,735,364	11,952	2,459	9,349,811	0.02	2.2	0.5	1,760	2.2	0.5	1,760	3.1	0.5	2,072	0.00
74	Great River Energy	cooperative	10,511,768	10,366,680	9,901,867	17,613	9,695	11,558,080	0.40	3.4	1.8	2,199	3.4	1.9	2,230	3.6	1.9	2,268	0.08
75	Brookfield	foreign-owned corp.	10,427,470	41,333	-	0	5	21,399	-	0.0	0.0	4	0.0	0.2	1,035	-	-	-	-
76	Entegra Power	privately held corp.	10,386,954	10,386,954	-	28	656	5,533,581	-	0.0	0.1	1,065	0.0	0.1	1,065	-	-	-	-
77	Energy Investors Funds	privately held corp.	10,346,553	10,169,440	1,468,836	1,064	1,819	4,680,042	0.00	0.2	0.4	905	0.2	0.4	920	1.4	1.8	2,273	0.00
78	EDP	foreign-owned corp.	10,171,855	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
79	PUD No 2 of Grant County	power district	10,099,590	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
80	East Kentucky Power Coop	cooperative	9,853,229	9,754,931	9,367,607	9,978	4,464	10,396,648	0.06	2.0	0.9	2,110	2.0	0.9	2,132	2.1	0.9	2,160	0.01
81	Big Rivers Electric	cooperative	9,847,253	9,847,253	8,526,434	20,921	11,393	11,145,261	0.10	4.2	2.3	2,264	4.2	2.3	2,264	4.9	2.7	2,237	0.02
82	CLECO	investor-owned corp.	9,560,933	9,560,933	2,702,447	12,245	5,125	8,535,715	0.06	2.6	1.1	1,786	2.6	1.1	1,786	7.4	1.8	2,354	0.05
83	PUD No 1 of Chelan County	power district	9,450,357	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
84	BP	foreign-owned corp.	9,427,148	5,377,861	-	80	340	2,411,030	-	0.0	0.1	512	0.0	0.1	798	-	-	-	-
85	Buckeye Power	cooperative	9,419,551	9,419,551	9,310,726	12,404	5,292	9,803,808	0.15	2.6	1.1	2,082	2.6	1.1	2,082	2.7	1.1	2,090	0.03
86	El Paso Electric	investor-owned corp.	9,343,518	4,314,326	614,450	553	4,130	2,768,999	0.01	0.1	0.9	593	0.3	1.9	1,284	1.8	5.8	2,119	0.03
87	Invenergy	privately held corp.	9,172,044	2,472,201	-	5	464	1,057,526	-	0.0	0.1	231	0.0	0.4	856	-	-	-	-
88	Energy Northwest	municipality	8,783,622	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
89	TransAlta	foreign-owned corp.	8,715,612	7,121,213	6,703,715	2,821	7,864	8,029,336	0.05	0.6	1.8	1,843	0.8	2.2	2,255	0.8	2.3	2,331	0.02
90	UniSource	investor-owned corp.	8,666,665	8,638,700	7,526,651	5,674	9,872	8,840,568	0.09	1.3	2.3	2,040	1.3	2.3	2,047	1.5	2.5	2,208	0.02
91	Austin Energy	municipality	8,608,548	5,756,091	3,815,214	425	2,729	5,520,980	0.05	0.1	0.6	1,283	0.1	0.9	1,918	0.2	1.1	2,346	0.03
92	J-Power	foreign-owned corp.	8,439,903	8,439,903	289,400	161	921	4,017,573	0.01	0.0	0.2	952	0.0	0.2	952	1.0	1.0	2,221	0.04
93	E.ON	foreign-owned corp.	8,289,845	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
94	International Paper	investor-owned corp.	7,543,455	1,682,214	340,046	-	2,271	794,803	-	-	0.6	211	-	2.7	945	-	7.7	1,639	-
95	Brazos Electric Power Coop	cooperative	7,212,209	7,212,209	841,609	2,435	2,218	3,615,188	0.01	0.7	0.6	1,003	0.7	0.6	1,003	5.8	4.1	1,960	0.01
96	Avista	investor-owned corp.	7,110,500	3,170,564	1,307,440	1,305	1,714	2,268,997	0.01	0.4	0.5	638	0.8	1.1	1,431	2.0	2.6	2,283	0.01
97	LS Power	privately held corp.	7,055,206	6,792,296	2,154,518	6,211	5,238	4,512,168	0.02	1.8	1.5	1,279	1.8	1.5	1,329	5.8	4.1	1,960	0.01
98	Grand River Dam Authority	state power authority	7,001,951	6,290,162	4,432,089	11,396	5,370	6,273,301	0.10	3.3	1.5	1,792	3.6	1.7	1,995	5.1	2.4	2,475	0.05
99	Hoosier Energy	cooperative	6,856,805	6,838,334	6,577,657	13,068	2,809	7,150,556	0.07	3.8	0.8	2,086	3.8	0.8	2,090	4.0	0.8	2,132	0.02
100	Sacramento Municipal Util Dist	municipality	6,765,215	5,475,310	-	12	138	2,334,956	-	0.0	0.0	690	0.0	0.0	853	-	-	-	-
	Total (in thousands)		3,447,817	2,293,156	1,385,231	2,904	1,456	1,946,140	0.02										
	Average (mean)									1.7	1.0	1,294	2.0	1.3	1,644	3.6	2.2	2,209	0.03
	Average (weighted by MWh)									1.8	0.9	1,176	2.5	1.3	1,694	4.2	1.9	2,191	0.03
	Median									1.1	0.9	1,333	1.5	1.1	1,773	2.9	2.0	2,207	0.03

\* Breakdown of ownership categories provided in endnote 2 ■ privately/investor owned ■ public power ■ cooperative

## Generation by Fuel Type

The 100 largest power producers in the U.S. accounted for 85 percent of the electricity produced in 2013. Coal accounted for 40 percent of the power produced by the 100 largest companies, followed by natural gas (26 percent), nuclear (22 percent), hydroelectric power (7 percent), oil (<1 percent), and non-hydroelectric renewables and other fuel sources (4 and 1 percent, respectively). Natural gas was the source of 37 percent of the power produced by smaller companies (i.e., those not within the top 100), followed by coal (30 percent), non-hydroelectric renewables/other (20 percent), hydroelectric power (7 percent), nuclear power (3 percent), and oil (1 percent).

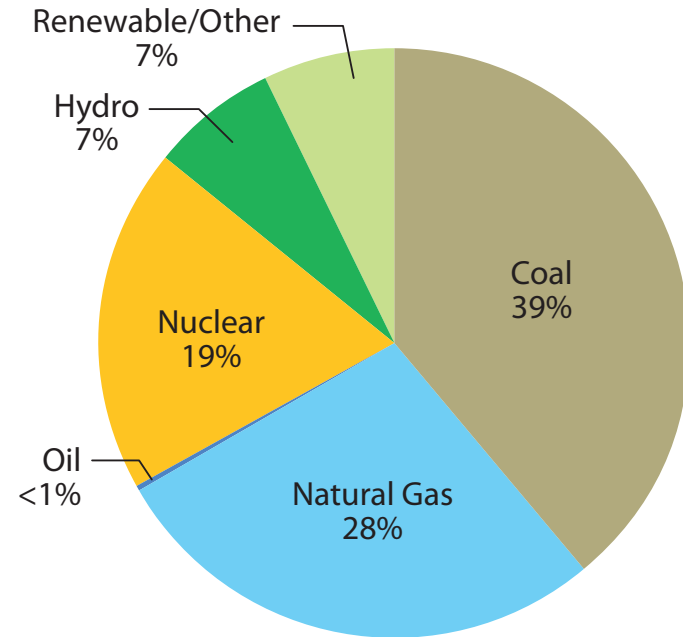
As a portion of total electric power production, the 100 largest producers accounted for 88 percent of all coal-fired power, 80 percent of natural gas-fired power, 35 percent of oil-fired power, 97 percent of nuclear power, 85 percent of hydroelectric power, and 73 percent of non-hydroelectric renewable power.

Figure 3 illustrates the 2013 electricity generation by fuel for each of the 100 largest power (MWh) producers. The generation levels, expressed in million megawatt hours, show production from facilities wholly and partially owned by each producer and reported to the EIA. Coal or nuclear accounted for over half of the output of the largest producers. The exceptions are a handful of generating companies whose assets are dominated by hydroelectric or natural gas-fired plants.

These data reflect the mix of generating facilities that are directly owned by the 100 largest power producers, not the energy purchases that some utility companies rely on to meet their customers' electricity needs. For example, some utility companies have signed long-term supply contracts for the output of renewable energy projects. In this report, the output of these facilities would be attributed to the owner of the project, not the buyer of the output.

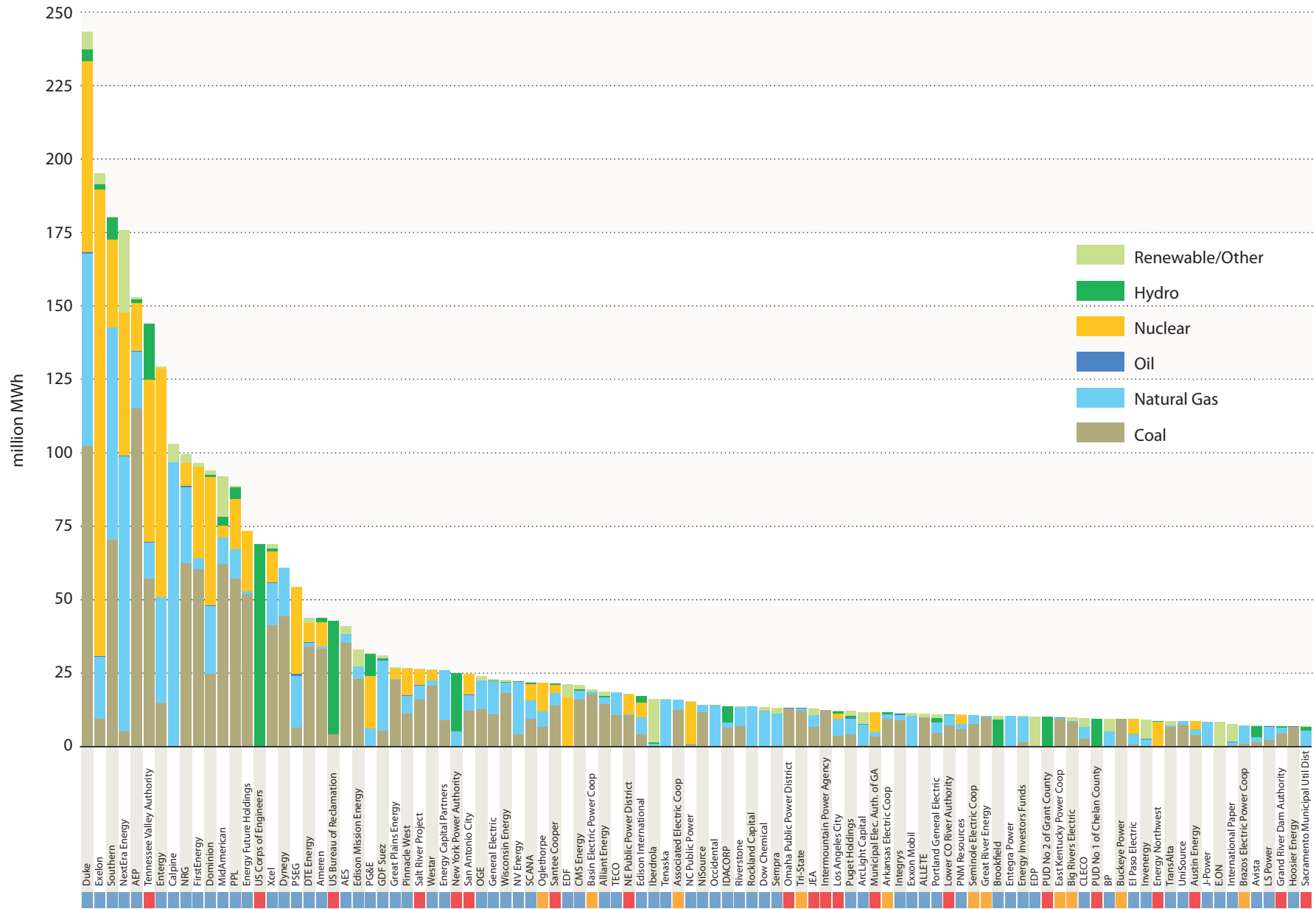
FIGURE 2

U.S. Electricity Generation by Fuel Type (2013)



SOURCE: U.S. ENERGY INFORMATION ADMINISTRATION, EIA-923  
MONTHLY GENERATION AND FUEL CONSUMPTION 2013 FINAL RELEASE.

**FIGURE 3**  
**Generation of 100 Largest Power Producers by Fuel Type (2013)\***



\* Breakdown of ownership categories provided in endnote 2 ■ privately/investor owned ■ public power ■ cooperative

## Emissions Rankings

Table 3 shows the relative ranking of the 100 largest power producers by several measures—their contribution to total generation, total emissions, and emission rates. These rankings help to evaluate and compare emissions performance.

Figures 4 through 7 illustrate SO<sub>2</sub>, NO<sub>x</sub>, CO<sub>2</sub>, and mercury emissions levels (expressed in tons for SO<sub>2</sub>, NO<sub>x</sub> and CO<sub>2</sub>, and pounds for mercury) and emission rates for each of the 100 largest producers. These comparisons illustrate the relative emissions performance of each producer based on the company's ownership stake in power plants with reported emissions information. For SO<sub>2</sub> and NO<sub>x</sub>, the report presents comparisons of total emissions levels and rates for fossil fuel-fired facilities. For CO<sub>2</sub>, the report presents comparisons of total emissions levels and rates for all generating sources (e.g., fossil, nuclear, and renewable). For mercury, the report presents comparisons of total emissions levels and rates for coal-fired generating facilities only.

The mercury emissions shown in this report were obtained from EPA's Toxic Release Inventory (TRI). The TRI contains facility-level information on the use and environmental release of chemicals classified as toxic under the Clean Air Act. While the TRI includes data on total facility chemical releases, this report uses the "air releases" section to calculate mercury emissions. Because coal plants are the primary source of mercury emissions within the electric industry, the mercury emissions and emission rates presented in this report reflect the emissions associated with each producer's fleet of coal plants only. Other toxic air pollutant emissions, such as hydrogen chloride and hydrogen fluoride (acid gases), are also reported to EPA under the TRI program. However, we have not included these air toxics because of uncertainties about the quality of the data submitted to EPA. We will continue to evaluate whether these pollutants might be included in future benchmarking efforts. In general, there is a strong correlation between SO<sub>2</sub> reductions and co-benefit reductions in acid gas emissions.



The charts present both the total emissions by company as well as their average emission rates. The evaluation of emissions performance by both emission levels and emission rates provides a more complete picture of relative emissions performance than viewing these measures in isolation. Total emission levels are useful for understanding each producer's contribution to overall emissions loading, while emission rates are useful for assessing how electric power producers compare according to emissions per unit of energy produced when size is eliminated as a performance factor.

The charts illustrate significant differences in the total emission levels and emission rates of the 100 largest power producers. For example, the tons of CO<sub>2</sub> emissions range from 0 to over 137 million tons per year. The NO<sub>x</sub> emission rates range from 0 to 3.8 lb/MWh. The total tons of emissions from any producer are influenced by the total amount of generation that a producer owns and by the fuels and technologies used to generate electricity.

**TABLE 3**  
**Company Rankings for 100 Largest Power Producers (2013)**  
 in alphabetical order

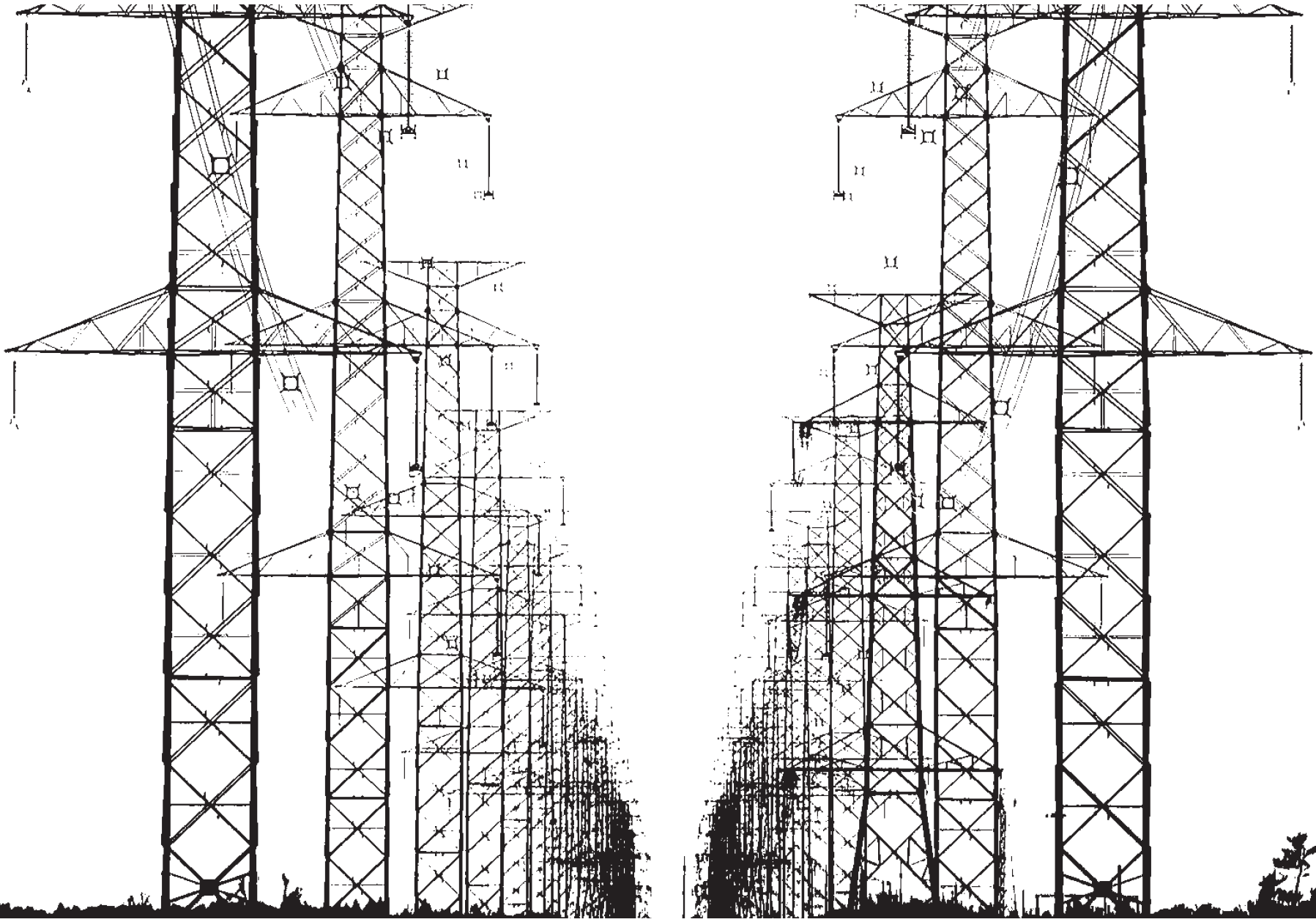
Owner	Ownership Type*	By Generation			By Tons of Emissions				By Emission Rates											
		Total	Fossil	Coal	SO <sub>2</sub>	NO <sub>x</sub>	CO <sub>2</sub>	Hg	All Generating Sources			Fossil Fuel Plants			Coal Plants					
									SO <sub>2</sub>	NO <sub>x</sub>	CO <sub>2</sub>	SO <sub>2</sub>	NO <sub>x</sub>	CO <sub>2</sub>	SO <sub>2</sub>	NO <sub>x</sub>	CO <sub>2</sub>	Hg		
AEP	investor-owned corp.	5	3	1	1	1	2	1	13	31	30	12	35	29	21	52	57	23		
AES	investor-owned corp.	22	16	12	10	12	14	13	3	16	15	5	27	17	11	41	55	34		
ALLETE	investor-owned corp.	69	62	38	51	44	46	29	40	17	6	44	28	2	59	45	6	20		
Alliant Energy	investor-owned corp.	43	37	24	18	31	28	17	4	27	18	4	33	15	6	50	19	5		
Ameren	investor-owned corp.	20	18	14	13	22	18	7	19	48	39	14	47	35	29	70	76	13		
ArLight Capital	privately held corp.	64	74	76	77	84	81	78	75	84	78	75	81	74	51	74	3	77		
Arkansas Electric Coop	cooperative	66	52	42	27	32	49	25	7	7	17	8	9	27	16	19	43	9		
Associated Electric Coop	cooperative	49	39	28	25	14	38	37	14	2	24	19	2	43	26	5	67	52		
Austin Energy	municipality	91	81	66	76	70	73	57	74	54	48	74	55	38	78	68	9	38		
Avista	investor-owned corp.	96	88	72	69	77	88	72	65	65	79	60	48	64	58	20	21	65		
Basin Electric Power Coop	cooperative	42	32	20	26	16	23	12	21	3	3	26	5	4	43	18	8	6		
Big Rivers Electric	cooperative	81	63	46	29	37	48	39	9	5	1	11	10	5	20	17	29	41		
BP	foreign-owned corp.	84	83	-	81	88	85	-	79	87	84	79	86	92	-	-	-	-		
Brazos Electric Power Coop	cooperative	95	75	73	67	74	82	73	58	56	62	66	68	76	14	6	77	57		
Brookfield	foreign-owned corp.	75	93	-	92	93	93	-	92	93	93	84	78	75	-	-	-	-		
Buckeye Power	cooperative	85	67	43	41	59	54	33	22	34	9	29	46	20	44	69	69	30		
Calpine	investor-owned corp.	8	5	-	78	48	13	-	81	79	72	82	82	87	-	-	-	-		
CLECO	investor-owned corp.	82	65	69	42	62	58	55	25	37	27	30	49	46	3	48	7	11		
CMS Energy	investor-owned corp.	41	31	21	16	27	24	14	5	25	14	7	36	24	10	47	30	3		
Dominion	investor-owned corp.	11	15	15	20	21	17	23	55	67	74	48	62	59	45	57	68	51		
Dow Chemical	investor-owned corp.	56	49	-	89	85	71	-	87	86	70	90	89	90	-	-	-	-		
DTE Energy	investor-owned corp.	19	17	13	7	10	15	6	2	13	28	2	14	12	4	33	41	14		
Duke	investor-owned corp.	1	1	2	4	2	1	8	39	49	56	31	45	54	33	44	66	59		
Dynegy	investor-owned corp.	17	11	10	15	18	10	28	32	52	20	41	66	41	47	72	27	68		
E.ON	foreign-owned corp.	93	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
East Kentucky Power Coop	cooperative	80	64	40	48	65	52	56	31	44	7	39	58	14	53	73	54	60		
EDF	foreign-owned corp.	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Edison International	investor-owned corp.	46	61	62	65	35	65	50	63	24	73	65	7	65	61	2	60	29		
Edison Mission Energy	privately held corp.	23	21	16	17	30	19	41	18	47	31	16	50	22	25	63	12	67		
EDP	foreign-owned corp.	78	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
El Paso Electric	investor-owned corp.	86	86	75	75	67	83	70	72	45	81	71	23	68	60	3	61	28		
Energy Capital Partners	privately held corp.	30	22	44	30	45	29	62	41	59	46	49	70	66	32	55	32	72		
Energy Future Holdings	privately held corp.	14	13	9	5	13	9	2	6	46	34	3	43	3	5	64	15	2		
Energy Investors Funds	privately held corp.	77	60	71	72	75	76	77	68	71	67	73	76	80	64	49	22	76		
Energy Northwest	municipality	88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Entegra Power	privately held corp.	76	58	-	82	82	72	-	82	80	61	83	83	73	-	-	-	-		
Entergy	investor-owned corp.	7	14	23	19	11	16	19	54	57	80	42	37	61	9	22	25	8		
Exelon	investor-owned corp.	2	19	41	35	29	26	42	71	78	88	57	54	69	39	16	75	50		
Exxon Mobil	investor-owned corp.	68	57	-	85	78	75	-	83	75	71	89	88	93	-	-	-	-		
FirstEnergy	investor-owned corp.	10	10	6	11	6	7	15	34	30	44	27	20	25	42	35	64	55		
GDF Suez	foreign-owned corp.	25	20	58	34	58	30	38	49	72	60	54	75	71	13	65	56	17		
General Electric	investor-owned corp.	34	27	34	8	23	31	22	1	21	43	1	31	62	1	12	63	7		
Grand River Dam Authority	state power authority	98	79	61	46	57	69	43	17	22	26	17	30	28	18	28	2	10		
Great Plains Energy	investor-owned corp.	26	24	17	28	28	21	20	35	35	21	37	42	11	52	58	48	32		
Great River Energy	cooperative	74	59	37	31	43	47	16	16	12	2	20	25	8	35	42	24	1		
Hoosier Energy	cooperative	99	77	54	38	69	64	53	12	50	8	15	61	18	31	77	58	54		
Iberdrola	foreign-owned corp.	47	91	-	91	92	92	-	91	92	92	86	84	91	-	-	-	-		
IDACORP	investor-owned corp.	53	72	55	52	47	60	36	45	36	55	38	26	34	49	34	38	19		
Integrus	investor-owned corp.	67	55	45	32	60	51	31	20	43	22	22	53	33	34	66	40	27		
Intermountain Power Agency	power district	61	48	29	61	17	43	75	53	1	13	64	1	30	73	9	74	78		

\* Breakdown of ownership categories provided in endnote 2 ■ privately/investor owned ■ public power ■ cooperative

A ranking of 1 indicates the highest absolute number or rate in any column: the highest generation (MWh), highest emissions (tons), or highest emission rate (lb/MWh). A ranking of 100 indicates the lowest absolute number or rate in any column.

Owner	Ownership Type*	By Generation			By Tons of Emissions				By Emission Rates									
		Total	Fossil	Coal	SO <sub>2</sub>	NO <sub>x</sub>	CO <sub>2</sub>	Hg	All Generating Sources			Fossil Fuel Plants			Coal Plants			
									SO <sub>2</sub>	NO <sub>x</sub>	CO <sub>2</sub>	SO <sub>2</sub>	NO <sub>x</sub>	CO <sub>2</sub>	SO <sub>2</sub>	NO <sub>x</sub>	CO <sub>2</sub>	Hg
International Paper	investor-owned corp.	94	90	77	-	72	91	-	-	61	86	-	4	79	-	1	79	-
Invenery	privately held corp.	87	89	-	90	86	89	-	89	83	85	88	74	88	-	-	-	-
JEA	municipality	60	47	51	37	36	44	52	30	11	19	36	24	40	28	11	17	53
J-Power	foreign-owned corp.	92	70	78	79	79	80	71	78	74	64	78	80	78	71	71	33	15
Los Angeles City	municipality	62	68	67	73	68	66	54	69	55	59	72	63	63	75	38	71	24
Lower CO River Authority	state power authority	71	54	49	68	63	53	44	67	42	25	70	56	44	77	59	16	40
LS Power	privately held corp.	97	78	70	56	61	77	68	36	23	49	43	34	67	15	7	78	58
MidAmerican	privately held corp.	12	7	5	12	3	5	5	37	20	36	34	18	23	48	27	31	35
Municipal Elec. Auth. of GA	municipality	65	85	68	59	73	79	61	52	70	76	40	59	50	40	60	53	36
NC Public Power	municipality	50	92	74	70	81	90	74	70	82	91	25	21	1	38	39	5	62
NE Public Power District	power district	45	53	35	21	34	45	21	15	28	47	6	11	9	12	30	36	4
New York Power Authority	state power authority	31	84	-	83	89	86	-	86	90	89	81	87	83	-	-	-	-
NextEra Energy	investor-owned corp.	4	4	59	60	25	12	51	76	76	83	77	77	77	68	29	1	39
NISource	investor-owned corp.	51	41	32	23	41	37	35	10	29	10	13	40	21	19	51	11	43
NRG	investor-owned corp.	9	6	4	3	7	4	3	11	33	32	9	39	39	7	46	35	12
NV Energy	investor-owned corp.	36	28	65	62	50	42	47	64	58	58	69	69	72	55	26	26	16
Occidental	investor-owned corp.	52	42	-	88	83	68	-	88	85	65	92	90	82	-	-	-	-
OGE	investor-owned corp.	33	26	27	22	15	25	27	23	9	33	28	13	45	22	13	18	31
Oglethorpe	cooperative	38	50	53	50	64	55	45	51	69	68	45	67	57	41	61	52	37
Omaha Public Power District	power district	58	45	26	24	33	39	24	8	10	5	10	22	10	24	40	47	21
PG&E	investor-owned corp.	24	80	-	87	91	84	-	90	91	90	87	92	86	-	-	-	-
Pinnacle West	investor-owned corp.	27	36	33	53	20	35	26	61	18	57	58	6	51	63	8	49	18
PNM Resources	investor-owned corp.	72	73	57	64	39	61	63	56	8	45	56	3	36	67	10	44	70
Portland General Electric	investor-owned corp.	70	71	60	39	54	67	69	27	38	51	24	38	53	17	32	51	71
PPL	investor-owned corp.	13	9	8	9	4	8	9	24	19	41	21	17	31	30	24	50	45
PSEG	investor-owned corp.	18	23	56	49	38	34	48	66	68	82	61	57	70	46	15	28	47
PUD No 1 of Chelan County	power district	83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PUD No 2 of Grant County	power district	79	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puget Holdings	privately held corp.	63	66	63	63	53	63	64	57	40	53	59	44	58	57	21	20	66
Riverstone	privately held corp.	54	44	50	33	51	50	67	28	39	37	32	60	55	23	56	23	73
Rockland Capital	privately held corp.	55	43	79	74	80	70	76	73	81	69	76	85	85	2	4	4	61
Sacramento Municipal Util Dist	municipality	100	82	-	86	90	87	-	85	89	77	91	93	89	-	-	-	-
Salt River Project	power district	28	30	22	57	19	27	30	62	15	42	67	16	42	74	14	45	44
San Antonio City	municipality	32	35	31	40	49	33	32	48	63	50	47	65	47	54	75	62	42
Santee Cooper	state power authority	39	34	25	55	56	32	58	59	64	40	63	71	48	70	78	73	69
SCANA	investor-owned corp.	37	40	39	45	52	41	60	47	62	54	46	64	52	50	62	65	64
Seminole Electric Coop	cooperative	73	56	47	43	71	56	66	29	66	29	35	73	49	37	79	72	74
Sempra	investor-owned corp.	57	51	-	84	87	74	-	84	88	75	85	91	84	-	-	-	-
Southern	investor-owned corp.	3	2	3	2	5	3	4	26	51	52	23	51	60	8	43	46	26
TECO	investor-owned corp.	44	33	36	44	55	36	65	43	60	35	53	72	56	56	76	59	75
Tenaska	privately held corp.	48	38	-	80	76	62	-	80	73	66	80	79	81	-	-	-	-
Tennessee Valley Authority	federal power authority	6	8	7	6	9	6	10	38	53	63	18	41	32	27	53	37	48
TransAlta	foreign-owned corp.	89	76	52	66	46	59	59	60	14	23	62	15	7	72	31	14	56
Tri-State	cooperative	59	46	30	54	26	40	34	44	4	4	52	8	13	66	25	34	49
UniSource	investor-owned corp.	90	69	48	58	42	57	46	42	6	11	50	12	26	62	23	39	46
US Bureau of Reclamation	federal power authority	21	87	64	71	66	78	49	77	77	87	68	19	19	76	37	70	25
US Corps of Engineers	federal power authority	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Westar	investor-owned corp.	29	25	18	36	24	20	18	46	32	16	51	32	6	65	54	10	22
Wisconsin Energy	investor-owned corp.	35	29	19	47	40	22	40	50	41	12	55	52	16	69	67	13	63
Xcel	investor-owned corp.	16	12	11	14	8	11	11	33	26	38	33	29	37	36	36	42	33

\* Breakdown of ownership categories provided in endnote 2 ■ privately/investor owned ■ public power ■ cooperative



## NO<sub>x</sub> and SO<sub>2</sub> Emissions Levels and Rates

Figures 4 and 5 display NO<sub>x</sub> and SO<sub>2</sub> emission levels and emission rates for fossil fuel-fired generating sources owned by each company.

“Fossil only” emission rates are calculated by dividing each company’s total NO<sub>x</sub> and SO<sub>2</sub> emissions from fossil-fired power plants by its total generation from fossil-fired power plants. Companies with significant coal-fired generating capacity have the highest total emissions of SO<sub>2</sub> and NO<sub>x</sub> because coal contains higher concentrations of sulfur than natural gas and oil and coal plants generally have higher NO<sub>x</sub> emission rates.

Figures 4 and 5 illustrate wide disparities in the “fossil only” emission levels and emission rates of the 100 largest power producers. Their total fossil generation varies from 0 to 168 million MWh and:

- NO<sub>x</sub> emission rates range from 0 to 3.8 lb/MWh, and NO<sub>x</sub> emissions range from 0 to 103,780 tons;
- SO<sub>2</sub> emission rates range from 0 to 10.3 lb/MWh, and SO<sub>2</sub> emissions range from 0 to 280,480 tons.

FIGURE 4

**Fossil Fuel - NOx Total Emissions and Emission Rates (2013)\***

Total emissions (thousand tons) and emission rates (lb/MWh) from fossil fuel generating facilities

\* Breakdown of ownership categories provided in endnote 2

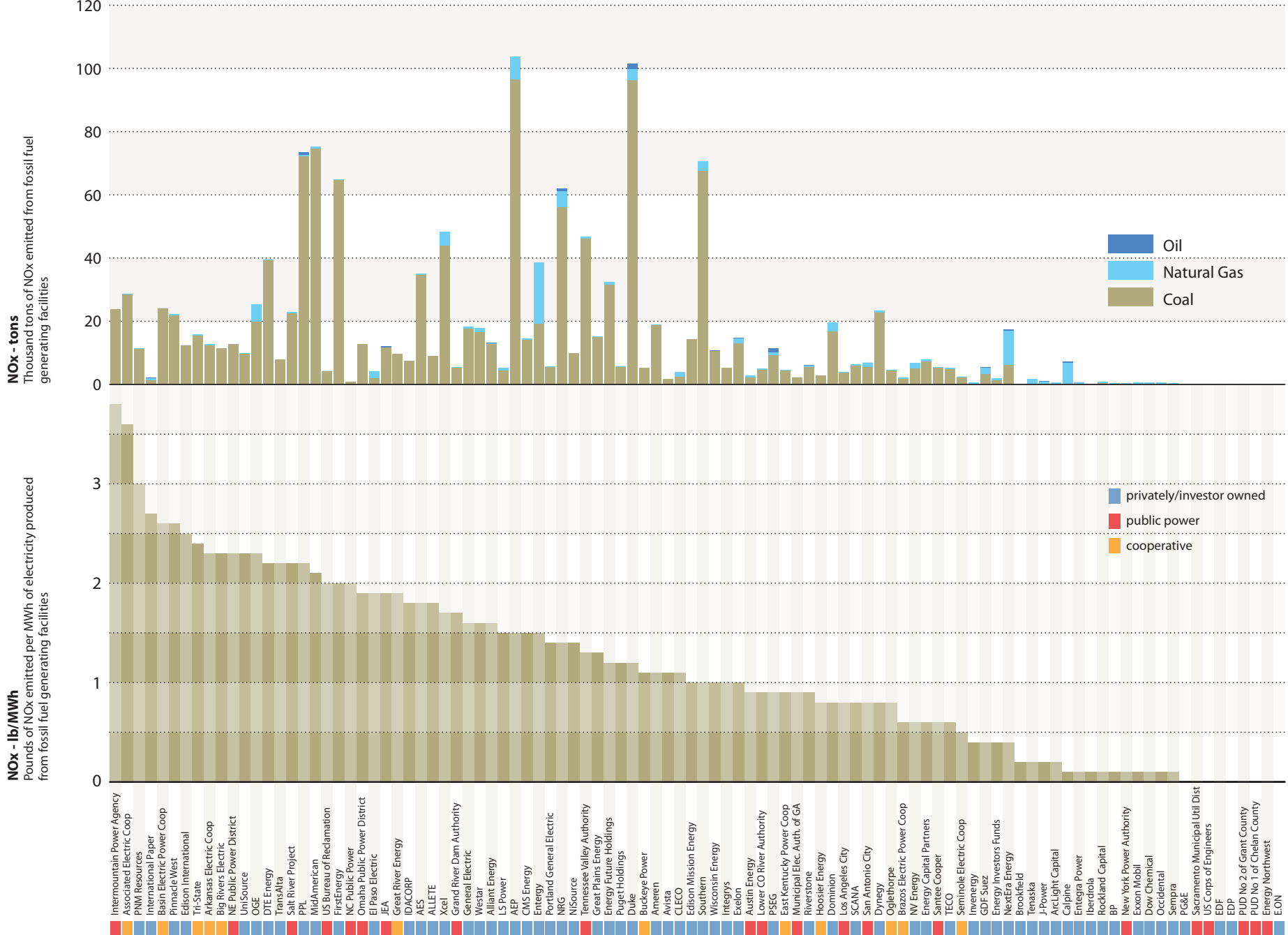
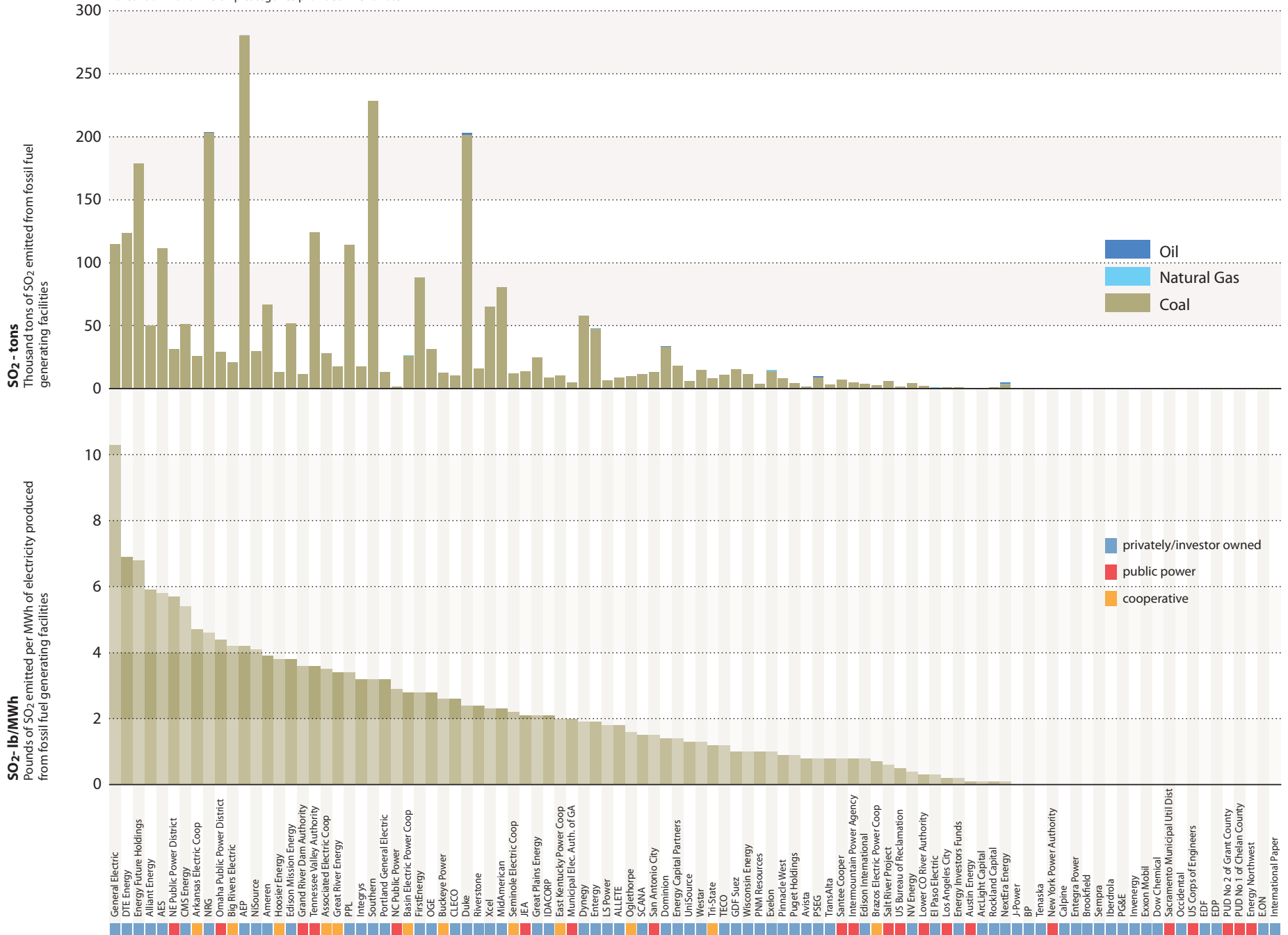


FIGURE 5

**Fossil Fuel - SO<sub>2</sub> Total Emissions and Emission Rates (2013)\***

Total emissions (thousand tons) and emission rates (lb/MWh) from fossil fuel generating facilities

\* Breakdown of ownership categories provided in endnote 2



## CO<sub>2</sub> Emission Levels and Rates

Figure 6 displays total CO<sub>2</sub> emission levels from coal, oil, and natural gas combustion and emission rates based on all generating sources owned by each company.

“All-source” emission rates are calculated by dividing each company’s total CO<sub>2</sub> emissions by its total generation. In most cases, producers with significant non-emitting fuel sources, such as nuclear, hydroelectric and wind power, have lower all-source emission rates than producers owning primarily fossil fuel power plants. Among the 100 largest power producers:

- Coal-fired power plants are responsible for 78 percent of CO<sub>2</sub> emissions;
- Natural gas-fired power plants are responsible for 21 percent of CO<sub>2</sub> emissions;
- Oil-fired power plants are responsible 0.3 percent of CO<sub>2</sub> emissions.

Figure 6 illustrates wide disparities in the “all-source” emission levels and emission rates of the 100 largest power producers. Their total electric generation varies from just under 7 million to 243 million MWh, their CO<sub>2</sub> emissions range from 0 to 137 million tons, and their CO<sub>2</sub> emission rates range from 0 to 2,264 lb/MWh.

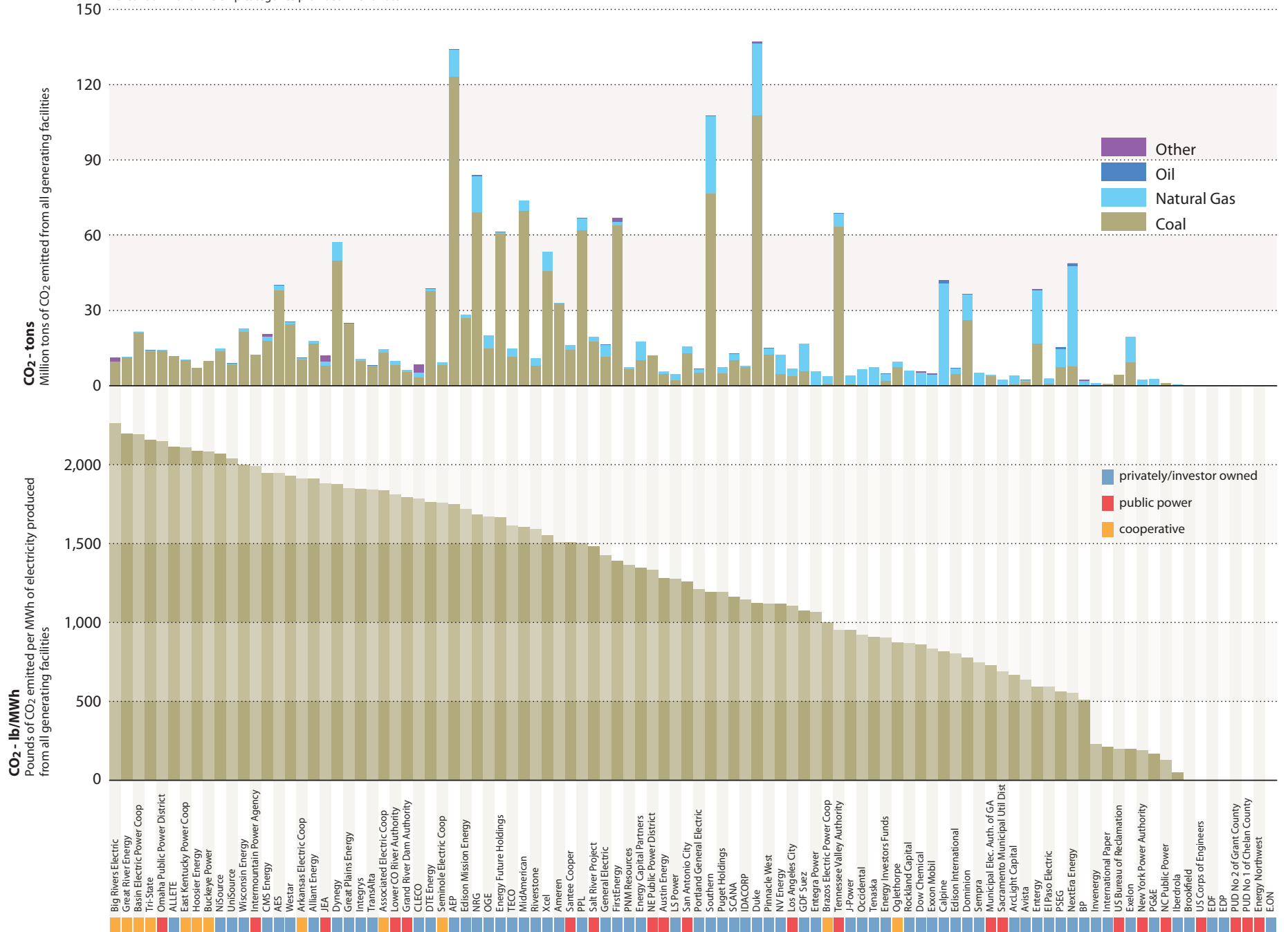


FIGURE 6

**All Source - CO<sub>2</sub> Total Emissions and Emission Rates (2013)\***

Total emissions (million tons) and emission rates (lb/MWh) from all generating facilities

\* Breakdown of ownership categories provided in endnote 2



## Mercury Emission Levels and Rates

Figure 7 displays total mercury emission levels and emission rates from coal-fired power plants.

In 2012, EPA finalized the Mercury and Air Toxics Standards (MATS), regulating emissions of mercury and other hazardous air pollutants from coal- and oil-fired electric generating units. The standards went into effect April 16, 2015, although there are still pending legal challenges to the rule. The differences in mercury emission rates seen in the following figures are due to the mercury content and type of coal used, and the effect of control technologies designed to lower SO<sub>2</sub>, NO<sub>x</sub>, and particulate emissions. In recent years, a significant amount of coal-fired capacity has also installed mercury controls to comply with MATS and state mercury rules.

Coal mercury emissions from the top 100 power producers range from less than 1 to 4,107 pounds, and coal mercury emission rates range from 0.0003 to 0.081 pound per gigawatt hour (a gigawatt hour is 1,000 megawatt-hours).

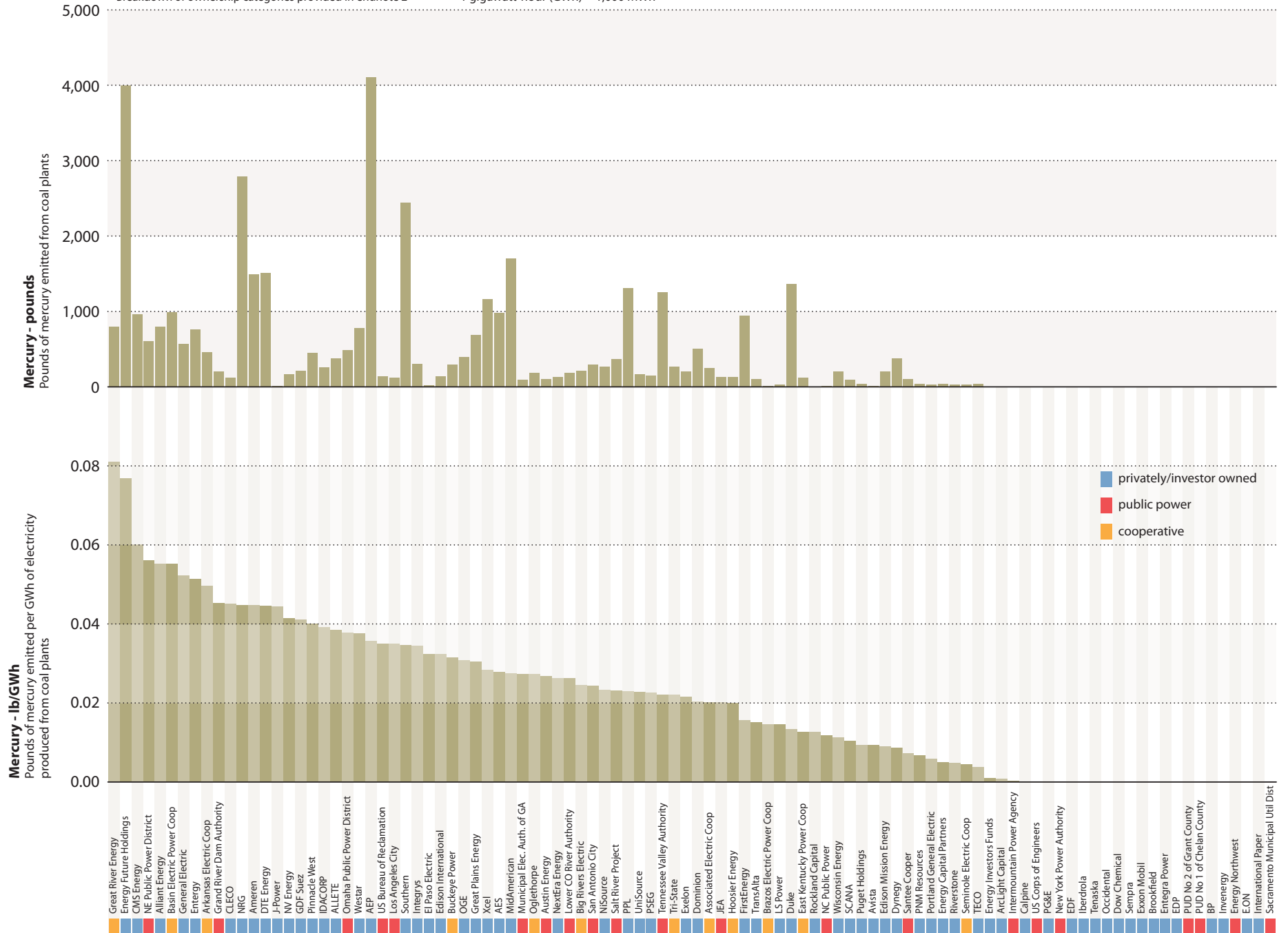
FIGURE 7

**Coal - Mercury Emission Rates and Total Emissions (2013)\***

Emission rates (lb/GWh) and total emissions (pounds) from coal plants

\* Breakdown of ownership categories provided in endnote 2

1 gigawatt-hour (GWh) = 1,000 MWh



# Emissions Trends Analysis

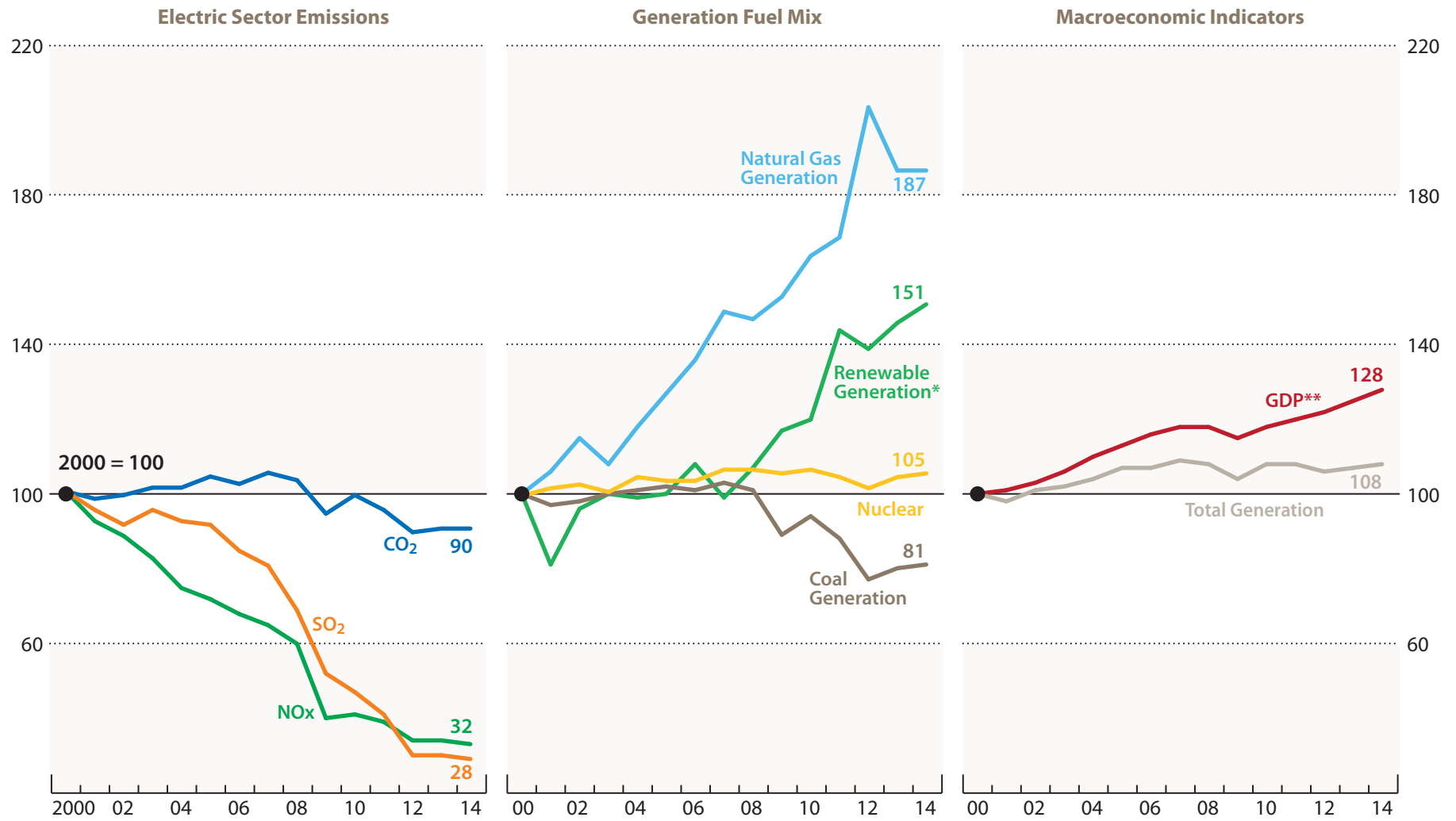
The electric power sector has made significant progress in terms of reducing its NO<sub>x</sub> and SO<sub>2</sub> emissions over the past several decades. In 2013, power plant NO<sub>x</sub> and SO<sub>2</sub> emissions were 80 percent and 74 percent lower, respectively, than they were in 1990 when Congress passed major amendments to the Clean Air Act. Large reductions in mercury emissions have also been realized, with 2013 emissions 50 percent below 2000 emissions. Less progress has been made in terms of reducing CO<sub>2</sub> emissions. In 2013, power plant CO<sub>2</sub> emissions were 14 percent higher than 1990 levels. More recently, as illustrated in Figure 8, CO<sub>2</sub> emissions from power plants have declined, with 2013 emissions 12 percent lower than emissions in 2008.

Figure 8 plots the trends in power plant NO<sub>x</sub>, SO<sub>2</sub>, and CO<sub>2</sub> emissions since 2000 (indexed 12-month totals). Figure 8 also plots total electricity generation by fuel type, as well as gross domestic product (GDP). The electric industry has cut its NO<sub>x</sub> and SO<sub>2</sub> emissions even as overall electricity generation and GDP have increased. In the wake of the recent economic recession, power plant emissions declined significantly, in part due to a decline in overall electricity demand. Emissions have leveled off in recent years, but are expected to decline further in response to coal plant retirements, the installation of pollution controls at coal-fired power plants, and low natural gas prices. New environmental policies, including the Clean Power Plan, are also expected to contribute to the overall trend of declining emissions from the electric sector. Over the past two years, CO<sub>2</sub> emissions have basically been flat.

The Emissions Benchmarking report can also be used to evaluate a company's individual performance over time. Figure 9 compares the emissions trends over the past several years for a small sampling of companies based on the data reported in past versions of the Emissions Benchmarking report. A wide range of factors will influence a company's emissions, including plant utilization, pollution control retrofits, new plant construction, power plant divestitures and retirements, and mergers and acquisitions. The companies profiled include Duke, Exelon, Southern, and NextEra. These were the four largest generating companies in 2013. For each company, Figure 9 highlights the key changes that have influenced its emissions.

FIGURE 8

**Annual Electric Sector Trends and Macroeconomic Indicators**  
(Indexed: 2000 = 100)



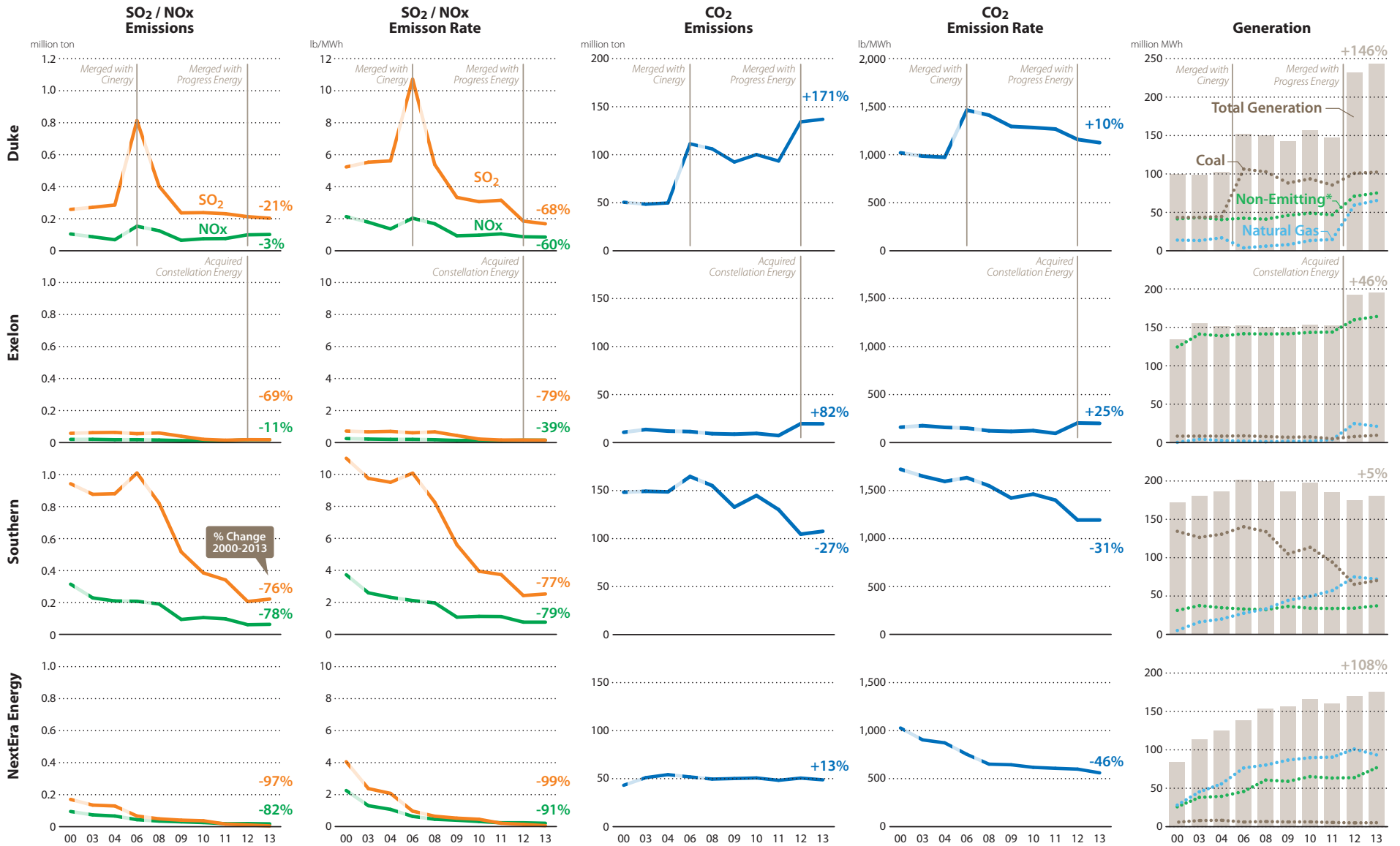
\*INCLUDES HYDROELECTRIC, WIND, SOLAR, BIOMASS, GEOTHERMAL AND OTHER RENEWABLE SOURCES.

\*\*GROSS DOMESTIC PRODUCT (GDP) IN CHAINED 2009 DOLLARS.

- Duke Energy has seen significant improvement in its SO<sub>2</sub> and NO<sub>x</sub> emission rates since 2000. However, its CO<sub>2</sub> emissions have increased dramatically. After merging with Cinergy in 2006, Duke expanded its coal-fired generating fleet, which led to a major increase in its CO<sub>2</sub> and SO<sub>2</sub> emissions. The company's SO<sub>2</sub> emissions dropped significantly after the merger as Duke completed scrubber retrofits at ten plants. The company's total generation has more than doubled between 2000 and 2013, including a nearly 60 percent increase from its merger with Progress Energy in 2012. As a result, Duke's CO<sub>2</sub> emissions have nearly trebled since 2000. Despite significantly higher CO<sub>2</sub> emissions, Duke's CO<sub>2</sub> emission rate has only risen 10 percent thanks in part to an increase in low- and non-emitting generation.
- Exelon has low total emissions and emission rates among the top 100 producers. This is due to the company's sizeable low- and non-emitting generating resource base—Exelon is the nation's largest producer of nuclear energy and has significant investments in renewable energy. Exelon's increase in 2012/2013 emissions was due to its acquisition of Constellation Energy. A number of Constellation units, and Exelon's shares of two Pennsylvania coal plants, have since been divested (not reflected in this year's data) which will result in even lower emissions for Exelon in 2015 and future years.
- Southern Company reduced both total emissions and rates for SO<sub>2</sub>, NO<sub>x</sub>, and CO<sub>2</sub> between 2000 and 2013 as it cut back coal generation and added gas-fired generation. Between 2000 and 2013, Southern reduced its coal-fired generation by nearly half while the company's gas-fired generation increased more than 12 times during the same period. Installation of controls have also contributed to the decline in Southern's SO<sub>2</sub> and NO<sub>x</sub> emissions and emission rates, with scrubbers and SCRs operating at 17 and 16 coal units, respectively, by the end of 2011. Although Southern has made substantial emissions reductions since 2000, it remains one of the largest producers of SO<sub>2</sub>, NO<sub>x</sub>, and CO<sub>2</sub> in the U.S.
- NextEra's SO<sub>2</sub> and NO<sub>x</sub> emissions and rates dropped substantially between 2000 and 2013. These reductions were due in large part to a decline in oil-fired generation, with NextEra subsidiary Florida Power & Light's use of oil decreasing from 40 million barrels in 2001 to less than one million barrels in 2012. While total CO<sub>2</sub> emissions have increased by 13 percent over the same time period, NextEra has more than doubled its electricity generation, including a significant increase in natural gas and wind generation.

FIGURE 9

Emissions and Electric Generation Trends: Duke, Exelon, Southern, and NextEra Energy



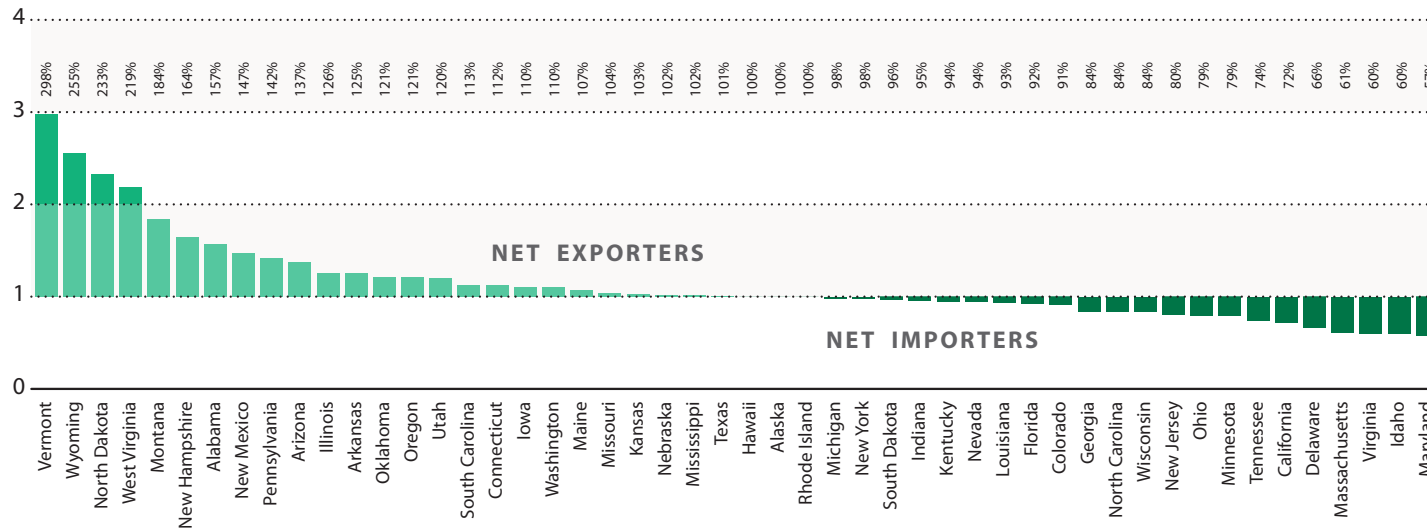
NOTE: THE X-AXES IN THE CHARTS ABOVE DO NOT DENOTE EQUAL INTERVALS. DATA FOR YEARS 2001, 2002, 2005, AND 2007 ARE NOT SHOWN IN THE CHARTS ABOVE.

\*INCLUDES NUCLEAR, HYDRO, AND RENEWABLE SOURCES

# State-by-State Emissions Summary

Figure 11 summarizes CO<sub>2</sub> emissions from power plants on a state-by-state basis. Texas, Florida, and Ohio had the highest total CO<sub>2</sub> emissions in the U.S. in 2013. Vermont, Idaho, and Maine have the lowest total CO<sub>2</sub> emissions. Figure 11 also presents the average CO<sub>2</sub> emission rates for each state, including all source CO<sub>2</sub> emission rates, fossil CO<sub>2</sub> emission rates, and coal-only CO<sub>2</sub> emission rates. While Texas ranks first in terms of total emissions, it ranks 21st in terms of its all source CO<sub>2</sub> emission rate. Kentucky, Wyoming, and West Virginia have the highest all source CO<sub>2</sub> emission rates because of their heavy reliance on coal for electricity generation. States also vary in terms of their import and export of electricity. Florida, for example, produces virtually all of the electricity that it generates with limited imports. West Virginia and North Dakota, in contrast, are large exporters of electricity. Figure 10 summarizes the net imports or exports of electricity by state.

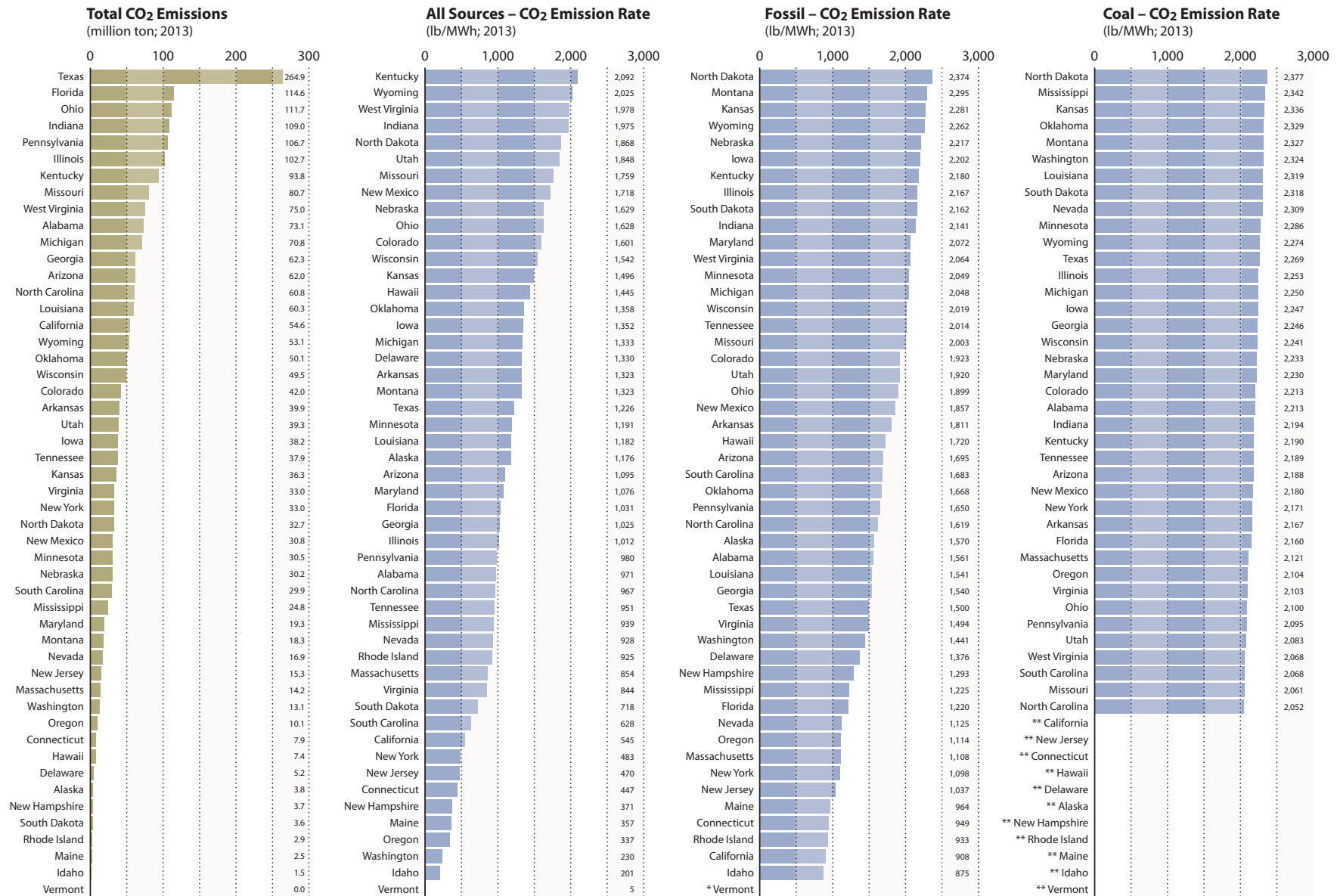
**FIGURE 10**  
**Electricity Exporters/Importers**  
(Net Intersate Trade Index; 2012)



% : TOTAL IN-STATE SUPPLY OF ELECTRICITY AS % SHARE OF TOTAL IN-STATE CONSUMPTION NEEDS; IN-STATE SUPPLY INCLUDES INTERNATIONAL IMPORTS.

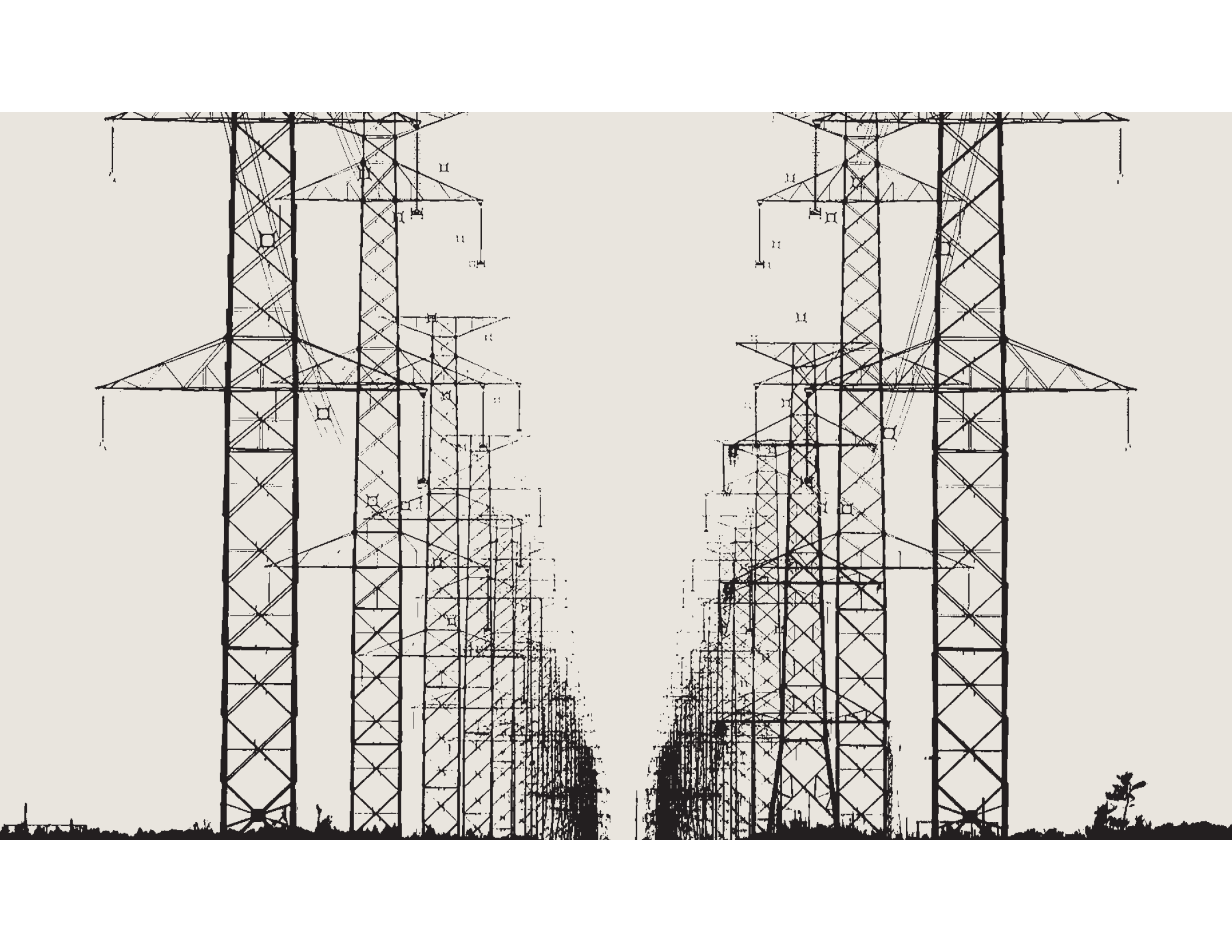


FIGURE 11



\* VERMONT DID NOT HAVE ENOUGH FOSSIL-FIRED GENERATION IN 2013 TO CALCULATE A MEANINGFUL EMISSION RATE

\*\* THESE STATES DID NOT HAVE ENOUGH COAL-FIRED GENERATION IN 2013 TO CALCULATE MEANINGFUL EMISSION RATES



# Use of the Benchmarking Data

This report provides public information that can be used to evaluate electric power producers' emissions performance and risk exposure. Transparent information on emissions performance is useful to a wide range of decision-makers, including electric companies, financial analysts, investors, policymakers, and consumers.

## Electric Companies

This provision of transparent information supports corporate self-evaluation and business planning by providing a useful “reality check” that companies can use to assess their performance relative to key competitors, prior years, and industry benchmarks. By understanding and tracking their performance, companies can evaluate how different business decisions may affect emissions performance over time, and how they may more appropriately consider environmental issues in their corporate policies and business planning.

This report is also useful for highlighting the opportunities and risks companies may face from environmental concerns and potential changes in environmental regulations. Business opportunities may include increasing the competitive advantage of existing assets, the chance to generate or enhance revenues from emission trading mechanisms, and opportunities to increase market share by pursuing diversification into clean energy. Corporate risks that could have severe financial implications include a loss of competitive advantage or decrease in asset value due to policy changes, risks to corporate reputation, and the risk of exposure to litigation arising from potential violations of future environmental laws and regulations. Becoming aware of a company's exposure to these opportunities and risks is the first step in developing effective corporate environmental strategies.

## Investors

The financial community and investors in the electric industry need accurate information concerning environmental performance in order to evaluate the financial risks associated with their investments and to assess their overall value. Air emissions information is material to investors and can be an important indicator of a company's management.

Evaluation of financial risks associated with SO<sub>2</sub>, NO<sub>x</sub> and mercury has become a relatively routine corporate practice. By comparison, until recent years, corporate attention and disclosure of business impacts related to CO<sub>2</sub> has been more limited. This is likely to change with the U.S. Securities and Exchange Commission's (SEC) issuance, in January 2010, of interpretive guidance concerning corporate climate risk disclosure. All publicly-traded companies in the U.S. are required to disclose climate-related "material" effects on business operations – whether from new emissions management policies, the physical impacts of changing weather or business opportunities associated with the growing clean energy economy – in their annual SEC filings. Despite the SEC's guidance, not all publically traded companies mentioned climate change in their most recent annual Form 10-K filings. As a result, some have concluded that SEC requirements must be strengthened to ensure companies meet the expectations of their investors to disclose climate-related risks.

Numerous studies have pointed to the growing financial risks of climate change issues for all firms, especially those within the electric industry. Changing environmental requirements can have important implications for long-term share value, depending on how the changes affect a company's assets relative to its competitors. Especially in the context of climate change, which poses considerable uncertainty and different economic impacts for different types of power plants, a company's current environmental performance can shed light on its prospects for sustained value.

As the risks associated with climate change have become clearer and regulation of carbon pollution moves ahead through the Environmental Protection Agency's New Source Performance Standards, the financial implications of climate change for the electric industry have drawn the attention of Wall Street. Ratings agencies such as Moody's Investors Service and Standard and Poor's have issued reports analyzing the credit impacts of climate change for the power sector. In a December 2013 report, Moody's Investor Service predicted a stable outlook for public power utilities in 2014, noting however that rising costs tied to environmental compliance and the transition to cleaner power sources create longer term risks.<sup>3</sup> In an October 2013 news release, Moody's noted that the completion of generation and environmental projects will drive capital investing of U.S. regulated utilities to peak in 2013 or 2014, and then fall in 2015. New environmental standards including rules for carbon emissions could cause capital spending to rise again after 2016.<sup>4</sup> In March 2013, Standard and Poor's (S&P) rating services declared that future carbon constraints need to be factored in to credit assessments for the oil sector. "By analyzing the potential impact of future carbon constraints driven by global climate change policies, a deterioration in the financial risk profiles for

smaller oil companies that could lead to negative outlooks and downgrades.”<sup>5</sup> Furthermore, S&P noted that U.S. utilities are responding to EPA’s rules to limit greenhouse gas emissions by “closing coal-fired plants, installing new pollution-control equipment, building gas-fired units, or retooling older, coal-dependent sites to use different fuels”. According to S&P, “Regulated utilities can generally pass these costs on to customers. Plans to meet stricter standards could weigh on credit quality if a utility lacks adequate cost-recovery regulatory mechanisms”. Mainstream financial firms such as Citigroup and Sanford C. Bernstein have issued reports evaluating the company-specific financial impacts of different regulatory scenarios on electric power companies and their shareholders.<sup>6,7</sup>

Shareholder concern about the financial impacts of climate change has increased significantly over the past decade. Much of this concern is directed toward encouraging electric companies to disclose the financial risks associated with climate change, particularly the risks associated with the future regulation of CO<sub>2</sub>. The Carbon Disclosure Project (CDP) was launched in 2000 and annually requests climate change information from companies. CDP now represents 822 institutional investors with combined assets of over \$95 trillion under management, and, as of 2014, received responses on climate strategy and greenhouse gas emissions data from over 5,000 of the world’s largest companies. In addition to its original Climate Change Program, CDP has introduced Supply Chain and Water Disclosure Programs. Over 65 companies currently work with CDP on their corporate supply chain, and 1,064 companies responded to CDP’s Water Disclosure Program in 2014, a 79 percent increase since 2013. Since 2011, CDP has moved towards scoring companies not only on the comprehensiveness of their carbon disclosure, but also on their performance to combat climate change through mitigation, adaptation, and transparency. CDP notes that the performance score is a developing metric.

In 2003, the Investor Network on Climate Risk (INCR) was launched to promote better understanding of the risks of climate change among institutional investors. INCR, which now numbers 110 institutional investors representing assets of \$13 trillion, encourages companies in which its members invest to address and disclose material risks and opportunities to their businesses associated with climate change and a shift to a lower carbon economy.

Shareholders have demonstrated increasing support for proxy resolutions requesting improved analysis and disclosure of the financial risks companies face from CO<sub>2</sub> emissions and their strategies for addressing these risks. In response to shareholder activity, more than a dozen of the largest U.S. electric power companies

have issued reports for investors detailing their climate-related business risks and strategies. In early 2014, FirstEnergy Corporation, one of the largest electric utilities in the U.S., reached an agreement with shareholders to report its plan for reducing greenhouse gas emissions in its 2014 sustainability report. The company plans to cut its carbon dioxide emissions 25 percent below 2005 levels by 2015 through plant closures and the installation of additional emissions-control equipment. The decision comes in response to a shareholder resolution filed in the fall of 2013, and could encourage other energy companies to seriously consider the threat of climate change.<sup>8</sup> Shareholders continue to file resolutions with electric power companies that have not yet disclosed this information. According to the Investor Network on Climate Risk, 51 shareholder resolutions relating to climate and environmental issues at 25 oil and gas and electric power companies were filed in the 2014 proxy season.

## Policymakers

The information on emissions contained in this report is useful to policymakers who are working to develop long-term solutions to the public health and environmental effects of air pollutant emissions. The outcomes of federal policy debates concerning various regulatory and legislative proposals to improve power plant emissions performance will impact the electric industry, either in regard to the types of technologies or fuels that will be used at new power plant facilities or the types of environmental controls that will be installed at existing facilities.

Information about emissions performance helps policymakers by indicating which pollution control policies have been effective (e.g. SO<sub>2</sub> reductions under the Clean Air Act's Acid Rain Program), where opportunities may exist for performance and environmental improvements (e.g. SO<sub>2</sub> and NO<sub>x</sub> emissions performance standards for large, older facilities under the Regional Haze Rule), and where policy action is required to achieve further environmental gains (e.g. the environmental and financial risks associated with climate change).

## Electricity Consumers

Finally, the information in this report is valuable to electricity consumers. Accurate and understandable information on emissions promotes public awareness of the difference in environmental performance and risk exposure. In jurisdictions that allow consumers to choose their electricity supplier, this information enables consumers to consider environmental performance in power purchasing decisions. This knowledge also enables consumers to hold companies accountable for decisions and activities that affect the environment and/or public health and welfare.

The information in this report can also help the public verify that companies are meeting their environmental commitments and claims. For example, some electric companies are establishing voluntary emissions reduction goals for CO<sub>2</sub> and other pollutants, and many companies are reporting significant CO<sub>2</sub> emission reductions from voluntary actions. Public information is necessary to verify the legitimacy of these claims. Public awareness of companies' environmental performance supports informed public policymaking by promoting the understanding of the economic and environmental tradeoffs of different generating technologies and policy approaches.





# Appendix A

## Data Sources, Methodology and Quality Assurance

This report examines the air pollutant emissions of the 100 largest electricity generating companies in the United States based on 2013 electricity generation, emissions and ownership data. The report relies on publicly-available information reported by the U.S. Energy Information Administration (EIA), U.S. Environmental Protection Agency (EPA), Securities and Exchange Commission (SEC), state environmental agencies, company websites, and media articles.

### Data Sources

The following public data sources were used to develop this report:

**EPA AIR MARKETS PROGRAM DATA (AMP):** EPA's Air Markets Program Data account for almost all of the SO<sub>2</sub> and NO<sub>x</sub> emissions, and about 20 percent of the CO<sub>2</sub> emissions analyzed in this report. These emissions were compiled using EPA's on-line emissions database available at <http://ampd.epa.gov/ampd/>.

**EPA TOXIC RELEASE INVENTORY (TRI):** Power plants and other facilities are required to submit reports on the use and release of certain toxic chemicals to the TRI. The 2013 mercury emissions used in this report are based on TRI reports submitted by facility managers and which are available at [http://iaspub.epa.gov/triexplorer/tri\\_release.chemical](http://iaspub.epa.gov/triexplorer/tri_release.chemical).

EIA FORMS 923 POWER PLANT DATABASES (2013): EIA Form 923 provided almost all of the generation data analyzed in this report. EIA Form 923 provides data on the electric generation and heat input by fuel type for utility and non-utility power plants. The heat input data was used to calculate approximately 80 percent of the CO<sub>2</sub> emissions analyzed in this report. The form is available at [http://www.eia.doe.gov/cneaf/electricity/page/eia906\\_920.html](http://www.eia.doe.gov/cneaf/electricity/page/eia906_920.html).

EIA FORM 860 ANNUAL ELECTRIC GENERATOR REPORT (2013): EIA Form 860 is a generating unit level data source that includes information about generators at electric power plants, including information about generator ownership. EIA Form 860 was used as the primary source of power plant ownership for this report. The form is available at <http://www.eia.doe.gov/cneaf/electricity/page/eia860.html>.

EPA U.S. INVENTORY OF GREENHOUSE GAS EMISSIONS AND SINKS (2015): EPA's U.S. Inventory of Greenhouse Gas Emissions and Sinks report provides in Annex 2 heat contents and carbon content coefficients of various fuel types. This data was used in conjunction with EIA Form 923 to calculate approximately 80 percent of the CO<sub>2</sub> emissions analyzed in this report. Annex 2 is available <http://www.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2015-Annex-2-Emissions-Fossil-Fuel-Combustion.pdf>.

## Plant Ownership

This report aims to reflect power plant ownership as of December 31, 2013. Plant ownership data used in this report are primarily based on the EIA-860 database from the year 2013. EIA-860 includes ownership information on generators at electric power plants owned or operated by electric utilities and non-utilities, which include independent power producers, combined heat and power producers, and other industrial organizations. It is published annually by EIA.

For the largest 100 power producers, plant ownership is further checked against self-reported data from the producer's 10-K form filed with the SEC, listings on their website, and other media sources. Ownership of plants is updated based on the most recent data available. Consequently, in a number of instances, ultimate assignment of plant ownership in this report differs from EIA-860's reported ownership. This primarily happens when the plant in question falls in one or more of the categories listed below:

1. It is owned by a limited liability partnership shareholders of which are among the 100 largest power producers.
2. The owner of the plant as listed in EIA-860 is a subsidiary of a company that is among the 100 largest power producers.
3. It was sold or bought during the year 2013. Because form 10-K for a particular year is usually filed by the producer in the first quarter of the following year, this report assumes that ownership as reported in form 10-K is more accurate.

Publicly available data do not provide a straightforward means to accurately track lease arrangements and power purchase agreements. Therefore, in order to apply a standardized methodology to all companies, this report allocates generation and any associated emissions according to reported asset ownership as of December 31, 2013.

Identifying “who owns what” in the dynamic electricity generation industry is probably the single most difficult and complex part of this report. Shares of power plants are regularly traded and producers merge, reorganize, or cease operations altogether. While considerable effort was expended in ensuring the accuracy of ownership information reflected in this report, there may be inadvertent errors in the assignment of ownership for some plants where public information was either not current or could not be verified.

## Generation Data and Cogeneration Facilities

Plant generation data used in this report come from EIA Form 923.

Cogeneration facilities produce both electricity and steam or some other form of useful energy. Because electricity is only a partial output of these plants, their reported emissions data generally overstate the emissions associated with electricity generation. Generation and emissions data included in this report for cogeneration facilities have been adjusted to reflect only their electricity generation. For all such cogeneration facilities emissions data were calculated on the basis of heat input of fuel associated with electricity generation only. Consequently, for all such facilities EIA form 923, which report a plant’s total heat input as well as that which is associated with electricity production only, was used to calculate their emissions.

## NO<sub>x</sub> and SO<sub>2</sub> Emissions

The EPA AMP database collects and reports SO<sub>2</sub> and NO<sub>x</sub> emissions data for nearly all major power plants in the U.S. Emissions information reported in the AMP database is collected from continuous emission monitoring (CEM) systems. SO<sub>2</sub> and NO<sub>x</sub> emissions data reported to the AMP account for all of the SO<sub>2</sub> and NO<sub>x</sub> emissions assigned to the 100 largest power producers in this report.

The AMP database collects and reports SO<sub>2</sub> and NO<sub>x</sub> emissions data by fuel type at the boiler level. This report consolidates this data at the generating unit and plant levels. In the case of jointly owned plants, because joint ownership is determined by producer's share of installed capacity, assignment of SO<sub>2</sub> and NO<sub>x</sub> emissions to the producers on this basis implicitly assumes that emission rates are uniform across the different units. This may cause producers to be assigned emission figures that are slightly higher or lower than their actual shares.

The apportionment of NO<sub>x</sub> emissions between coal and natural gas at boilers that can burn both fuels may in certain instances slightly overstate coal's share of the emissions. This situation is likely to arise when a dual-fuel boiler that is classified as "coal-fired" within AMP burns natural gas to produce electricity in substantial amounts. In most years there would be very little economic reason to make this switch in a boiler that is not part of a combined cycle setup. But low natural gas prices in 2013 led to a small number of boilers switching to natural gas for most or a large part of their electricity output. Because AMP datasets do not make this distinction, apportioning emissions based on the fuel-type of the boiler would increase coal's share of the emissions.

SO<sub>2</sub> and CO<sub>2</sub> emissions are mostly not affected by this issue. Natural gas emits virtually no SO<sub>2</sub>. CO<sub>2</sub> emissions can be calculated from the heat input data report in EIA 923, which allows for the correct apportionment of emissions between coal and natural gas.

## CO<sub>2</sub> Emissions

A majority of CO<sub>2</sub> emissions reported in this report were calculated using heat input data from EIA form 923 and carbon content coefficient of various fuel types provided by EPA. Table A.1 shows the carbon coefficients used in this procedure. Non-emitting fuel types, whose carbon coefficients are zero, are not shown in the table. CO<sub>2</sub> emissions reported through the EPA AMP account a small share of the CO<sub>2</sub> emissions used in this report.

The datasets report heat input and emissions data by fuel type at either the prime mover or boiler level. This report consolidates that data at the generating unit and plant levels. In the case of jointly owned plants, because joint ownership is determined by producer's share of installed capacity, assignment of CO<sub>2</sub> emissions to the producers on this basis implicitly assumes that emission rates are uniform across the different units. This may cause producers to be assigned emission figures that are slightly higher or lower than their actual shares.

## Mercury Emissions

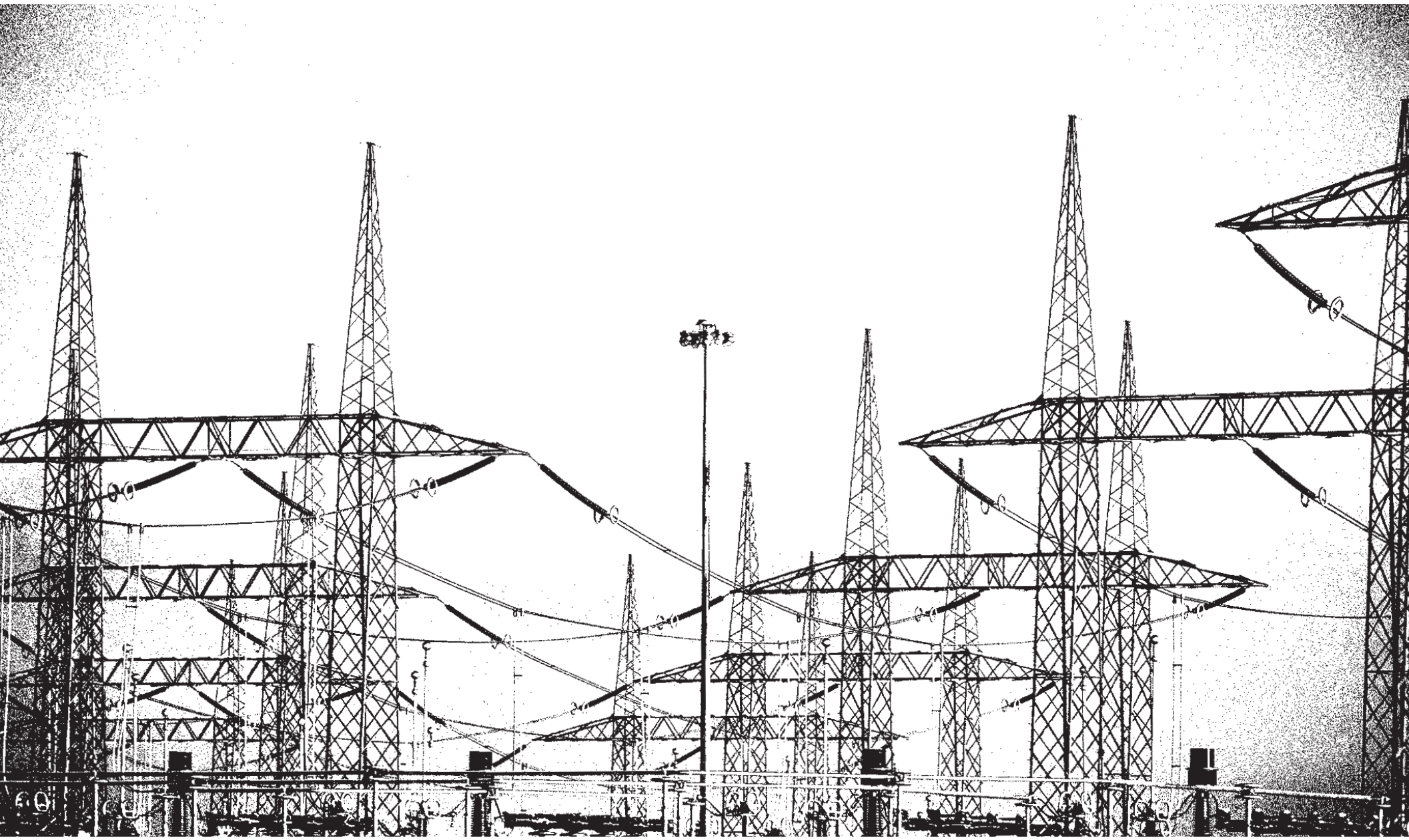
Mercury emissions data for coal power plants presented in this report were obtained from EPA's Toxic Release Inventory (TRI). Mercury emissions reported to the TRI are based on emission factors, mass balance calculations or data monitoring. The TRI contains facility-level information on the use and environmental release of chemicals classified as toxic under the Clean Air Act. The TRI contains information on all toxic releases from a facility; mercury emissions in this report are based on air releases only. Because coal plants are the primary source of mercury emissions within the electric industry, the mercury emissions and emission rates presented in this report reflect the emissions associated with each producer's fleet of coal plants only.

**TABLE A.1**

**Carbon Content Co-efficients by Fuel Type**

From Table A-40 (in Annex 2 of GHG Inventory 2015)

FUEL TYPE	CARBON CONTENT COEFFICIENTS (Tg Carbon/Qbtu)
<b>COAL</b>	
Anthracite Coal	28.28
Bituminous Coal	25.44
Sub-bituminous Coal	26.50
Lignite Coal	26.65
Waste/Other Coal (includes anthracite culm, bituminous gob, fine coal, lignite waste, waste coal)	26.05
Coal-based Synfuel (including briquettes, pellets, or extrusions, which are formed by binding materials or processes that recycle materials)	25.34
Coal-based Synfuel Gas	18.55
<b>OIL</b>	
Distillate Fuel Oil (Diesel, No. 1, No. 2, and No. 4 Fuel Oils)	20.17
Jet Fuel	19.70
Kerosene	19.96
Residual Fuel Oil (No. 5, No. 6 Fuel Oils, and Bunker C Fuel Oil)	20.48
Waste/Other Oil (including Crude Oil, Liquid Butane, Liquid Propane, Oil Waste, Re-Refined Motor Oil, Sludge Oil, Tar Oil, or other petroleum-based liquid wastes)	20.55
<b>GAS</b>	
Petroleum Coke	27.85
Natural Gas	14.46
Blast Furnace Gas	18.55
Other Gas	18.55
Gaseous Propane	14.46



# Appendix B

## Fuel Mix of the Top-100 Power Producers

Table B.1 shows the 2013 fuel-mix for each of the 100 largest power producers. The share of each major fuel type – coal, gas, oil, nuclear, hydro, and renewable / other – is shown as a percentage share of total generation from facilities wholly and partially owned by each producer and reported to the EIA.

“Renewable / Other” comprises mostly generation from wind, solar, biomass, and geothermal, along with some small contributions from other miscellaneous fuel sources not classifiable into the main categories listed in the table. These include non-biogenic municipal solid waste, tire-derived fuel, manufactured and waste gases, etc.

Figure 3 in the main body of the report presents a graphical illustration of the data in Table B.1.

















































TABLE B.1

**Fuel Mix of 100 Largest Power Producers**  
in order of 2013 generation

Rank	Owner	Ownership Type*	Total (million MWh)	Coal	Natural Gas	Oil	Nuclear	Hydro	Renewable/ Other
1	Duke	investor-owned corp.	243.4	42%	27%	0.2%	27%	2%	2%
2	Exelon	investor-owned corp.	195.1	5%	11%	0.1%	81%	1%	2%
3	Southern	investor-owned corp.	180.2	39%	40%	0.0%	16%	4%	0%
4	NextEra Energy	investor-owned corp.	175.7	3%	53%	0.2%	28%	0%	16%
5	AEP	investor-owned corp.	153.1	75%	13%	0.2%	11%	1%	1%
6	Tennessee Valley Authorit	federal power authority	144.1	40%	9%	0.1%	38%	13%	0%
7	Entergy	investor-owned corp.	129.4	11%	28%	0.0%	60%	0%	1%
8	Calpine	investor-owned corp.	103.0	0%	94%	0.1%	0%	0%	6%
9	NRG	investor-owned corp.	99.4	63%	26%	0.4%	8%	0%	3%
10	FirstEnergy	investor-owned corp.	96.5	63%	4%	0.1%	32%	0%	1%
11	Dominion	investor-owned corp.	93.9	26%	24%	0.3%	47%	1%	1%
12	MidAmerican	privately held corp.	91.9	68%	10%	0.1%	4%	3%	15%
13	PPL	investor-owned corp.	88.6	64%	11%	0.1%	19%	5%	0%
14	Energy Future Holdings	privately held corp.	73.4	71%	1%	0.1%	28%	0%	0%
15	US Corps of Engineers	federal power authority	69.0	0%	0%	0.0%	0%	100%	0%
16	Xcel	investor-owned corp.	68.8	60%	21%	0.0%	16%	1%	2%
17	Dynegy	investor-owned corp.	60.8	73%	27%	0.1%	0%	0%	0%
18	PSEG	investor-owned corp.	54.4	12%	32%	1.6%	54%	0%	0%
19	DTE Energy	investor-owned corp.	43.9	77%	3%	0.2%	15%	0%	4%
20	Ameren	investor-owned corp.	43.8	76%	2%	0.0%	19%	3%	0%
21	US Bureau of Reclamation	federal power authority	42.7	10%	0%	0.0%	0%	90%	0%
22	AES	investor-owned corp.	41.1	86%	7%	0.2%	0%	0%	7%
23	Edison Mission Energy	privately held corp.	33.0	70%	13%	0.0%	0%	0%	17%
24	PG&E	investor-owned corp.	31.7	0%	19%	0.0%	57%	23%	1%
25	GDF Suez	foreign-owned corp.	31.1	17%	77%	0.1%	0%	2%	3%
26	Great Plains Energy	investor-owned corp.	26.9	84%	1%	0.2%	13%	0%	2%
27	Pinnacle West	investor-owned corp.	26.7	42%	23%	0.0%	34%	0%	1%
28	Salt River Project	power district	26.3	60%	19%	0.1%	20%	1%	0%
29	Westar	investor-owned corp.	26.3	79%	7%	0.1%	13%	0%	2%
30	Energy Capital Partners	privately held corp.	26.0	34%	65%	0.1%	0%	0%	0%
31	New York Power Authority	state power authority	24.9	0%	20%	0.3%	0%	79%	0%
32	San Antonio City	municipality	24.7	49%	22%	0.0%	29%	0%	0%
33	OGE	investor-owned corp.	24.0	53%	40%	0.0%	0%	0%	7%
34	General Electric	investor-owned corp.	23.0	47%	50%	0.2%	0%	0%	3%
35	Wisconsin Energy	investor-owned corp.	22.8	80%	15%	0.0%	0%	1%	3%
36	NV Energy	investor-owned corp.	22.1	18%	82%	0.0%	0%	0%	0%
37	SCANA	investor-owned corp.	22.0	43%	28%	0.2%	26%	2%	1%
38	Oglethorpe	cooperative	21.7	31%	24%	0.0%	45%	0%	0%
39	Santee Cooper	state power authority	21.4	65%	20%	0.2%	13%	1%	1%
40	EDF	foreign-owned corp.	21.3	0%	0%	0.0%	78%	0%	22%
41	CMS Energy	investor-owned corp.	21.0	76%	14%	0.2%	0%	2%	7%
42	Basin Electric Power Coop	cooperative	19.6	92%	3%	0.1%	0%	0%	5%
43	Alliant Energy	investor-owned corp.	18.6	78%	12%	0.2%	0%	1%	9%
44	TECO	investor-owned corp.	18.4	58%	41%	0.2%	0%	0%	0%
45	NE Public Power District	power district	18.0	60%	1%	0.0%	38%	0%	1%
46	Edison International	investor-owned corp.	17.2	25%	33%	0.2%	29%	13%	0%
47	Iberdrola	foreign-owned corp.	16.3	0%	6%	0.0%	0%	2%	92%
48	Tenaska	privately held corp.	16.2	0%	99%	0.3%	0%	0%	1%
49	Associated Electric Coop	cooperative	15.9	78%	22%	0.0%	0%	0%	0%
50	NC Public Power	municipality	15.4	5%	0%	0.0%	95%	0%	0%
51	NiSource	investor-owned corp.	14.2	82%	18%	0.0%	0%	0%	0%
52	Occidental	investor-owned corp.	14.1	0%	99%	0.0%	0%	0%	1%

\* Breakdown of ownership categories provided in endnote 2 ■ privately/investor owned ■ public power ■ cooperative



Rank	Owner	Ownership Type*	Total (million MWh)	Coal	Natural Gas	Oil	Nuclear	Hydro	Renewable/ Other
53	IDACORP	investor-owned corp. 	13.8	47%	11%	0.1%	0%	41%	0%
54	Riverstone	privately held corp. 	13.7	51%	47%	0.4%	0%	0%	2%
55	Rockland Capital	privately held corp. 	13.6	1%	99%	0.1%	0%	0%	0%
56	Dow Chemical	investor-owned corp. 	13.4	0%	90%	0.0%	0%	0%	10%
57	Sempra	investor-owned corp. 	13.3	0%	83%	0.0%	0%	0%	17%
58	Omaha Public Power District	power district 	13.2	98%	1%	0.1%	0%	0%	0%
59	Tri-State	cooperative 	13.0	94%	6%	0.1%	0%	0%	0%
60	JEA	municipality 	12.8	53%	31%	0.0%	0%	0%	16%
61	Intermountain Power Agency	power district 	12.4	100%	0%	0.1%	0%	0%	0%
62	Los Angeles City	municipality 	12.3	29%	47%	0.0%	15%	5%	3%
63	Puget Holdings	privately held corp. 	12.2	34%	44%	0.1%	0%	7%	15%
64	ArcLight Capital	privately held corp. 	11.8	3%	61%	0.0%	0%	1%	35%
65	Municipal Elec. Auth. of GA	municipality 	11.7	29%	13%	0.0%	58%	0%	0%
66	Arkansas Electric Coop	cooperative 	11.6	81%	14%	0.1%	0%	5%	0%
67	Integrus	investor-owned corp. 	11.5	77%	17%	0.0%	0%	3%	3%
68	Exxon Mobil	investor-owned corp. 	11.4	0%	92%	0.0%	0%	0%	8%
69	ALLETE	investor-owned corp. 	11.1	89%	0%	0.0%	0%	2%	9%
70	Portland General Electric	investor-owned corp. 	11.0	43%	31%	0.1%	0%	15%	11%
71	Lower CO River Authority	state power authority 	10.9	65%	35%	0.0%	0%	1%	0%
72	PNM Resources	investor-owned corp. 	10.8	56%	15%	0.2%	29%	0%	1%
73	Seminole Electric Coop	cooperative 	10.6	73%	27%	0.2%	0%	0%	0%
74	Great River Energy	cooperative 	10.5	94%	4%	0.1%	0%	0%	1%
75	Brookfield	foreign-owned corp. 	10.4	0%	0%	0.0%	0%	88%	11%
76	Entegra Power	privately held corp. 	10.4	0%	100%	0.0%	0%	0%	0%
77	Energy Investors Funds	privately held corp. 	10.3	14%	84%	0.1%	0%	1%	1%
78	EDP	foreign-owned corp. 	10.2	0%	0%	0.0%	0%	0%	100%
79	PUD No 2 of Grant County	power district 	10.1	0%	0%	0.0%	0%	100%	0%
80	East Kentucky Power Coop	cooperative 	9.9	95%	4%	0.2%	0%	0%	1%
81	Big Rivers Electric	cooperative 	9.8	87%	0%	0.1%	0%	0%	13%
82	CLECO	investor-owned corp. 	9.6	28%	42%	0.0%	0%	0%	30%
83	PUD No 1 of Chelan County	power district 	9.5	0%	0%	0.0%	0%	100%	0%
84	BP	foreign-owned corp. 	9.4	0%	54%	0.0%	0%	0%	46%
85	Buckeye Power	cooperative 	9.4	99%	1%	0.3%	0%	0%	0%
86	El Paso Electric	investor-owned corp. 	9.3	7%	40%	0.0%	54%	0%	0%
87	Invenergy	privately held corp. 	9.2	0%	27%	0.0%	0%	0%	73%
88	Energy Northwest	municipality 	8.8	0%	0%	0.0%	96%	1%	3%
89	TransAlta	foreign-owned corp. 	8.7	77%	5%	0.1%	0%	0%	18%
90	UniSource	investor-owned corp. 	8.7	87%	13%	0.1%	0%	0%	0%
91	Austin Energy	municipality 	8.6	44%	23%	0.0%	33%	0%	0%
92	J-Power	foreign-owned corp. 	8.4	3%	96%	0.3%	0%	0%	0%
93	E.ON	foreign-owned corp. 	8.3	0%	0%	0.0%	0%	0%	100%
94	International Paper	investor-owned corp. 	7.5	5%	16%	1.4%	0%	0%	78%
95	Brazos Electric Power Coop	cooperative 	7.2	12%	88%	0.0%	0%	0%	0%
96	Avista	investor-owned corp. 	7.1	18%	26%	0.0%	0%	51%	4%
97	LS Power	privately held corp. 	7.1	31%	66%	0.0%	0%	0%	4%
98	Grand River Dam Authority	state power authority 	7.0	63%	27%	0.0%	0%	10%	0%
99	Hoosier Energy	cooperative 	6.9	96%	4%	0.1%	0%	0%	0%
100	Sacramento Municipal Util Dist	municipality 	6.8	0%	81%	0.0%	0%	15%	4%
	Total (top-100 producers)		3,447.8	40%	26%	0.1%	22%	7%	5%
	Total (all U.S. producers)		4,056.8	39%	28%	0.3%	19%	7%	7%

\* Breakdown of ownership categories provided in endnote 2  privately/investor owned  public power  cooperative

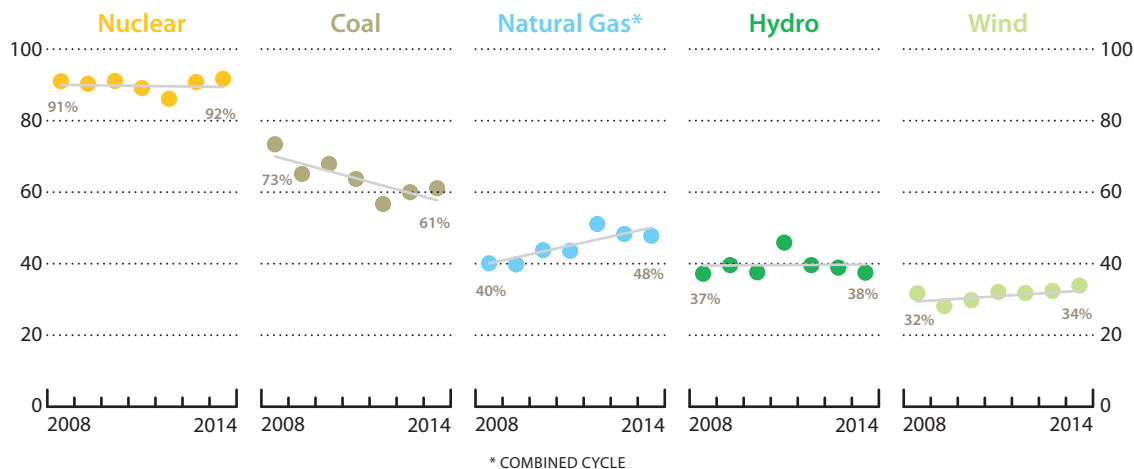
# Appendix C

## Annual Capacity Factors for Select Fuels and Technologies

Figure C.1 shows the capacity factors of different types of power plants from 2008 to 2014. Capacity factors measure the extent to which a power plant is utilized over the course of time. The technical definition is the ratio of the electrical energy produced by a generating unit to the electrical energy that could have been produced assuming continuous full power operation. Coal plant utilization has declined in recent years; the average annual capacity factor of coal plants in the U.S. dropped from 73 percent in 2008 to 61 percent in 2014, while over the same time period, natural gas combined-cycle capacity factors rose, from 40 to 48 percent. Nuclear plants have high utilization rates, consistently running at a 90 percent average capacity factor. Hydropower and wind capacity factors are lower, but have also remained relatively constant over the past six years.

FIGURE C.1

### Annual Capacity Factors for Select Fuels and Technologies (percent)

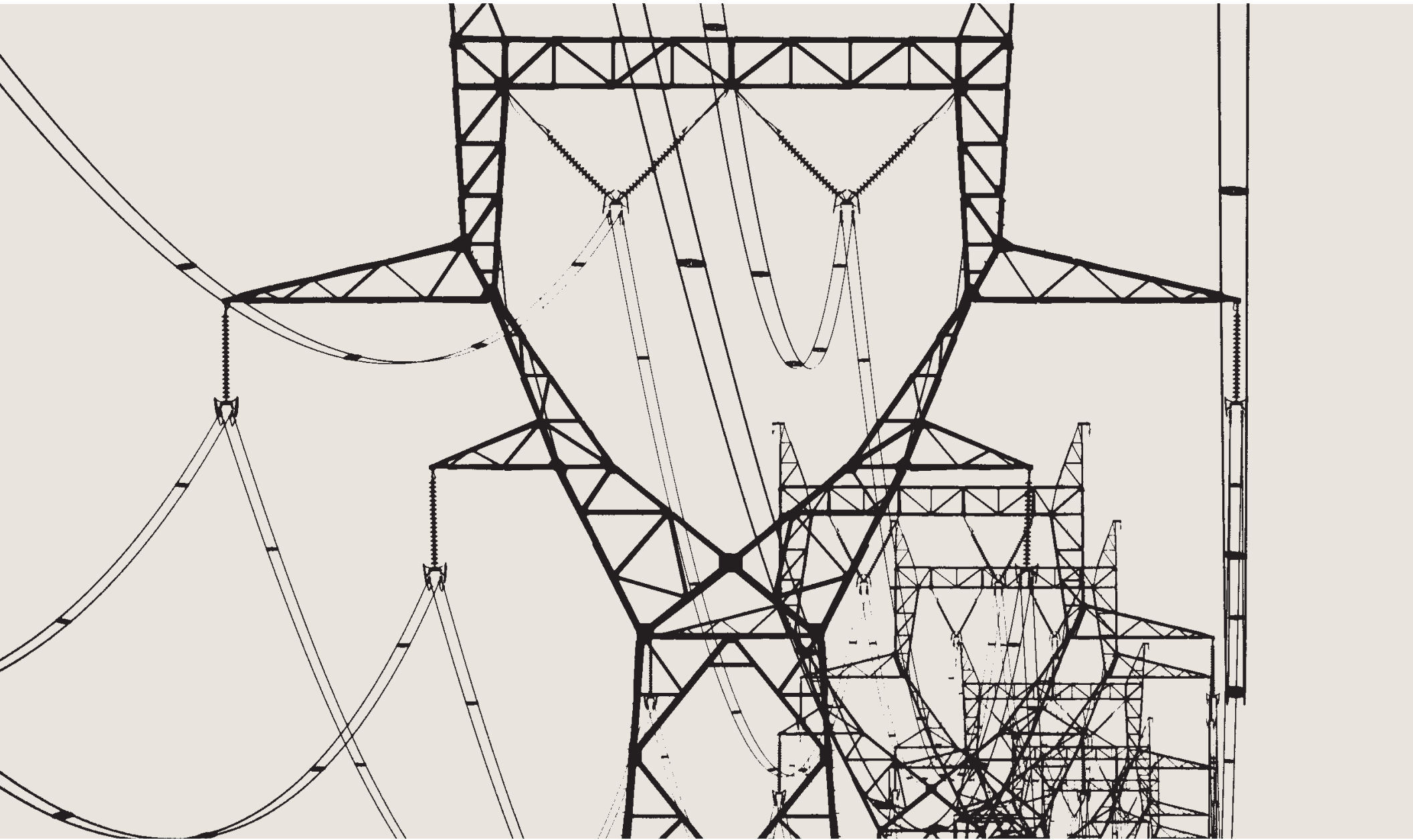


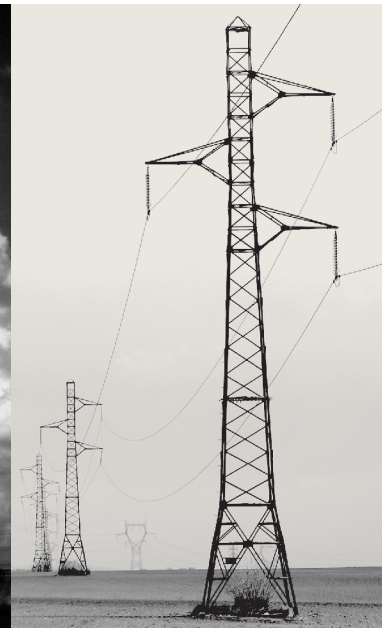
SOURCE: U.S. ENERGY INFORMATION ADMINISTRATION. ELECTRIC POWER MONTHLY, TABLES 6.7A AND 6.7B. FEBRUARY 2015



# Endnotes

1. Private entities include investor-owned and privately held utilities and non-utility power producers (e.g., independent power producers). Cooperative electric utilities are owned by their members (i.e., the consumers they serve). Publicly-owned electric utilities are nonprofit government entities that are organized at either the local or State level. There are also several Federal electric utilities in the United States, such as the Tennessee Valley Authority.
2. Power plant ownership in this report is divided into three categories: privately/investor owned (investor-owned corporations, privately held corporations, foreign-owned corporations), public power (federal power authorities, state power authorities, municipalities, power districts), and cooperative.
3. Electric Light & Power. Moody's issues stable outlook for public power utilities. December 13, 2013.
4. Moody's Investor Service. Capital Expenditures of US Regulated Utilities to fall in 2015 and Beyond. October 22, 2013.
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6. Bernstein Research, U.S. Utilities: Which Utilities Are Most at Risk from Pending Plant Retirements? April 23, 2008.
7. Citigroup, The Mean Green Machine: 2010 Overview of Major Upcoming EPA Environmental Policies, January 27, 2010.
8. Bloomberg BNA. "FirstEnergy Agrees With Shareholders to Report on Plan for Reducing Emissions." January 15, 2014.





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