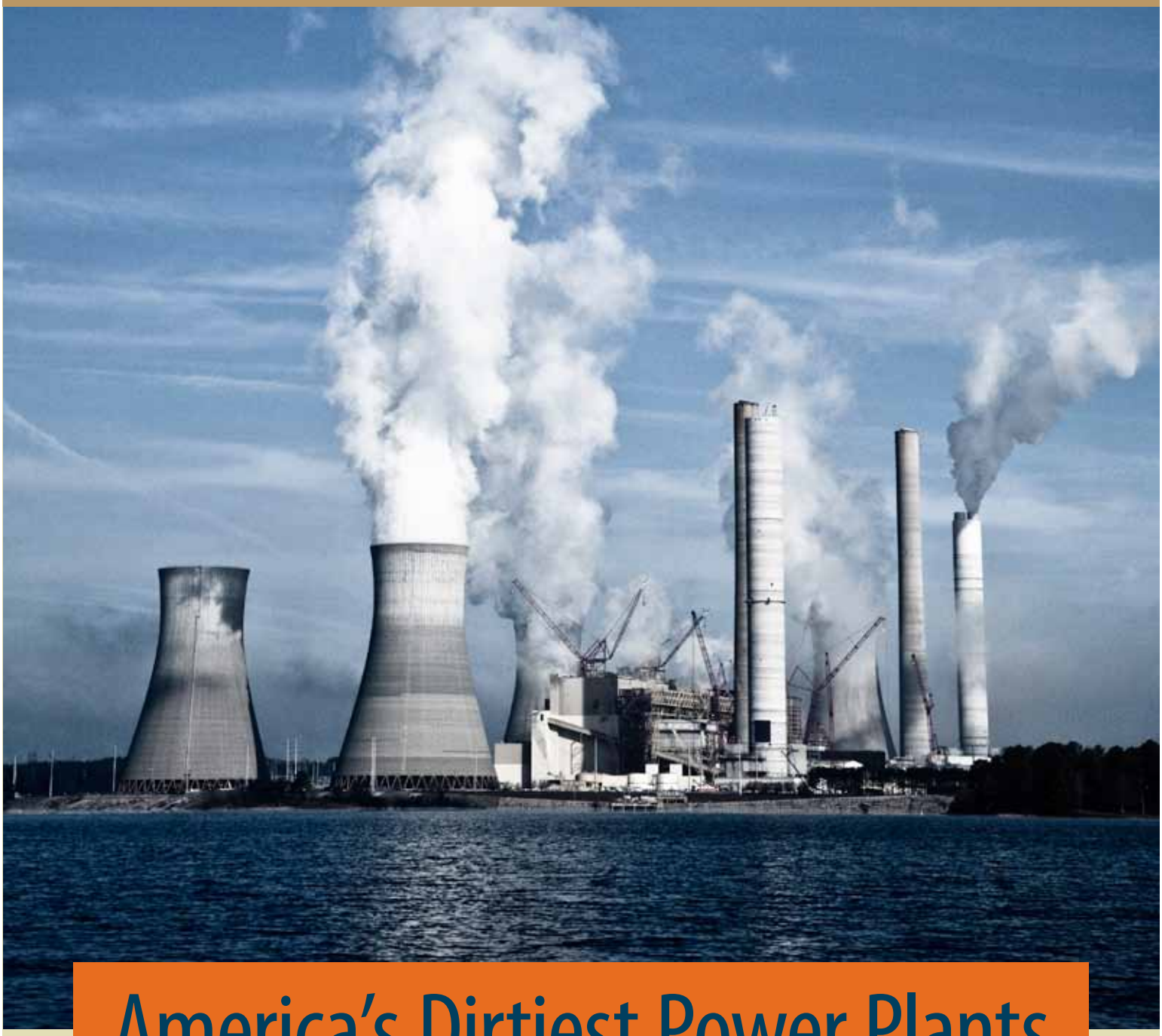

# America's Dirtiest Power Plants

## Their Oversized Contribution to Global Warming and What We Can Do About It

WISCONSIN ENVIRONMENT
RESEARCH & POLICY CENTER

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September 2013

# Acknowledgments

The authors thank Jeff Deyette, Senior Energy Analyst at Union of Concerned Scientists; Liz Perera, Senior Washington Representative, and Debbie Sease, Legislative Director, at Sierra Club; Mike Obeiter, Senior Associate, Climate and Energy Program at World Resources Institute; Starla Yeh, Policy Analyst, Climate and Clean Air Program at Natural Resources Defense Council; and others for providing useful feedback and insightful suggestions on drafts of this report. We also thank Frank Iannuzzi at Environment America Research & Policy Center for contributing to this report; and Tony Dutzik and Ben Davis at Frontier Group for providing editorial support.

The authors bear responsibility for any factual errors. The views expressed in this report are those of the authors and do not necessarily reflect the views of our funders or those who provided review.

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Cover photo: Georgia Power Company's Plant Scherer in Juliette, Georgia, is the nation's most-polluting power plant. Each year, it emits more carbon dioxide pollution than that produced by energy consumption in Maine. See Table 1 in report.

Photo Credit: TinRoof Marketing & Design

Cover design: Kathleen Krushas, To the Point Publications, www.tothepointpublications.com

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# Executive Summary

Global warming is one of the most profound threats of our time, and we're already starting to feel the impacts – especially when it comes to extreme weather. From Hurricane Sandy to devastating droughts and deadly heat waves, extreme weather events threaten our safety, our health and our environment, and scientists predict things will only get worse for future generations unless we cut the dangerous global warming pollution that is fueling the problem. Power plants are the largest source of global warming pollution in the United States, responsible for 41 percent of the nation's production of carbon dioxide pollution, the leading greenhouse gas driving global warming.

America's power plants are among the most significant sources of carbon dioxide pollution in the world. **The 50 most-polluting U.S. power plants emit more than 2 percent of the world's energy-related carbon dioxide pollution – or more pollution than every nation except six worldwide.**

Despite their enormous contribution to global warming, U.S. power plants do not face any federal limits on carbon dioxide pollution. To protect our health, our safety and our environment from the worst impacts of global warming, the United States should clean up the dirtiest power plants.

## A small handful of the dirtiest power plants produce a massive and disproportionate share of the nation's global warming pollution.

- In 2011, the U.S. power sector contributed 41 percent of all U.S. emissions of carbon dioxide, the leading pollutant driving global warming.
- There are nearly 6,000 electricity generating facilities in the United States, but most of the global warming pollution emitted by the U.S. power sector comes from a handful of exceptionally dirty power plants. For example, about 30 percent of all power-sector carbon dioxide emissions in 2011 came from the 50 dirtiest power plants; about half came from the 100 dirtiest plants; and about 90 percent came from the 500 dirtiest plants. (See Figure ES-1.)

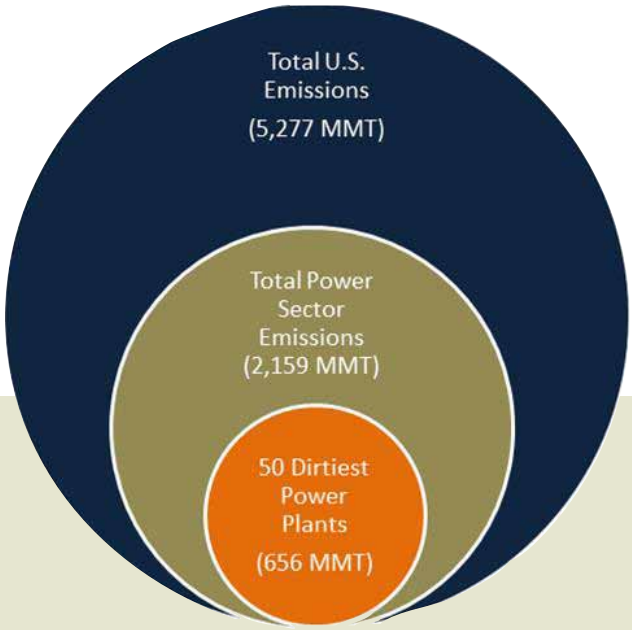


**Figure ES-1. The 50 Dirtiest Power Plants Contribute Significantly to U.S. Carbon Dioxide Pollution (Million Metric Tons – MMT), 2011**

- The dirtiest power plant in the United States, Georgia Power's Plant Scherer, produced more than 21 million metric tons of carbon dioxide in 2011 – more than the total energy-related emissions of Maine. (See Table ES-1.)
- Dirty power plants produce a disproportionate share of the nation's global warming pollution – especially given the relatively small share of total electricity they produce. For example, despite producing 30 percent of all power-sector carbon dioxide emissions, the 50 dirtiest power plants only produced 16 percent of the nation's electricity in 2011.

## The dirtiest U.S. power plants are major sources of global warming pollution on a global scale.

- If the 50 most-polluting U.S. power plants were an independent nation, they would be the seventh-largest emitter of carbon dioxide in the world, behind Germany and ahead of South Korea. (See Figure ES-2.) These power plants emitted carbon dioxide pollution equivalent to more than half the emissions of all passenger vehicles in the United States in 2010.

**Table ES-1. Emissions Equivalencies for the Nation's Top Emitters of Global Warming Pollution**

| | Total 2011 Emissions (Million Metric Tons of Carbon Dioxide) | Percent of Total U.S. Carbon Dioxide Emissions | Percent of Global Carbon Dioxide Emissions from Energy Use | These Plants Produce Carbon Dioxide Greater Than or Equivalent To… |
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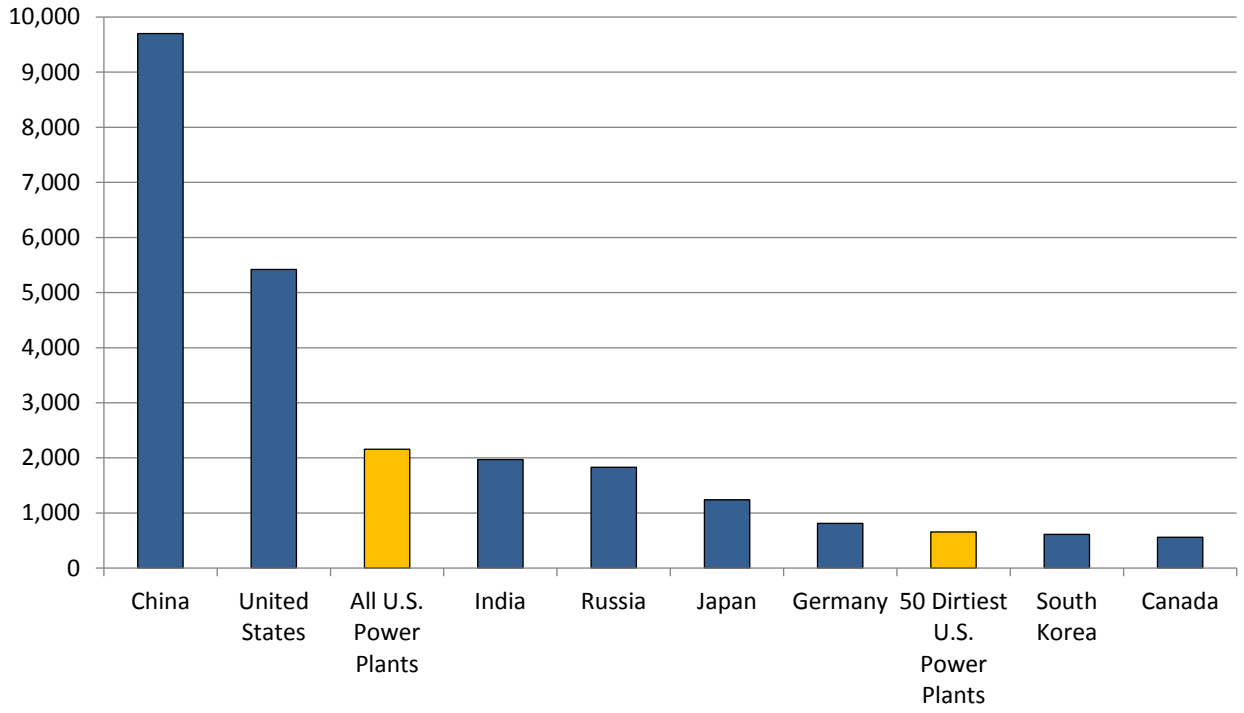
| Top Polluting Plant (Scherer Power Plant, GA) | 21 | 0.4% | 0.1% | • The total energy-related emissions of Maine<br>• The pollution produced by electricity use in all New England homes in a year |
| Top 10 Polluting Power Plants | 179 | 3.4% | 0.5% | • The pollution emitted by all the passenger vehicles in New York and California<br>• The total energy-related emissions of Venezuela |
| Top 50 Polluting Power Plants | 656 | 12.4% | 2.0% | • Half the emissions of all passenger vehicles in the United States<br>• The total energy-related emissions of Texas |
| Top 100 Polluting Power Plants | 1,052 | 19.9% | 3.2% | • The emissions of all passenger vehicles in the United States<br>• The pollution produced by electricity use in all U.S. homes in a year |

**Figure ES-2. Carbon Dioxide Pollution Emitted by the 50 Dirtiest Power Plants Compared to Other Countries (MMT $CO_2$)**




- The 100 most-polluting U.S. power plants produced more than 3 percent of the world's carbon dioxide emissions from energy use in 2011, while the 500 most-polluting power plants were responsible for about 6 percent.

## To protect our health, our safety, and our environment from the dangers of global warming, America must clean up polluting power plants.

- The Obama Administration should set strong limits on carbon dioxide pollution from new power plants to prevent the construction of a new generation of dirty power plants, and force existing power plants to clean up by setting strong limits on carbon dioxide emissions from all existing power plants.
  - New plants – The Environmental Protection Agency (EPA) should work to meet its September 2013 deadline for re-proposing a stringent emissions standard for new power plants. It should also set a deadline for finalizing these standards no later than June 2015.
  - Existing plants – The EPA should work to meet the timeline put forth by President Obama for proposing and finalizing emissions standards for existing power plants. This timeline calls for limits on existing plants to be proposed by June 2014 and finalized by June 2015. The standards should be based on the most recent climate science and designed to achieve the emissions reduction targets that are necessary to avoid the worst impacts of global warming.

**In addition to cutting pollution from power plants, the United States should adopt a suite of clean energy policies at the local, state, and federal levels to curb emissions of carbon dioxide from energy use in other sectors.**

In particular, the United States should prioritize establishing a comprehensive, national plan to reduce carbon pollution from all sources – including transportation, industrial activities, and the commercial and residential sectors.

Other policies to curb emissions include:

- Retrofitting three-quarters of America's homes and businesses for improved energy efficiency, and implementing strong building energy codes to dramatically reduce fossil fuel consumption in new homes and businesses.
- Adopting a federal renewable electricity standard that calls for 25 percent of America's electricity to come from clean, renewable sources by 2025.
- Strengthening and implementing state energy efficiency resource standards that require utilities to deliver energy efficiency improvements in homes, businesses and industries.
- Installing more than 200 gigawatts of solar panels and other forms of distributed renewable energy at residential, commercial and industrial buildings over the next two decades.
- Encouraging the use of energy-saving combined heat-and-power systems in industry.
- Facilitating the deployment of millions of plug-in vehicles that operate partly or solely on electricity, and adopting clean fuel standards that require a reduction in the carbon intensity of transportation fuels.
- Ensuring that the majority of new residential and commercial development in metropolitan areas takes place in compact, walkable communities with access to a range of transportation options.
- Expanding public transportation service to double ridership by 2030, encouraging further ridership increases through better transit service, and reducing per-mile global warming pollution from transit vehicles. The U.S. should also build high-speed rail lines in 11 high-priority corridors by 2030.
- Strengthening and expanding the Regional Greenhouse Gas Initiative, which limits carbon dioxide pollution from power plants in nine northeastern state, and implementing California's Global Warming Solutions Act (AB32), which places an economy-wide cap on the state's greenhouse gas emissions.

# Introduction

It doesn't take a trip to the Arctic Circle to see evidence of global warming these days. The impacts of a warming planet are now appearing on our doorsteps, making headlines in the morning paper. The United States has seen much more than its usual share of extreme downpours and intense heat waves in recent years, and emerging science links the increase in frequency and severity of some of these events to global warming.[1] New research also shows that a warmer world is likely to exacerbate the impacts of extreme weather events, such as hurricanes, floods, drought and wildfires.[2] Many extreme weather events of 2012 foreshadow the kind of disruption global warming may cause in the future. From the late-season "superstorm" Hurricane Sandy wreaking havoc on the East Coast, to early-season wildfires destroying thousands of homes in the West, to year-round drought conditions parching the largest area of the continental U.S. since 1956, extreme weather events are occurring with increasing frequency and severity.[3]

Since 2007, federally declared weather-related disasters in the United States have affected counties housing 243 million people – or nearly four out of five Americans.[4] These events have caused billions of dollars in economic damage, have harmed our natural environment, and have jeopardized the lives of thousands of people. Climate science tells us that the impacts of these events will only worsen for future generations unless we immediately and dramatically reduce the dangerous carbon pollution that is fueling the problem. Meeting that challenge can seem overwhelming, and it's certainly not going to be easy. But the United States and the world can make a major down-payment toward those emission reductions by cleaning up our biggest sources of pollution.

In the case of the United States, that means power plants. As this report will show, a small number of dirty power plants make a massive and disproportionate contribution to the nation's global warming emissions. Cleaning up our existing power plants – and preventing construction of a new generation of dirty power plants – would make a significant difference in fighting global warming.

For the first time in history, the United States is preparing to take action to clean up these massive sources of carbon pollution. In 2012, the Environmental Protection Agency (EPA) issued the first-ever pollution standards for new power plants, and this summer President Obama directed the EPA to establish a standard for existing power plants by 2015.[5]

By finalizing strong carbon pollution standards for new and existing power plants, the U.S. will seize one of its best available opportunities to significantly reduce carbon pollution – helping to forestall the worst impacts of global warming for future generations.

Photo: Keith Syvinski

**Indiana Michigan Power Company's coal-fired Rockport power plant in Spencer County, Indiana, is the 11th largest emitter of carbon dioxide pollution in the U.S. power sector. It produces global warming pollution equivalent to that produced by 3.2 million passenger vehicles in a year. See Table A-2 in Appendix.**

**By finalizing strong carbon pollution standards for new and existing power plants, the U.S. will seize one of its best available opportunities to significantly reduce carbon pollution – helping to forestall the worst impacts of global warming for future generations.**

# The Dirtiest U.S. Power Plants Are a Major Source of Global Warming Pollution

Carbon dioxide is the leading greenhouse gas driving global warming, and power plants are the largest source of carbon dioxide pollution in the United States.[6] Burning fossil fuels for electricity generation produced about 41 percent of total U.S. carbon dioxide emissions in 2011.[7] A disproportionate share of these power-sector carbon dioxide emissions come from a small subset of the nation's dirtiest power plants, particularly coal-fired power plants. However, despite their enormous contribution to global warming, U.S. power plants currently face no federal limits on carbon dioxide pollution. Cleaning up these dirty power plants with strong, nationwide pollution standards is one of the most important steps the U.S. can take to curb global warming pollution.

## The 50 Dirtiest Power Plants Contribute a Massive and Disproportionate Share of Carbon Dioxide Emissions

There are nearly 6,000 electricity generating facilities in the United States, but most of the global warming pollution emitted by the U.S. power sector comes from a handful of exceptionally dirty power plants.[8] These dirty power plants also produce a disproportionately large amount of the nation's total global warming pollution. For example, just one of these dirty power plants, Georgia Power's Plant Scherer, produces more global warming pollution each year than all the energy-related emissions of Maine.[9]

- **In 2011, the 50 dirtiest U.S. power plants were responsible for 30 percent of all U.S. power-sector emissions of carbon dioxide, 12 percent of total U.S. energy-related emissions, and 2 percent of worldwide energy-related emissions**.[10] (See Figure 1.) If the 50 dirtiest power plants were an independent nation, they would be the seventh-largest emitter of carbon dioxide pollution in the world, behind Germany and ahead of South Korea.[11] (See Figure 2.) Their emissions in 2011 were greater than half the emissions of all passenger vehicles in the United States in 2010.[12] (See Table 1 for additional comparisons.)
- The 100 dirtiest plants were responsible for about half of total carbon dioxide emissions from the U.S. electricity sector in 2011, and more than 3 percent of total worldwide emissions from energy use.[13]
- The 500 dirtiest power plants were responsible for around 90 percent of total carbon dioxide emissions from the U.S. electricity sector, and about 6 percent of total worldwide emissions from energy use.[14]

**Figure 1. The 50 Dirtiest Power Plants Contribute Significantly to U.S. Carbon Dioxide Emissions**

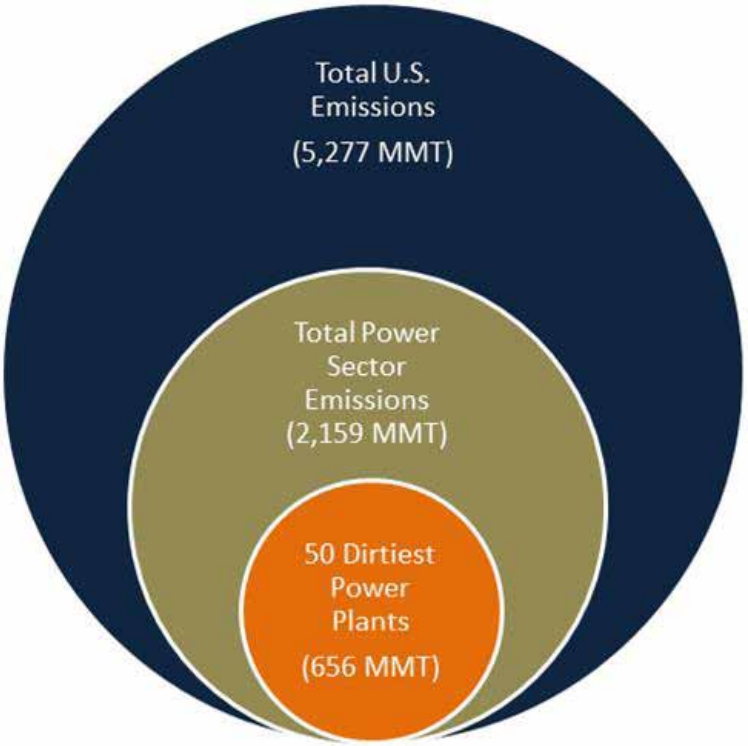



**Figure 2. Carbon Dioxide ($CO_2$) Pollution Emitted by the 50 Dirtiest Power Plants Compared to $CO_2$ Pollution in Other Countries (MMT)**

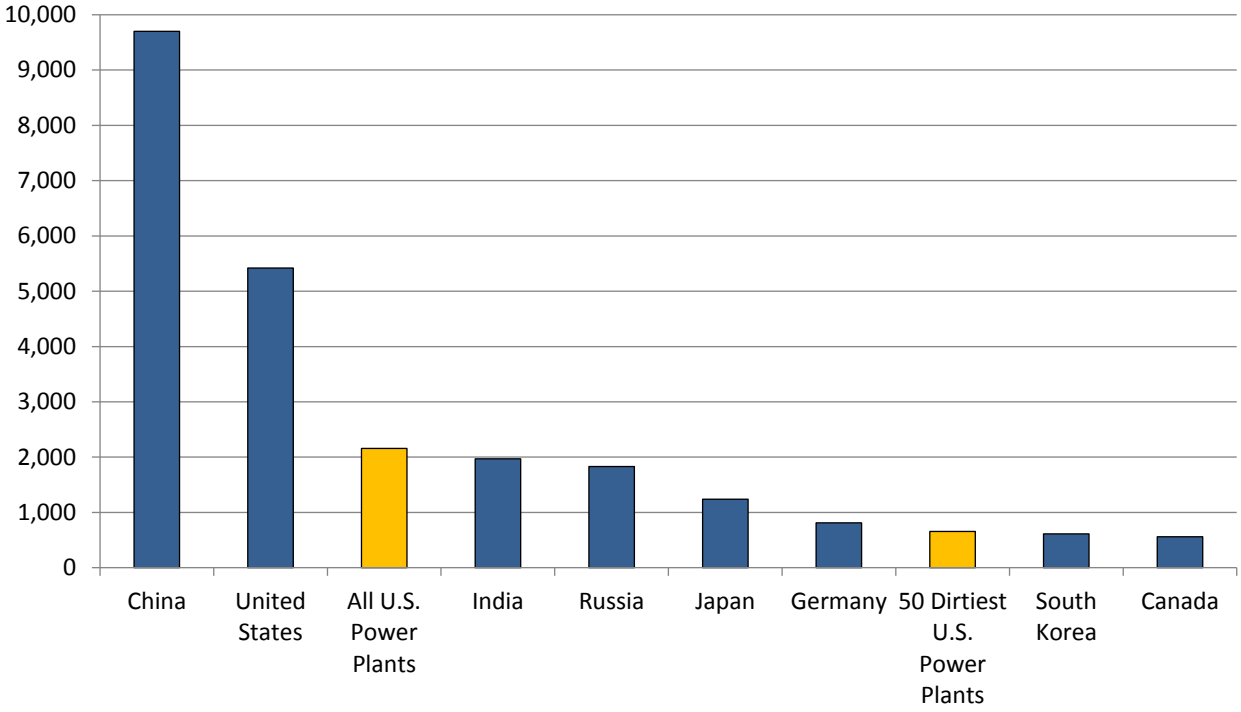


**Table 1. Emissions Equivalencies for the Nation's Top Emitters of Global Warming Pollution**[15]

| | Total 2011 Emissions (Million Metric Tons of Carbon Dioxide) | Percent of Total U.S. Carbon Dioxide Emissions | Percent of Global Carbon Dioxide Emissions from Energy Use | These Plants Produce Carbon Dioxide Greater Than or Equivalent To… |
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| Top Polluting Plant (Scherer Power Plant, GA) | 21 | 0.4% | 0.1% | • The total energy-related emissions of Maine[16]<br>• The pollution produced by electricity use in all New England homes in a year[17] |
| Top 10 Polluting Power Plants | 179 | 3.4% | 0.5% | • The pollution emitted by all the passenger vehicles in New York and California[18]<br>• The total energy-related emissions of Venezuela[19] |
| Top 50 Polluting Power Plants | 656 | 12.4% | 2.0% | • Half the emissions of all passenger vehicles in the United States[20]<br>• The total energy-related emission of Texas[21] |
| Top 100 Polluting Power Plants | 1,052 | 19.9% | 3.2% | • The emissions of all passenger vehicles in the United States[22]<br>• The pollution produced by electricity use in all U.S. homes in a year[23] |

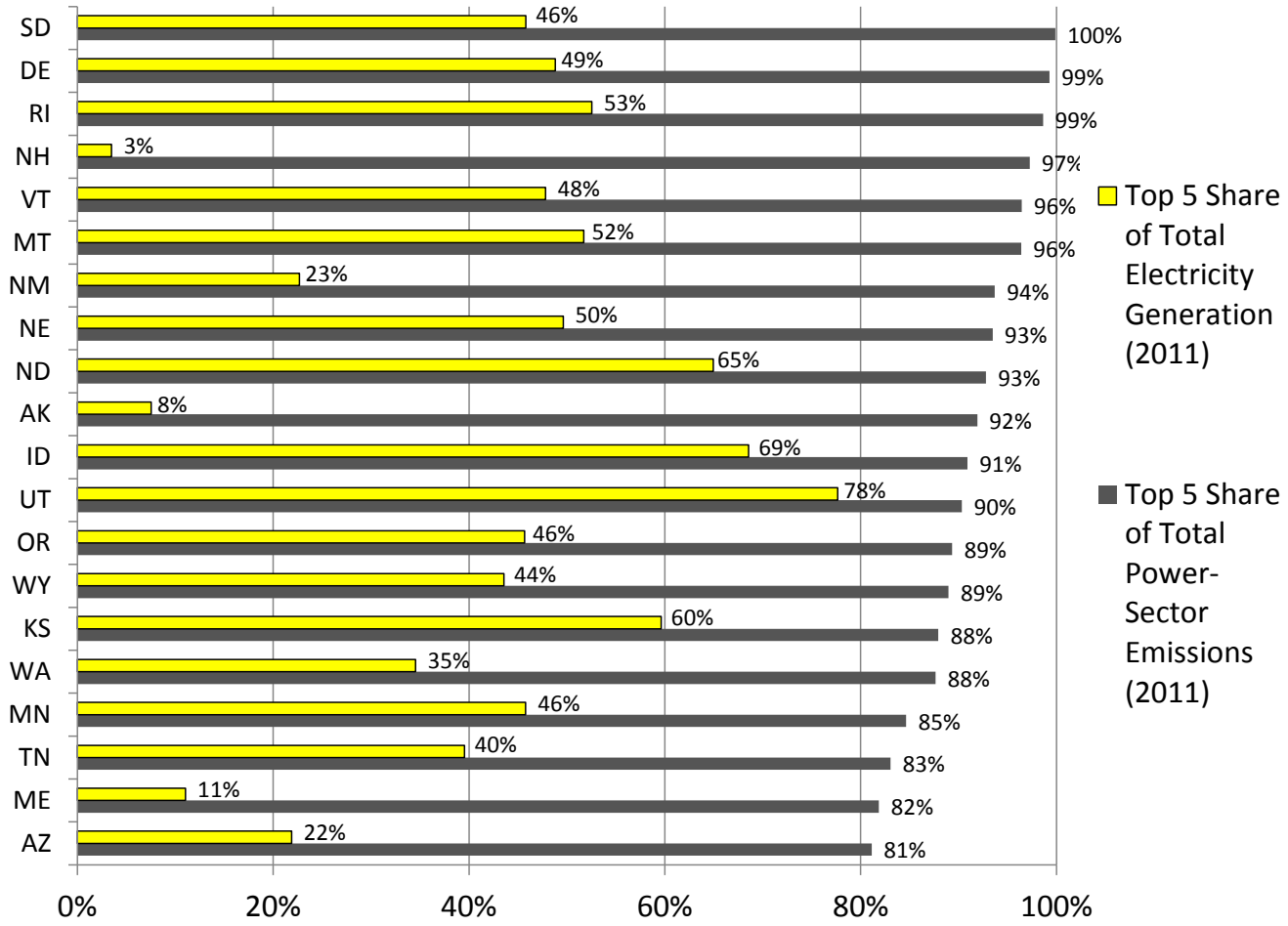
## The Dirtiest Power Plants Are Old and Inefficient

Coal-fired power plants are among the biggest sources of carbon dioxide pollution in the electric power sector.[24] In fact, 98 of the nation's 100 most-polluting power plants in terms of total carbon dioxide emissions are coal plants; among the top 500, 317 (63 percent) are coal plants.[25] The remainder are older oil and gas-fired power plants. (See Table A-2 in Appendix).

Most of the nation's coal plants are old and inefficient. About 74 percent of U.S. coal plants were at least 30 years old at the end of 2012, and about half were 40 to 60 years old, according to the Energy Information Administration (EIA).[26] Coal plants are not designed to last much longer than 30 years, but coal companies routinely renovate these plants to extend their lifetimes.[27] Still, many of these plants are inefficient to operate, so power providers run them at only a fraction of their full capacity or for shorter periods of time, which results in a lower "capacity factor" (the ratio of a power plant's actual output compared to its full capacity) for the oldest and dirtiest plants. In 2009, the average capacity factor for the whole U.S. coal fleet was 64 percent, with about 40 percent reporting capacity factors below 30 percent.[28]

Although many coal plants today are underutilized because of their age and inefficiency, they remain

**Figure 3. Share of Statewide Power-Sector Emissions vs. Share of Electricity Generation for Top 5 Emitters in 20 States[31]**




among the worst contributors to global warming pollution. For example, coal-fired power plants were responsible for nearly 80 percent of the global warming pollution produced by electric power plants in 2011, even though they produced only 42 percent of the nation's electricity.[29] The 50 dirtiest plants produced 30 percent of all power-sector carbon dioxide emissions, but only 16 percent of electricity nationwide in 2011.[30] In some states, this imbalance is even more extreme. (See Figure 3.)

In some states, emissions from a handful of the dirtiest power plants can exceed emissions from the rest of the economy, including the industrial and transportation sectors. For example, in five states – Wyoming, Montana, North Dakota, West Virginia, and New Mexico – the five dirtiest power plants are responsible for about half of total statewide energy-related emissions; and in 31 states, these top polluters are responsible for at least one-quarter of statewide energy-related emissions. (See Table 2 and Table A-3 in the Appendix.)

**Table 2. Emissions of Top 5 Polluting Plants as a Share of Power-Sector and Statewide Total Carbon Dioxide Emissions in 50 States, 2011**[32]

| State | Total Emissions of Top 5 Power Plants (Million Metric Tons of Carbon Dioxide) | Top 5 Share of Power-Sector Emissions (2011) | Top 5 Share of Total Emissions[33] |
|---|---|---|---|
| Wyoming | 38.1 | 89% | 59% |
| Montana | 16.1 | 96% | 55% |
| North Dakota | 27.1 | 93% | 52% |
| West Virginia | 49.3 | 69% | 52% |
| New Mexico | 29.1 | 94% | 50% |
| Utah | 30.6 | 90% | 49% |
| Arizona | 43.0 | 81% | 46% |
| Nebraska | 24.7 | 93% | 45% |
| Arkansas | 32.0 | 92% | 45% |
| Kansas | 30.8 | 88% | 41% |
| Alabama | 48.1 | 63% | 36% |
| Delaware | 3.9 | 99% | 36% |
| North Carolina | 43.0 | 71% | 36% |
| Missouri | 50.1 | 62% | 35% |
| Georgia | 52.1 | 76% | 34% |
| Iowa | 29.7 | 75% | 34% |
| Kentucky | 50.4 | 54% | 34% |
| South Carolina | 26.3 | 70% | 34% |
| Tennessee | 34.4 | 83% | 34% |
| Oklahoma | 35.0 | 69% | 32% |
| Hawaii | 5.6 | 77% | 31% |
| New Hampshire | 4.9 | 97% | 31% |
| Wisconsin | 29.1 | 67% | 29% |
| Maryland | 18.6 | 80% | 28% |
| Nevada | 9.3 | 64% | 28% |
| Colorado | 26.2 | 67% | 28% |
| Rhode Island | 3.5 | 99% | 28% |
| Michigan | 42.8 | 64% | 27% |
| Indiana | 58.7 | 52% | 27% |
| Minnesota | 26.3 | 85% | 27% |
| Mississippi | 14.1 | 61% | 25% |
| Ohio | 54.7 | 50% | 24% |
| South Dakota | 2.9 | 100% | 23% |
| Pennsylvania | 55.7 | 48% | 22% |

**Table 2. (continued)**

| State | Total Emissions of Top 5 Power Plants (Million Metric Tons of Carbon Dioxide) | Top 5 Share of Power-Sector Emissions (2011) | Top 5 Share of Total Emissions[33] |
|---|---|---|---|
| Oregon | 5.9 | 89% | 22% |
| Illinois | 44.0 | 46% | 19% |
| Virginia | 16.8 | 60% | 19% |
| Florida | 41.7 | 37% | 18% |
| Massachusetts | 10.5 | 66% | 16% |
| Connecticut | 5.9 | 75% | 16% |
| Washington | 6.7 | 88% | 15% |
| Louisiana | 35.0 | 61% | 12% |
| Maine | 2.8 | 82% | 11% |
| Texas | 74.6 | 30% | 10% |
| New Jersey | 9.9 | 64% | 10% |
| New York | 11.0 | 32% | 7% |
| Alaska | 2.8 | 75% | 6% |
| Idaho | 0.4 | 91% | 4% |
| California | 7.5 | 19% | 2% |
| Vermont | 0.0 | 96% | 0% |

Despite the large contribution of fossil fuel-fired power plants to U.S. global warming emissions, neither these highly polluting plants nor proposed new power plants face any federal regulations limiting emissions of carbon dioxide or other greenhouse gases. As a result, these power plants have emitted carbon dioxide pollution unchecked for decades, and there is no guarantee that new power plants will be built in ways that minimize their contribution to global warming.

# Cutting U.S. Power Plant Pollution Can Help Prevent the Worst Impacts of Global Warming

Global warming threatens our health, our safety, and our environment. Rising global average temperatures and other climate impacts have already resulted in extreme precipitation events and heat waves in the United States, and climate science tells us that global warming will likely lead to further changes in weather extremes.[34] Extreme weather events such as Hurricane Sandy, extended droughts, heat waves, and floods caused by heavy precipitation are likely to become more common in a warming world.[35] At the same time, global warming-induced sea-level rise, changes in summer and winter precipitation patterns, and ecosystem changes could reduce the ability of natural and man-made systems to withstand even normal weather events.

To avoid the worst impacts of global warming, worldwide emissions of carbon dioxide and other global warming pollutants will have to peak roughly three years from now, and then decline quickly and dramatically – dropping by more than 50 percent by 2050.[36] In the United States, addressing this challenge means cleaning up our biggest sources of global warming pollution – especially dirty power plants, which are responsible for more than 40 percent of our emissions of carbon dioxide each year.[37]

A handful of exceptionally dirty power plants are the worst contributors to this problem. By focusing on cleaning up power plants – our country's largest single source of carbon pollution – and preventing construction of a new generation of dirty power plants in the United States, America can make a meaningful difference in preventing the worst impacts of global warming.

## The U.S. must act now to prevent the worst impacts of global warming

In 2007, the Intergovernmental Panel on Climate Change (IPCC) – the world's foremost scientific authority on the subject – concluded that "warming of the climate system is unequivocal" and that "[m]ost of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic [greenhouse gas] concentrations."[38] In 2013, in a draft of its upcoming Fifth Assessment Report on climate change, the IPCC strengthened this assertion, citing "near certainty" that global warming is human-caused and suggesting that seas could rise by as much as three feet by the end of the century if greenhouse gas emissions continue unabated.[39]

Clear signs of global warming have already begun to emerge:

- Global average sea and air temperatures in 2010 were tied for the hottest on record, according to the National Oceanic and Atmospheric Administration (NOAA).[40] 2001 to 2010 was the hottest decade on record, with average temperatures estimated to be 0.83˚F hotter than the 1961-1990 norm.[41] 2010 was also the wettest year on record based on global average precipitation.[42]

- Oceans have absorbed 80 percent of the extra heat in the climate system, causing ocean water to expand.[43] Coupled with melting glaciers, this has caused sea levels to rise by about eight inches – with the rate of increase accelerating.[44]

- Hurricanes have become more intense, and the frequency of extreme rain and snowstorms has increased.[45]

- At the same time, droughts in many parts of the world have become longer and more severe, especially in the tropics and subtropics.[46]

- In the United States, warmer average annual temperatures are connected to increases in extreme precipitation and more intense heat waves. Furthermore, the U.S. has experienced an increase in the frequency and severity of extreme weather events, including floods, prolonged drought, more intense wildfires, and stronger tropical storms and hurricanes.[47]

The more global warming pollution that humanity emits, the more serious the consequences. And the changes will be largely irreversible for a thousand years after emissions stop.[48]

On our current emissions path, humanity risks increasing the average global temperature by 4°C (7.2°F) or more (above the pre-industrial era) by the end of this century even if current emission reduction commitments and pledges are met, according to a 2012 report by the World Bank.[49] Warming on this scale would have catastrophic consequences, including:

- Sea level rise of as much as 3 feet in the next century, causing extensive coastal inundation and increasing the risk of storm surge flooding in major coastal cities.50 By 2300, global mean sea levels could rise as high as 13 feet above present-day levels.[51]

- A 150 percent increase in ocean acidity above pre-industrial levels, resulting in wide-ranging, negative impacts on marine species and ecosystems, with particularly severe damage to coral reefs and fisheries.[52]

- An increase of 20-30 percent in the amount of precipitation falling during heavy rainstorms, increasing the risk of major flooding events in many parts of the world.[53]

- Increasing aridity, drought and extreme temperatures in Africa, southern Europe and the Middle East, and most of the Americas, Australia, and Southeast Asia.[54]

## Global Warming Endangers Public Health

Hotter temperatures bring about numerous threats to public health. High temperatures combine with sunlight, nitrogen oxides and volatile organic compounds to create ozone "smog," which damages the respiratory system, reduces lung function, and aggravates asthma and other respiratory diseases.[55] The Union of Concerned Scientists estimates that, by 2020, students in the United States could experience more than 900,000 additional missed school days, and seniors and infants could experience more than 5,000 additional hospitalizations due to increases of ozone smog exposure that result from the higher temperatures caused by global warming.[56] Higher temperatures will also allow pollen allergens such as ragweed to proliferate, causing those who suffer from seasonal allergies to experience worsening symptoms, such as hay fever and asthma.[57]

Global warming can also be expected to increase the number of deaths caused by heat stress.[58] Excessive heat events happen when high temperatures combine with other weather conditions – such as dew point temperature, cloud cover, wind speed and surface atmospheric pressure throughout the day –

and contribute to heat-related deaths in a particular location.[59] According to a 2012 study by the Natural Resources Defense Council (NRDC), excessive heat events caused by global warming could kill up to 150,000 people in America's 40 largest cities by the end of the century.[60]

Higher temperatures may also change the patterns of occurrence of various infectious diseases. A 2009 study, for example, found a correlation between warmer temperatures and increased reports of infection by West Nile Virus.[61] Global warming may also increase the risk of more frequent and more widespread outbreaks of waterborne illnesses by allowing warm-water pathogens to expand into cooler climates, or by exposing more urban water bodies to sewage contamination after flooding caused by major precipitation events, according to NRDC.[62]

Increases in droughts and flooding caused by global warming can also reduce water available for drinking or for irrigation; they can also harm crops directly, diminishing food variety, nutritional content, and availability, all of which can contribute to malnutrition and the spread of disease.[63] Finally, sea-level rise and disasters such as strong storms and floods can damage urban infrastructure and displace existing communities.[64]

Global warming pollutants are not the only emissions from power plants that harm human health. For example, in 2010, two-thirds of all airborne mercury pollution in the United States came from the smokestacks of coal-fired power plants.[65] Mercury is a potent neurotoxicant, and exposure to mercury during critical periods of brain development can contribute to irreversible deficits in verbal skills, damage to attention and motor control, and reduced IQ.[66] Coal- and natural gas-fired power plants also emit nitrogen oxides ($NO_X$), which exacerbate ozone smog pollution, as well as other pollutants that contribute to particulate matter and acid rain. Like smog, particulate matter pollution contributes to a host of respiratory and cardiovascular ailments.[67] Sulfur dioxide, too, is a respiratory irritant for sensitive populations.[68] In addition, it is a major component of acid rain that has damaged forests across the eastern United States.[69]

## Cleaning Up U.S. Power Plants Would Cut Carbon Pollution at a Global Scale

Humanity as a whole must limit emissions to no more than 1 trillion metric tons of carbon dioxide from 2000 through 2050 in order to have a 75 percent chance of limiting the global temperature increase to 3.6° F (2° C) above the pre-industrial era – a target the international community has set to limit the most severe global warming impacts.[70] For the world, this means that emissions will need to peak by 2015 and decline by more than half by 2050 to have a chance at preventing the worst impacts of climate change.[71] For the United States and other developed countries, emission reductions must occur more quickly and more steeply, with reductions of at least 25 to 40 percent below 1990 levels by 2020 and 80 to 95 percent by 2050.[72]

As of 2011, annual U.S. greenhouse gas emissions were still 10 percent above 1990 levels.[73] The annual emissions from a small group of the nation's dirtiest power plants are greatly hindering our ability to meet the emissions reduction targets necessary to avoid the worst impacts of global warming. Replacing these power plants with zero-emission energy sources such as wind and solar power, or eliminating the need for the power they produce through energy efficiency and conservation, would reduce U.S. greenhouse gas emissions to 11 percent below 1990 levels, even in the absence of other efforts to reduce emissions.[74]

Limiting carbon dioxide pollution from new and existing power plants is one of the most effective ways to reduce U.S. global warming pollution in the short run and for decades to come, reducing the risk that

emissions will reach a level that triggers dangerous, irreversible climate change impacts.

Adopting federal limits on carbon dioxide pollution from power plants as part of a suite of policies to reduce global warming pollution at all levels of government would help the United States achieve 2020 emissions reduction targets – even in the absence of a federal, economy-wide cap on carbon pollution. For example, Environment America Research & Policy Center's 2011 report, *The Way Forward on Global Warming,* demonstrated that with a suite of local, state and federal policies to increase energy efficiency, deploy clean energy technologies and improve public transportation, **the United States could curb emissions of carbon dioxide from energy use by as much as 3.5 percent below 1990 levels by 2020 and 20 percent below 1990 levels by 2030.**[75] A nationwide cap on carbon pollution from all sources – not just power plants – would allow the United States to make the remaining emissions reductions necessary to prevent the worst impacts of global warming.

# Carbon Pollution Standards Are Needed to Clean Up Existing Power Plants

The unprecedented threat that global warming poses to our health, our safety and our environment demands that the United States takes urgent action to reduce emissions of global warming pollution. However, U.S. power plants currently face no federal limits on the amount of carbon dioxide pollution they can emit.

Given the enormous share of global warming pollution contributed by U.S. power plants, limiting carbon dioxide emissions from both new and existing power plants must be a key part of any strategy to reduce U.S. global warming emissions. Fortunately, the first steps toward setting these standards are already being taken. On June 25, 2013, President Obama announced his plan to address global warming through executive action, using existing statutory authority and funds.[76] The two most important elements of this plan are finalizing carbon emissions standards for new power plants and directing the EPA to quickly propose and implement a limit on existing plants.[77]

The EPA proposed a limit on new power plants in March 2012. Since then, the EPA has received more than 3.2 million public comments supporting limiting carbon pollution from power plants, and President Obama has asked the EPA to re-propose a carbon pollution standard for new power plants by September 20, 2013.[78]

The originally proposed limit restricts global warming pollution for facilities 25 megawatts (MW) or larger to 1,000 pounds of $CO_2$ per megawatt-hour (MWh) of electricity they produce.[79] According to the EPA, this standard was based on commonly used combined-cycle natural gas power plants – a standard that new coal plants are highly unlikely to meet.[80] Existing coal plants produce an average of 2,180 lbs $CO_2$/MWh, with the worst plants producing more than 3,000 lbs $CO_2$/MWh.[81]

The EPA has yet to propose a standard for existing power plants, a large portion of which are aging coal-fired plants. However, the president has directed the EPA to propose and submit carbon pollution limits for existing plants by June 2014 and to finalize those limits the following year.[82] (See "The Long Road to Carbon Pollution Limits" on page 21.)

Some states already limit carbon pollution from power plants. California has an economy-wide cap on carbon dioxide emissions, and nine states from Maine to Maryland participate in the Regional Greenhouse Gas Initiative (RGGI), which caps pollution from power plants in the Northeast. Once finalized, the EPA's carbon pollution limits for all new power plants nationwide would go a long way toward reducing future U.S. global warming pollution. However, the agency must also move quickly to establish strong federal standards for existing power plants – and force the nation's largest sources of carbon pollution to clean up.

## The Long Road to Carbon Pollution Limits

The Obama administration's recent actions indicating progress toward carbon dioxide pollution from power plants are the culmination of a 14-year campaign to clean up the nation's power plants. In 1999, one year after the EPA declined to include carbon dioxide pollution limits in new vehicle emissions standards, 19 environmental and public interest groups petitioned the EPA to classify carbon dioxide as an air pollutant subject to the Clean Air Act regulation.[83] They cited carbon dioxide's contribution to global warming – which threatens human health and the environment – as rationale for regulation.[84]

In 2003, the EPA released an official statement that it did not believe the Act authorized the EPA to regulate global warming pollution, and that even if it did authorize regulating greenhouse gases, the EPA objected to doing so on policy grounds.[85] However, the U.S. Supreme Court disagreed with the EPA in 2007, ruling with several states and environmental groups that the EPA does indeed have the authority to regulate greenhouse gases, and that its policy objections were insufficient to decline to regulate.[86] The court also directed the EPA to determine if greenhouse gases contribute to global warming and, if so, whether global warming endangered public health and welfare.[87] By the end of 2009, the EPA officially determined that emissions of carbon dioxide endanger public health and welfare by contributing to global warming.[88]

In December 2010, the EPA announced its plan to release new performance standards and mandatory emissions guidelines for all new fossil fuel-fired power plants.[89] The EPA proposed an interim carbon pollution standard for new power plants in April 2012 that is in effect until a rule can be finalized.[90] This step set the first-ever national limits on the amount of carbon pollution power plants can emit.[91]

# Policy Recommendations

**To protect our health, our economy, and our environment from the dangers of global warming, America must clean up its dirtiest power plants.**

- The Obama Administration should set strong limits on carbon dioxide pollution from new power plants to prevent the construction of a new generation of dirty power plants, and force existing power plants to clean up by setting strong limits on carbon dioxide emissions for all existing power plants.
    - New plants – The EPA should work to meet its September 2013 deadline for re-proposing a stringent emissions standard for new power plants. It should also set a deadline for finalizing these standards no later than June 2015.
    - Existing plants – The EPA should work to meet the timeline put forth by President Obama for proposing and finalizing emissions standards for existing power plants. This timeline calls for limits on existing plants to be proposed by June 2014 and finalized by June 2015.[92] The standards should be based on climate science and designed to achieve the emissions reductions targets that are necessary to avoid the worst impacts of global warming.

**In addition to cutting pollution from power plants, the United States should adopt a suite of clean energy policies at the local, state, and federal level to curb emissions of carbon dioxide from energy use in other sectors.**

In particular, the United States should prioritize establishing a comprehensive, national plan to reduce carbon pollution from all sources – including transportation, industrial activities, and the commercial and residential sectors.

Other policies to curb emissions include:

- Retrofitting three-quarters of America's homes and businesses for improved energy efficiency, and implementing strong building energy codes to dramatically reduce fossil fuel consumption in new homes and businesses.
- Adopting a federal renewable electricity standard that calls for 25 percent of America's electricity to come from clean, renewable sources by 2025.
- Installing more than 200 gigawatts of solar panels and other forms of distributed renewable energy at residential, commercial and industrial buildings over the next two decades.
- Strengthening and implementing state energy efficiency resource standards that require utilities to deliver energy efficiency improvements in homes, businesses and industries.

- Encouraging the use of energy-saving combined heat-and-power systems in industry.
- Setting strong energy efficiency standards for household appliances and commercial equipment, and promoting the use of energy-efficient boilers, process heat systems, and energy-saving combined heat-and-power in industrial facilities.
- Facilitating the deployment of millions of plug-in vehicles that operate partly or solely on electricity, and adopting clean fuel standards that require a reduction in the carbon intensity of transportation fuels. The U.S. should also adopt strong fuel economy standards for heavy-duty trucks.
- Ensuring that the majority of new residential and commercial development in metropolitan areas takes place in compact, walkable communities with access to a range of transportation options.
- Expanding public transportation service to double ridership by 2030, encouraging further ridership increases through better transit service, and reducing per-mile global warming pollution from transit vehicles. The U.S. should also build high-speed rail lines in 11 high-priority corridors by 2030.
- Carrying out President Obama's Executive Order 13514, which requires large reductions in global warming pollution from federal agencies.
- Rejecting proposals to increase our access to and use of carbon-intensive fuels, including current proposals to import tar sands oil from Canada via the Keystone XL pipeline and to open more land to hydraulic fracturing for shale oil and natural gas.
- Strengthening and expanding the Regional Greenhouse Gas Initiative, which limits carbon dioxide pollution from power plants in nine northeastern states, and implementing California's Global Warming Solutions Act (AB32), which places an economy-wide cap on the state's greenhouse gas emissions.

# Methodology

In this report we examine emissions of carbon dioxide from all utility and non-utility power plants within the United States in 2011. We derive emissions data from fuel consumption figures reported to the U.S. Department of Energy and estimates of the carbon content of each fuel source developed by the U.S. Environmental Protection Agency. Details follow.

- We obtained fuel consumption and electricity generation data for power plants operating in the United States from the U.S. Department of Energy's Energy Information Administration (EIA), *2011 December EIA-923 Monthly Time Series*.[93] We focused on fuel consumption for electricity generation, excluding any fuel consumption for the purposes of generating heat.

- We obtained estimates of the carbon dioxide emissions created per unit of energy output of the different fuels used in electricity generation from the U.S. Environmental Protection Agency, Center for Climate Leadership, *Emission Factors for Greenhouse Gas Inventories*, November 2011; and U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2011*, April 2013. Table 3 lists these coefficients. For all biomass fuels, including wood waste and the biogenic fraction of municipal solid waste, we assigned an emissions value of zero, since these fuels are already part of the non-fossil portion of the world's carbon cycle.

- We multiplied fuel consumption in terms of heat content by the appropriate carbon dioxide emissions factors, yielding an estimate of 2011 carbon dioxide emissions by plant. Using database tools, we sorted or aggregated the data in various ways to generate the facts in this report. Our methodology resulted in a value for 2011 carbon dioxide pollution from the power sector very similar to that listed in the EPA's 2011 greenhouse gas emissions inventory (see above); our analysis resulted in a value of 2,202 MMT of carbon dioxide from all U.S. power plants, while the EPA's emissions inventory gave a value of 2,159 MMT of carbon dioxide emissions from the power sector – a difference of less than 2 percent. EIA's 2011 *Annual Energy Review* lists a value of 2,166 MMT of carbon dioxide emitted by power plants in 2011.[94]

- We chose to estimate 2011 carbon dioxide pollution based on plant-level energy consumption data because EIA's *Form 923* database (which contains such data) includes information on a broader range of power plants than the EPA's *Air Markets Program Data*, which provides estimates of carbon dioxide emissions for a subset of large electric power plants.[95]

**Table 3: Carbon Dioxide Emission Coefficients**

| Category | Fuel | Emission Coefficient (Kg CO2 / MMBtu) |
|---|---|---|
| Coal | Bituminous | 93.40 |
| Coal | Lignite | 96.36 |
| Coal | Sub-Bituminous | 97.02 |
| Coal | Waste Coal[96] | 94.38 |
| Coal | Coal-Derived Synthesis Gas[97] | 94.38 |
| Coal | Anthracite | 103.54 |
| Coal | Coal-Based Synfuel[98] | 92.91 |
| Petroleum Products | Distillate Fuel Oil[99] | 73.15 |
| Petroleum Products | Jet Fuel | 72.22 |
| Petroleum Products | Kerosene | 75.20 |
| Petroleum Products | Petroleum Coke | 102.41 |
| Petroleum Products | Petroleum Coke-Derived Synthesis Gas[100] | 102.41 |
| Petroleum Products | Residual Fuel Oil[101] | 78.80 |
| Petroleum Products | Propane | 61.46 |
| Petroleum Products | Waste Oil[102] | 66.53 |
| Natural Gas and other gases | Natural Gas[103] | 53.02 |
| Natural Gas and other gases | Blast Furnace Gas[104] | 274.32 |
| Natural Gas and other gases | Other Fossil-Fuel Gas[105] | 59.00 |
| Other | Purchased Steam[106] | 88.18 |
| Other | Tire-Derived Fuels[107] | 85.97 |
| Other | Municipal Solid Waste - Non-Biogenic Fraction | 90.70 |

# Appendices

**Table A-1. Power Plant Carbon Dioxide Emissions as a Share of Total State-Level Emissions (MMT), 2010**[108]

| State | Electric Power Sector Emissions | Total Statewide Energy-Related Emissions | Percentage of Statewide Emissions from Power Plants | Estimated Share of Statewide Emissions Contributed by Top 5 Emitting Power Plants± | Total Power Sector Emissions Equivalent in Number of Passenger Vehicles (Millions)[109] |
|---|---|---|---|---|---|
| Alabama | 76.7 | 132.7 | 58% | 36% | 16.0 |
| Alaska | 3.0 | 38.7 | 8% | 6% | 0.6 |
| Arizona | 54.4 | 95.9 | 57% | 46% | 11.3 |
| Arkansas | 32.3 | 66.1 | 49% | 45% | 6.7 |
| California | 43.5 | 369.8 | 12% | 2% | 99.1 |
| Colorado | 39.9 | 96.5 | 41% | 28% | 8.3 |
| Connecticut | 7.7 | 36.9 | 21% | 16% | 1.6 |
| Delaware | 4.2 | 11.7 | 36% | 36% | 0.9 |
| District of Columbia | 0.2 | 3.3 | 6% | 6% | 0.0 |
| Florida | 119.6 | 246.0 | 49% | 18% | 24.9 |
| Georgia | 79.1 | 173.7 | 46% | 34% | 16.5 |
| Hawaii | 7.6 | 18.9 | 40% | 31% | 1.6 |
| Idaho | 0.7 | 16.2 | 4% | 4% | 0.1 |
| Illinois | 94.0 | 230.4 | 41% | 19% | 19.6 |
| Indiana | 114.3 | 219.1 | 52% | 27% | 23.8 |
| Iowa | 40.6 | 88.7 | 46% | 34% | 8.5 |
| Kansas | 35.4 | 75.0 | 47% | 41% | 7.4 |
| Kentucky | 94.2 | 150.7 | 63% | 34% | 19.6 |
| Louisiana | 42.6 | 223.5 | 19% | 12% | 8.9 |
| Maine | 2.6 | 18.5 | 14% | 11% | 0.5 |
| Maryland | 24.9 | 70.5 | 35% | 28% | 5.2 |
| Massachusetts | 18.2 | 73.0 | 25% | 16% | 3.8 |
| Michigan | 70.4 | 165.9 | 42% | 27% | 14.7 |
| Minnesota | 29.3 | 93.4 | 31% | 27% | 6.1 |
| Mississippi | 26.4 | 65.5 | 40% | 25% | 5.5 |
| Missouri | 76.0 | 135.7 | 56% | 35% | 15.8 |
| Montana | 19.8 | 34.9 | 57% | 55% | 4.1 |
| Nebraska | 23.1 | 48.0 | 48% | 45% | 4.8 |

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**Table A-1. Power Plant Carbon Dioxide Emissions as a Share of Total State-Level Emissions (MMT), 2010**[108]

| State | Electric Power Sector Emissions | Total Statewide Energy-Related Emissions | Percentage of Statewide Emissions from Power Plants | Estimated Share of Statewide Emissions Contributed by Top 5 Emitting Power Plants± | Total Power Sector Emissions Equivalent in Number of Passenger Vehicles (Millions)[109] |
|---|---|---|---|---|---|
| Nevada | 16.8 | 38.1 | 44% | 28% | 3.5 |
| New Hampshire | 5.4 | 17.0 | 32% | 31% | 1.1 |
| New Jersey | 17.7 | 115.4 | 15% | 10% | 3.7 |
| New Mexico | 29.0 | 54.8 | 53% | 50% | 0.6 |
| New York | 38.1 | 172.8 | 22% | 7% | 7.9 |
| North Carolina | 72.2 | 142.9 | 51% | 36% | 15 |
| North Dakota | 29.5 | 52.5 | 56% | 52% | 6.2 |
| Ohio | 120.8 | 249.1 | 48% | 24% | 25.2 |
| Oklahoma | 47.4 | 103.4 | 46% | 32% | 9.9 |
| Oregon | 9.8 | 40.3 | 24% | 22% | 0.2 |
| Pennsylvania | 119.6 | 256.6 | 47% | 22% | 24.9 |
| Rhode Island | 3.1 | 11.0 | 28% | 28% | 0.6 |
| South Carolina | 40.9 | 84.0 | 49% | 34% | 8.5 |
| South Dakota | 3.5 | 15.1 | 23% | 23% | 0.7 |
| Tennessee | 43.3 | 107.1 | 40% | 34% | 0.9 |
| Texas | 220.4 | 652.6 | 34% | 10% | 45.9 |
| Utah | 34.8 | 64.2 | 54% | 49% | 7.2 |
| Vermont | 0.0 | 6.0 | 0% | 0% | 0.0 |
| Virginia | 34.3 | 109.8 | 31% | 19% | 7.1 |
| Washington | 13.1 | 76.1 | 17% | 15% | 2.7 |
| West Virginia | 74.3 | 98.9 | 75% | 52% | 15.5 |
| Wisconsin | 42.6 | 99.2 | 43% | 29% | 8.9 |
| Wyoming | 42.8 | 64.9 | 66% | 59% | 8.9 |
| Total* | 2,240.0 | 5,631.3 | 40% | 24% | 466.7 |

* For the emissions of the United States as a country see, U.S. Energy Information Administration, *Monthly Energy Review*, Section 12: Environment, August 2013. Differing methodologies between that data series and the state-by-state data listed here causes the total for all states to be slightly different from the national-level estimate. The amount varies no more than 0.5 percent. NOTE: The District of Columbia is included in the data tables, but not in the analysis as it is not a state.

± Estimates obtained by multiplying Emissions for Top 5 as a Share of Power-Sector Total (2011) by Emissions for Power-Sector as a Share of Statewide Total (2010). U.S. EIA does not have state-by-state data on power-sector emissions from 2011. See Table A-3.

**Table A-2. The Nation's 100 Most-Polluting Power Plants, Carbon Dioxide Emissions Equivalent in Passenger Vehicles and Primary Fuel Category, 2011**

| Rank | State | Operator Name | Plant Name | Primary Fuel Category | Emissions (Million Metric Tons)[112] | Emissions Equivalent in Passenger Vehicles (Millions)[113] |
|---|---|---|---|---|---|---|
| 1 | GA | Georgia Power Co. | Scherer | Coal | 21.3 | 4.44 |
| 2 | AL | Alabama Power Co. | James H. Miller Jr. | Coal | 20.7 | 4.3 |
| 3 | TX | Luminant Generation Company, LLC | Martin Lake | Coal | 18.8 | 3.91 |
| 4 | MO | Union Electric Co. (MO) | Labadie | Coal | 18.5 | 3.85 |
| 5 | TX | NRG Texas Power, LLC | W. A. Parish | Coal | 17.8 | 3.71 |
| 6 | IN | Duke Energy Indiana Inc. | Gibson | Coal | 16.9 | 3.53 |
| 7 | OH | Ohio Power Co. | General James M. Gavin | Coal | 16.6 | 3.46 |
| 8 | PA | FirstEnergy Generation Corp. | FirstEnergy Bruce Mansfield | Coal | 16.4 | 3.41 |
| 9 | MI | Detroit Edison Co. | Monroe | Coal | 16.4 | 3.41 |
| 10 | AZ | Salt River Project | Navajo | Coal | 15.9 | 3.32 |
| 11 | IN | Indiana Michigan Power Co. | Rockport | Coal | 15.4 | 3.22 |
| 12 | KS | Westar Energy Inc. | Jeffrey Energy Center | Coal | 14.7 | 3.05 |
| 13 | GA | Georgia Power Co. | Bowen | Coal | 14.2 | 2.97 |
| 14 | WV | Appalachian Power Co. | John E. Amos | Coal | 13.9 | 2.89 |
| 15 | NM | Arizona Public Service Co. | Four Corners* | Coal | 13.8 | 2.88 |
| 16 | NC | Duke Energy Carolinas, LLC | Belews Creek | Coal | 13.8 | 2.87 |
| 17 | TX | Luminant Generation Company, LLC | Monticello | Coal | 13.7 | 2.85 |
| 18 | MT | PPL Montana, LLC | Colstrip | Coal | 13.6 | 2.82 |
| 19 | TX | NRG Texas Power, LLC | Limestone | Coal | 13.3 | 2.77 |
| 20 | LA | Louisiana Generating LLC | Big Cajun 2 | Coal | 13.2 | 2.75 |
| 21 | MN | Northern States Power Co. – Minnesota | Sherburne County | Coal | 13.1 | 2.73 |
| 22 | SC | South Carolina Public Service Authority | Cross | Coal | 12.9 | 2.69 |
| 23 | WY | PacifiCorp | Jim Bridger | Coal | 12.9 | 2.68 |
| 24 | IL | Dynegy Midwest Generation Inc. | Baldwin Energy Complex | Coal | 12.8 | 2.67 |
| 25 | OH | Dayton Power & Light Co. | J. M. Stuart | Coal | 12.7 | 2.66 |
| 26 | KY | Kentucky Utilities Co. | Ghent | Coal | 12.7 | 2.65 |
| 27 | TN | Tennessee Valley Authority | Cumberland | Coal | 12.4 | 2.57 |
| 28 | WY | Basin Electric Power Coop | Laramie River Station | Coal | 12.2 | 2.54 |
| 29 | UT | Los Angeles Department of Water & Power | Intermountain Power Project* | Coal | 12.0 | 2.51 |
| 30 | KY | Tennessee Valley Authority | Paradise | Coal | 12.0 | 2.49 |

*Indicates that this power plant is scheduled for retirement.[110]

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**Table A-2. The Nation's 100 Most-Polluting Power Plants, Carbon Dioxide Emissions Equivalent in Passenger Vehicles and Primary Fuel Category, 2011**

| Rank | State | Operator Name | Plant Name | Primary Fuel Category | Emissions (Million Metric Tons)[112] | Emissions Equivalent in Passenger Vehicles (Millions)[113] |
|---|---|---|---|---|---|---|
| 31 | IA | MidAmerican Energy Co. | Walter Scott Jr. Energy Center* | Coal | 11.7 | 2.43 |
| 32 | NC | Progress Energy Carolinas Inc. | Roxboro | Coal | 11.6 | 2.42 |
| 33 | NM | Public Service Co. of NM | San Juan* | Coal | 11.5 | 2.4 |
| 34 | AZ | Tucson Electric Power Co. | Springerville | Coal | 11.5 | 2.39 |
| 35 | AR | Entergy Arkansas Inc. | Independence | Coal | 11.1 | 2.3 |
| 36 | TX | Southwestern Electric Power Co. | Welsh* | Coal | 11.0 | 2.29 |
| 37 | TX | Lower Colorado River Authority | Fayette Power Project | Coal | 10.9 | 2.26 |
| 38 | TX | Oak Grove Management Co., LLC | Oak Grove | Coal | 10.8 | 2.26 |
| 39 | OH | FirstEnergy Generation Corp. | FirstEnergy W. H. Sammis | Coal | 10.6 | 2.2 |
| 40 | PA | Allegheny Energy Supply Co., LLC | Hatfields Ferry Power Station* | Coal | 10.5 | 2.18 |
| 41 | WV | Allegheny Energy Supply Co., LLC | FirstEnergy Harrison Power Station | Coal | 10.4 | 2.16 |
| 42 | AR | Entergy Arkansas Inc. | White Bluff | Coal | 10.4 | 2.16 |
| 43 | AL | Alabama Power Co. | E. C. Gaston | Coal | 10.3 | 2.14 |
| 44 | FL | Progress Energy Florida Inc. | Crystal River* | Coal | 10.2 | 2.13 |
| 45 | NC | Duke Energy Carolinas, LLC | Marshall | Coal | 10.1 | 2.09 |
| 46 | IN | Indianapolis Power & Light Co. | AES Petersburg | Coal | 10.0 | 2.09 |
| 47 | PA | GenOn Northeast Management Company | Keystone | Coal | 10.0 | 2.08 |
| 48 | PA | GenOn Northeast Management Company | Conemaugh | Coal | 9.9 | 2.06 |
| 49 | IL | Midwest Generations EME, LLC | Powerton | Coal | 9.8 | 2.04 |
| 50 | NE | Nebraska Public Power District | Gerald Gentleman | Coal | 9.3 | 1.94 |
| 51 | OK | Oklahoma Gas & Electric Co. | Muskogee | Coal | 9.2 | 1.92 |
| 52 | FL | Tampa Electric Co. | Big Bend | Coal | 9.2 | 1.91 |
| 53 | KY | Louisville Gas & Electric Co. | Mill Creek | Coal | 9.1 | 1.89 |
| 54 | PA | Midwest Generations EME, LLC | Homer City Station | Coal | 9.0 | 1.87 |
| 55 | CO | Tri-State G & T Assn., Inc. | Craig | Coal | 9.0 | 1.87 |
| 56 | KY | East Kentucky Power Coop, Inc. | H. L. Spurlock | Coal | 8.9 | 1.86 |
| 57 | ND | Great River Energy | Coal Creek | Coal | 8.8 | 1.84 |
| 58 | NE | Omaha Public Power District | Nebraska City | Coal | 8.7 | 1.82 |
| 59 | PA | PPL Brunner Island, LLC | PPL Brunner Island | Coal | 8.6 | 1.79 |
| 60 | OK | Public Service Co. of Oklahoma | Northeastern* | Coal | 8.6 | 1.79 |

*Indicates that this power plant is scheduled for retirement.[110]

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**Table A-2. The Nation's 100 Most-Polluting Power Plants, Carbon Dioxide Emissions Equivalent in Passenger Vehicles and Primary Fuel Category, 2011**

| Rank | State | Operator Name | Plant Name | Primary Fuel Category | Emissions (Million Metric Tons)[112] | Emissions Equivalent in Passenger Vehicles (Millions)[113] |
|---|---|---|---|---|---|---|
| 61 | TX | Big Brown Power Company, LLC | Big Brown | Coal | 8.6 | 1.79 |
| 62 | WV | Appalachian Power Co. | Mountaineer | Coal | 8.5 | 1.77 |
| 63 | UT | PacifiCorp | Hunter | Coal | 8.4 | 1.76 |
| 64 | MO | Kansas City Power & Light Co. | Iatan | Coal | 8.4 | 1.75 |
| 65 | PA | PPL Montour, LLC | PPL Montour | Coal | 8.4 | 1.75 |
| 66 | WV | Ohio Power Co. | Mitchell | Coal | 8.4 | 1.74 |
| 67 | TX | City of San Antonio – (TX) | J. K. Spruce | Coal | 8.3 | 1.73 |
| 68 | MO | Associated Electric Coop, Inc. | Thomas Hill | Coal | 8.3 | 1.73 |
| 69 | KS | Kansas City Power & Light Co | La Cygne | Coal | 8.2 | 1.71 |
| 70 | WV | Virginia Electric & Power Co. | Mt. Storm | Coal | 8.2 | 1.7 |
| 71 | MI | Consumers Energy Co. | J. H. Campbell | Coal | 8.2 | 1.7 |
| 72 | IN | Northern Indiana Pub Serv Co. | R. M. Schahfer | Coal | 8.1 | 1.7 |
| 73 | IN | Indiana-Kentucky Electric Corp. | Clifty Creek | Coal | 8.1 | 1.69 |
| 74 | MI | Detroit Edison Co. | Belle River | Coal | 7.9 | 1.65 |
| 75 | FL | Florida Power & Light Co. | West County Energy Center | Natural Gas and other gases | 7.9 | 1.64 |
| 76 | FL | Seminole Electric Cooperative Inc. | Seminole | Coal | 7.9 | 1.64 |
| 77 | MO | Union Electric Co. – (MO) | Rush Island | Coal | 7.9 | 1.64 |
| 78 | WV | Allegheny Energy Supply Co., LLC | FirstEnergy Pleasants Power Station | Coal | 7.8 | 1.63 |
| 79 | KY | Tennessee Valley Authority | Shawnee | Coal | 7.8 | 1.62 |
| 80 | IL | Electric Energy Inc. | Joppa Steam | Coal | 7.8 | 1.62 |
| 81 | OH | Cardinal Operating Co. | Cardinal | Coal | 7.6 | 1.58 |
| 82 | TX | Southwestern Public Service Co. | Tolk | Coal | 7.5 | 1.57 |
| 83 | IL | Ameren Energy Generating Co. | Newton | Coal | 7.5 | 1.55 |
| 84 | MN | Minnesota Power Inc. | Clay Boswell | Coal | 7.4 | 1.55 |
| 85 | AZ | Arizona Public Service Co. | Cholla | Coal | 7.4 | 1.55 |
| 86 | AL | Alabama Power Co. | Barry | Natural Gas and other gases | 7.3 | 1.53 |
| 87 | TN | Tennessee Valley Authority | Gallatin | Coal | 7.3 | 1.51 |
| 88 | WI | Wisconsin Power & Light Co. | Columbia | Coal | 7.2 | 1.51 |
| 89 | CO | Public Service Co. of Colorado | Comanche | Coal | 7.2 | 1.5 |
| 90 | GA | Georgia Power Co. | Wansley | Coal | 7.2 | 1.5 |
| 91 | OK | Grand River Dam Authority | GRDA | Coal | 7.2 | 1.49 |
| 92 | OH | Duke Energy Ohio Inc. | Miami Fort* | Coal | 7.2 | 1.49 |
| 93 | MO | Associated Electric Coop, Inc. | New Madrid | Coal | 7.1 | 1.48 |
| 94 | OH | Ohio Power Co. | Conesville* | Coal | 7.1 | 1.47 |

*Indicates that this power plant is scheduled for retirement.[110]

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**Table A-2. The Nation's 100 Most-Polluting Power Plants, Carbon Dioxide Emissions Equivalent in Passenger Vehicles and Primary Fuel Category, 2011**

| Rank | State | Operator Name | Plant Name | Primary Fuel Category | Emissions (Million Metric Tons)[112] | Emissions Equivalent in Passenger Vehicles (Millions)[113] |
|---|---|---|---|---|---|---|
| 95 | LA | Entergy Gulf States – LA, LLC | R. S. Nelson | Coal | 7.0 | 1.46 |
| 96 | LA | Cleco Power, LLC | Brame Energy Center | Coal | 7.0 | 1.46 |
| 97 | OK | Oklahoma Gas & Electric Co. | Sooner | Coal | 7.0 | 1.45 |
| 98 | KY | Louisville Gas & Electric Co. | Trimble County | Coal | 6.9 | 1.45 |
| 99 | WV | Monongahela Power Co. | FirstEnergy Fort Martin Power Station | Coal | 6.8 | 1.42 |
| 100 | IN | Hoosier Energy R E C, Inc. | Merom | Coal | 6.7 | 1.39 |

*Indicates that this power plant is scheduled for retirement.[110]

**Table A-3. The Share of Each State's Electricity-Sector Carbon Dioxide Pollution Contributed by the Top 5 Most-Polluting Power Plants**

| State | Rank | Plant Name | Operator Name | Emissions (Millon Metric tons of $CO_2$) | Total Emissions of Top 5 Plants (MMT of $CO_2$) | Emissions for Top 5 as a Share of Power-Sector Total (2011) | Emissions for Power-Sector as a Share of Statewide Total (2010) | Estimated Share of Statewide Emissions Contributed by Top 5± |
|---|---|---|---|---|---|---|---|---|
| AK | 1 | Beluga | Chugach Electric Assn. Inc. | 1.27 | 2.8 | 75% | 8% | 6% |
| | 2 | George M Sullivan Generation Plant 2 | Anchorage Municipal Light and Power | 0.61 | | | | |
| | 3 | Aurora Energy, LLC Chena | Aurora Energy, LLC | 0.34 | | | | |
| | 4 | North Pole | Golden Valley Elec. Assn. Inc. | 0.30 | | | | |
| | 5 | Healy | Golden Valley Elec. Assn. Inc. | 0.23 | | | | |
| AL | 1 | James H Miller Jr. | Alabama Power Co. | 20.66 | 48.1 | 63% | 58% | 36% |
| | 2 | E. C. Gaston | Alabama Power Co. | 10.29 | | | | |
| | 3 | Barry | Alabama Power Co. | 7.33 | | | | |
| | 4 | Widows Creek* | Tennessee Valley Authority | 5.06 | | | | |
| | 5 | Colbert | Tennessee Valley Authority | 4.75 | | | | |
| AR | 1 | Independence | Entergy Arkansas Inc. | 11.06 | 32.0 | 92% | 49% | 45% |
| | 2 | White Bluff | Entergy Arkansas Inc. | 10.36 | | | | |
| | 3 | Plum Point Energy Station | Plum Point Energy Associates, LLC | 4.00 | | | | |
| | 4 | Flint Creek | Southwestern Electric Power Co. | 3.77 | | | | |
| | 5 | Union Power Partners, L.P. | Union Power Partners, L.P. | 2.79 | | | | |
| AZ | 1 | Navajo | Salt River Project | 15.92 | 43.0 | 81% | 57% | 46% |
| | 2 | Springerville | Tucson Electric Power Co. | 11.45 | | | | |
| | 3 | Cholla | Arizona Public Service Co. | 7.45 | | | | |
| | 4 | Coronado | Salt River Project | 5.66 | | | | |
| | 5 | Mesquite Generating Station | Mesquite Power, LLC | 2.50 | | | | |
| CA | 1 | Mountainview Generating Station | Southern California Edison Co. | 1.85 | 7.5 | 19% | 12% | 2% |
| | 2 | Delta Energy Center | Delta Energy Center, LLC | 1.64 | | | | |
| | 3 | Haynes | Los Angeles Department of Water & Power | 1.49 | | | | |
| | 4 | Cosumnes | Sacramento Municipal Util. Dist. | 1.26 | | | | |
| | 5 | Elk Hills Power, LLC | Elk Hills Power, LLC | 1.23 | | | | |

*Indicates that this power plant is scheduled for retirement.[113]

± Obtained by multiplying Emissions for Top 5 as a Share of Power-Sector Total (2011) by Emissions for Power-Sector as a Share of Statewide Total (2010) U.S. EIA does not have state-by-state data for power-sector emissions for 2011.

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**Table A-3. The Share of Each State's Electricity-Sector Carbon Dioxide Pollution Contributed by the Top 5 Most-Polluting Power Plants**

| State | Rank | Plant Name | Operator Name | Emissions (Millon Metric tons of $CO_2$) | Total Emissions of Top 5 Plants (MMT of $CO_2$) | Emissions for Top 5 as a Share of Power-Sector Total (2011) | Emissions for Power-Sector as a Share of Statewide Total (2010) | Estimated Share of Statewide Emissions Contributed by Top 5± |
|---|---|---|---|---|---|---|---|---|
| CO | 1 | Craig | Tri-State G & T Assn., Inc. | 8.96 | 26.2 | 67% | 41% | 28% |
| | 2 | Comanche | Public Service Co. of Colorado | 7.21 | | | | |
| | 3 | Cherokee* | Public Service Co. of Colorado | 4.01 | | | | |
| | 4 | Pawnee | Public Service Co. of Colorado | 3.05 | | | | |
| | 5 | Hayden | Public Service Co. of Colorado | 2.98 | | | | |
| CT | 1 | Lake Road Generating Plant | Lake Road Generating Co., L.P. | 2.07 | 5.9 | 75% | 21% | 16% |
| | 2 | Milford Power Project | Milford Power Co., LLC | 1.54 | | | | |
| | 3 | Bridgeport Energy Project | Bridgeport Energy, LLC | 1.08 | | | | |
| | 4 | Kleen Energy Systems Project | Kleen Energy Systems, LLC | 0.70 | | | | |
| | 5 | Bridgeport Station | PSEG Power Connecticut, LLC | 0.53 | | | | |
| DC | 1 | Benning | Potomac Power Resources | 0.11 | 0.2 | 100% | 6% | 6% |
| | 2 | US GSA Heating and Transmission | US GSA Heating and Transmission | 0.05 | | | | |
| | 3 | Buzzard Point | Potomac Power Resources | 0.01 | | | | |
| DE | 1 | Hay Road | Calpine Mid-Atlantic Generation, LLC | 1.70 | 3.9 | 99% | 36% | 36% |
| | 2 | Indian River Generating Station* | Indian River Operations Inc. | 1.57 | | | | |
| | 3 | Edge Moor* | Calpine Mid-Atlantic Generation, LLC | 0.37 | | | | |
| | 4 | Delaware City Plant | Delaware City Refining Company, LLC | 0.18 | | | | |
| | 5 | NRG Energy Center Dover | NRG Energy Center Dover, LLC | 0.11 | | | | |
| FL | 1 | Crystal River* | Progress Energy Florida Inc. | 10.24 | 41.7 | 37% | 49% | 18% |
| | 2 | Big Bend | Tampa Electric Co. | 9.18 | | | | |
| | 3 | West County Energy Center | Florida Power & Light Co. | 7.89 | | | | |
| | 4 | Seminole | Seminole Electric Cooperative Inc. | 7.88 | | | | |
| | 5 | St. Johns River Power Park | JEA | 6.55 | | | | |
| GA | 1 | Scherer | Georgia Power Co. | 21.32 | 52.1 | 76% | 46% | 34% |
| | 2 | Bowen | Georgia Power Co. | 14.24 | | | | |
| | 3 | Wansley | Georgia Power Co. | 7.19 | | | | |
| | 4 | Harllee Branch* | Georgia Power Co. | 5.15 | | | | |
| | 5 | Yates* | Georgia Power Co. | 4.16 | | | | |

*Indicates that this power plant is scheduled for retirement.[113]

± Obtained by multiplying Emissions for Top 5 as a Share of Power-Sector Total (2011) by Emissions for Power-Sector as a Share of Statewide Total (2010) U.S. EIA does not have state-by-state data for power-sector emissions for 2011.

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**Table A-3. The Share of Each State's Electricity-Sector Carbon Dioxide Pollution Contributed by the Top 5 Most-Polluting Power Plants**

| State | Rank | Plant Name | Operator Name | Emissions (Millon Metric tons of $CO_2$) | Total Emissions of Top 5 Plants (MMT of $CO_2$) | Emissions for Top 5 as a Share of Power-Sector Total (2011) | Emissions for Power-Sector as a Share of Statewide Total (2010) | Estimated Share of Statewide Emissions Contributed by Top 5± |
|---|---|---|---|---|---|---|---|---|
| HI | 1 | Kahe | Hawaiian Electric Co. Inc. | 2.41 | 5.6 | 77% | 40% | 31% |
| | 2 | AES Hawaii | AES Hawaii Inc. | 1.31 | | | | |
| | 3 | Waiau | Hawaiian Electric Co. Inc. | 0.87 | | | | |
| | 4 | Maalaea | Maui Electric Co. Ltd. | 0.55 | | | | |
| | 5 | Kalaeola Cogen Plant | Kalaeloa Partners, L.P. | 0.51 | | | | |
| IA | 1 | Walter Scott Jr. Energy Center* | MidAmerican Energy Co. | 11.67 | 29.7 | 75% | 46% | 34% |
| | 2 | George Neal North | MidAmerican Energy Co. | 5.76 | | | | |
| | 3 | George Neal South | MidAmerican Energy Co. | 4.32 | | | | |
| | 4 | Louisa | MidAmerican Energy Co. | 4.30 | | | | |
| | 5 | Ottumwa | Interstate Power and Light Co. | 3.65 | | | | |
| ID | 1 | Rathdrum Power, LLC | Rathdrum Operating Services Co., Inc. | 0.31 | 0.4 | 91% | 4% | 4% |
| | 2 | Evander Andrews Power Complex | Idaho Power Co. | 0.05 | | | | |
| | 3 | Bennett Mountain | Idaho Power Co. | 0.03 | | | | |
| | 4 | Rupert Cogen Project | Energy Operations Group | 0.03 | | | | |
| | 5 | Clearwater Paper IPP Lewiston | Clearwater Paper Corporation | 0.02 | | | | |
| IL | 1 | Baldwin Energy Complex | Dynegy Midwest Generation Inc. | 12.83 | 44.0 | 46% | 41% | 19% |
| | 2 | Powerton | Midwest Generations EME, LLC | 9.80 | | | | |
| | 3 | Joppa Steam | Electric Energy Inc. | 7.76 | | | | |
| | 4 | Newton | Ameren Energy Generating Co. | 7.46 | | | | |
| | 5 | Joliet 29 | Midwest Generations EME, LLC | 6.12 | | | | |
| IN | 1 | Gibson | Duke Energy Indiana Inc. | 16.95 | 58.7 | 52% | 52% | 27% |
| | 2 | Rockport | Indiana Michigan Power Co. | 15.44 | | | | |
| | 3 | AES Petersburg | Indianapolis Power & Light Co. | 10.05 | | | | |
| | 4 | R. M. Schahfer | Northern Indiana Pub Serv Co. | 8.14 | | | | |
| | 5 | Clifty Creek | Indiana-Kentucky Electric Corp. | 8.09 | | | | |

*Indicates that this power plant is scheduled for retirement.[113]

± Obtained by multiplying Emissions for Top 5 as a Share of Power-Sector Total (2011) by Emissions for Power-Sector as a Share of Statewide Total (2010) U.S. EIA does not have state-by-state data for power-sector emissions for 2011.

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**Table A-3. The Share of Each State's Electricity-Sector Carbon Dioxide Pollution Contributed by the Top 5 Most-Polluting Power Plants**

| State | Rank | Plant Name | Operator Name | Emissions (Millon Metric tons of $CO_2$) | Total Emissions of Top 5 Plants (MMT of $CO_2$) | Emissions for Top 5 as a Share of Power-Sector Total (2011) | Emissions for Power-Sector as a Share of Statewide Total (2010) | Estimated Share of Statewide Emissions Contributed by Top 5± |
|---|---|---|---|---|---|---|---|---|
| KS | 1 | Jeffrey Energy Center | Westar Energy Inc. | 14.66 | 30.8 | 88% | 47% | 41% |
| | 2 | La Cygne | Kansas City Power & Light Co. | 8.22 | | | | |
| | 3 | Lawrence Energy Center | Westar Energy Inc. | 3.69 | | | | |
| | 4 | Holcomb | Sunflower Electric Power Corp. | 2.76 | | | | |
| | 5 | Nearman Creek | City of Kansas City – (KS) | 1.50 | | | | |
| KY | 1 | Ghent | Kentucky Utilities Co. | 12.72 | 50.4 | 54% | 63% | 34% |
| | 2 | Paradise | Tennessee Valley Authority | 11.96 | | | | |
| | 3 | Mill Creek | Louisville Gas & Electric Co. | 9.05 | | | | |
| | 4 | H. L. Spurlock | East Kentucky Power Coop, Inc. | 8.91 | | | | |
| | 5 | Shawnee | Tennessee Valley Authority | 7.80 | | | | |
| LA | 1 | Big Cajun 2 | Louisiana Generating, LLC | 13.22 | 35.0 | 61% | 19% | 12% |
| | 2 | R. S. Nelson | Entergy Gulf States – LA, LLC | 7.01 | | | | |
| | 3 | Brame Energy Center | Cleco Power, LLC | 7.01 | | | | |
| | 4 | Dolet Hills | Cleco Power, LLC | 5.14 | | | | |
| | 5 | Nine Mile Point | Entergy Louisiana Inc. | 2.62 | | | | |
| MA | 1 | Mystic Generating Station | Constellation Mystic Power, LLC | 3.64 | 10.5 | 66% | 25% | 16% |
| | 2 | Brayton Point | Dominion Energy New England, LLC | 3.26 | | | | |
| | 3 | Fore River Generating Station | Constellation Mystic Power, LLC | 1.86 | | | | |
| | 4 | Millennium Power | Millennium Power Partners, L.P. | 0.92 | | | | |
| | 5 | ANP Blackstone Energy Project | ANP Blackstone Energy Company, LLC | 0.82 | | | | |
| MD | 1 | Brandon Shores | Raven Power Holdings, LLC | 6.02 | 18.6 | 80% | 35% | 28% |
| | 2 | Morgantown Generating Plant | GenOn Mid-Atlantic, LLC | 5.84 | | | | |
| | 3 | Chalk Point, LLC | GenOn Chalk Point, LLC | 3.79 | | | | |
| | 4 | Herbert A. Wagner | Raven Power Holdings, LLC | 1.54 | | | | |
| | 5 | Dickerson | GenOn Mid-Atlantic, LLC | 1.37 | | | | |

*Indicates that this power plant is scheduled for retirement.[113]

± Obtained by multiplying Emissions for Top 5 as a Share of Power-Sector Total (2011) by Emissions for Power-Sector as a Share of Statewide Total (2010) U.S. EIA does not have state-by-state data for power-sector emissions for 2011.

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**Table A-3. The Share of Each State's Electricity-Sector Carbon Dioxide Pollution Contributed by the Top 5 Most-Polluting Power Plants**

| State | Rank | Plant Name | Operator Name | Emissions (Millon Metric tons of $CO_2$) | Total Emissions of Top 5 Plants (MMT of $CO_2$) | Emissions for Top 5 as a Share of Power-Sector Total (2011) | Emissions for Power-Sector as a Share of Statewide Total (2010) | Estimated Share of Statewide Emissions Contributed by Top 5± |
|---|---|---|---|---|---|---|---|---|
| ME | 1 | Westbrook Energy Center Power Plant | Westbrook Energy Center | 1.01 | 2.8 | 82% | 14% | 11% |
| | 2 | Verso Paper | Verso Bucksport, LLC | 0.73 | | | | |
| | 3 | Maine Independence Station | Casco Bay Energy Co., LLC | 0.69 | | | | |
| | 4 | Rumford Power Associates | Rumford Power | 0.17 | | | | |
| | 5 | Androscoggin Energy Center | Verso Paper Androscoggin, LLC | 0.15 | | | | |
| MI | 1 | Monroe | Detroit Edison Co. | 16.39 | 42.8 | 64% | 42% | 27% |
| | 2 | J. H. Campbell | Consumers Energy Co. | 8.16 | | | | |
| | 3 | Belle River | Detroit Edison Co. | 7.91 | | | | |
| | 4 | St. Clair | Detroit Edison Co. | 6.54 | | | | |
| | 5 | Trenton Channel | Detroit Edison Co. | 3.76 | | | | |
| MN | 1 | Sherburne County | Northern States Power Co. – Minnesota | 13.11 | 26.3 | 85% | 31% | 27% |
| | 2 | Clay Boswell | Minnesota Power Inc. | 7.45 | | | | |
| | 3 | Allen S. King | Northern States Power Co. – Minnesota | 3.18 | | | | |
| | 4 | Black Dog* | Northern States Power Co. – Minnesota | 1.39 | | | | |
| | 5 | Taconite Harbor Energy Center | Minnesota Power Inc. | 1.20 | | | | |
| MO | 1 | Labadie | Union Electric Co. – (MO) | 18.50 | 50.1 | 62% | 56% | 35% |
| | 2 | Iatan | Kansas City Power & Light Co. | 8.41 | | | | |
| | 3 | Thomas Hill | Associated Electric Coop, Inc. | 8.29 | | | | |
| | 4 | Rush Island | Union Electric Co. – (MO) | 7.85 | | | | |
| | 5 | New Madrid | Associated Electric Coop, Inc. | 7.09 | | | | |
| MS | 1 | Victor J. Daniel Jr. | Mississippi Power Co. | 5.28 | 14.1 | 61% | 40% | 25% |
| | 2 | Red Hills Generating Facility | Choctaw Generating, L.P. | 2.74 | | | | |
| | 3 | Jack Watson | Mississippi Power Co. | 2.73 | | | | |
| | 4 | Baxter Wilson | Entergy Mississippi Inc. | 1.76 | | | | |
| | 5 | R. D. Morrow | South Mississippi El Pwr. Assn. | 1.55 | | | | |

*Indicates that this power plant is scheduled for retirement.[113]

± Obtained by multiplying Emissions for Top 5 as a Share of Power-Sector Total (2011) by Emissions for Power-Sector as a Share of Statewide Total (2010) U.S. EIA does not have state-by-state data for power-sector emissions for 2011.

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**Table A-3. The Share of Each State's Electricity-Sector Carbon Dioxide Pollution Contributed by the Top 5 Most-Polluting Power Plants**

| State | Rank | Plant Name | Operator Name | Emissions (Millon Metric tons of $CO_2$) | Total Emissions of Top 5 Plants (MMT of $CO_2$) | Emissions for Top 5 as a Share of Power-Sector Total (2011) | Emissions for Power-Sector as a Share of Statewide Total (2010) | Estimated Share of Statewide Emissions Contributed by Top 5± |
|---|---|---|---|---|---|---|---|---|
| MT | 1 | Colstrip | PPL Montana, LLC | 13.55 | 16.1 | 96% | 57% | 55% |
| | 2 | J. E. Corette Plant | PPL Montana, LLC | 0.90 | | | | |
| | 3 | Hardin Generator Project | Rocky Mountain Power Inc. | 0.77 | | | | |
| | 4 | Yellowstone Energy, L.P. | Yellowstone Energy, L.P. | 0.50 | | | | |
| | 5 | Lewis & Clark | Montana-Dakota Utilities Co. | 0.37 | | | | |
| NC | 1 | Belews Creek | Duke Energy Carolinas, LLC | 13.76 | 43.0 | 71% | 51% | 36% |
| | 2 | Roxboro | Progress Energy Carolinas Inc. | 11.60 | | | | |
| | 3 | Marshall | Duke Energy Carolinas, LLC | 10.05 | | | | |
| | 4 | G. G. Allen | Duke Energy Carolinas, LLC | 4.00 | | | | |
| | 5 | Mayo | Progress Energy Carolinas Inc. | 3.56 | | | | |
| ND | 1 | Coal Creek | Great River Energy | 8.82 | 27.1 | 93% | 56% | 52% |
| | 2 | Antelope Valley | Basin Electric Power Coop | 5.79 | | | | |
| | 3 | Milton R. Young | Minnkota Power Coop, Inc | 5.56 | | | | |
| | 4 | Leland Olds | Basin Electric Power Coop | 3.60 | | | | |
| | 5 | Coyote | Otter Tail Power Co. | 3.29 | | | | |
| NE | 1 | Gerald Gentleman | Nebraska Public Power District | 9.29 | 24.7 | 93% | 48% | 45% |
| | 2 | Nebraska City | Omaha Public Power District | 8.75 | | | | |
| | 3 | North Omaha | Omaha Public Power District | 3.58 | | | | |
| | 4 | Sheldon | Nebraska Public Power District | 1.58 | | | | |
| | 5 | Whelan Energy Center | City of Hasting – (NE) | 1.53 | | | | |
| NH | 1 | Merrimack | Public Service Co. of NH | 2.00 | 4.9 | 97% | 32% | 31% |
| | 2 | Granite Ridge | Granite Ridge Energy, LLC | 1.47 | | | | |
| | 3 | EP Newington Energy, LLC | EP Newington Energy, LLC | 1.05 | | | | |
| | 4 | Schiller | Public Service Co. of NH | 0.30 | | | | |
| | 5 | Newington | Public Service Co. of NH | 0.11 | | | | |

*Indicates that this power plant is scheduled for retirement.[113]

± Obtained by multiplying Emissions for Top 5 as a Share of Power-Sector Total (2011) by Emissions for Power-Sector as a Share of Statewide Total (2010) U.S. EIA does not have state-by-state data for power-sector emissions for 2011.

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**Table A-3. The Share of Each State's Electricity-Sector Carbon Dioxide Pollution Contributed by the Top 5 Most-Polluting Power Plants**

| State | Rank | Plant Name | Operator Name | Emissions (Millon Metric tons of $CO_2$) | Total Emissions of Top 5 Plants (MMT of $CO_2$) | Emissions for Top 5 as a Share of Power-Sector Total (2011) | Emissions for Power-Sector as a Share of Statewide Total (2010) | Estimated Share of Statewide Emissions Contributed by Top 5± |
|---|---|---|---|---|---|---|---|---|
| NJ | 1 | Bergen Generating Station | PSEG Fossil, LLC | 2.46 | 9.9 | 64% | 15% | 10% |
| | 2 | PSEG Linden Generating Station | PSEG Fossil, LLC | 2.13 | | | | |
| | 3 | Red Oak Power, LLC | Red Oak Power, LLC | 1.93 | | | | |
| | 4 | PSEG Hudson Generating Station | PSEG Fossil, LLC | 1.76 | | | | |
| | 5 | Linden Cogen Plant | Cogen Technologies Linden Vent | 1.60 | | | | |
| NM | 1 | Four Corners* | Arizona Public Service Co. | 13.85 | 29.1 | 94% | 53% | 50% |
| | 2 | San Juan* | Public Service Co. of NM | 11.52 | | | | |
| | 3 | Escalante | Tri-State G & T Assn., Inc. | 1.78 | | | | |
| | 4 | Hobbs Generating Station | CAMS NM, LLC | 1.24 | | | | |
| | 5 | Luna Energy Facility | Public Service Co. of NM | 0.70 | | | | |
| NV | 1 | Reid Gardner* | Nevada Power Co. | 2.48 | 9.3 | 64% | 44% | 28% |
| | 2 | Chuck Lenzie Generating Station | Nevada Power Co. | 2.30 | | | | |
| | 3 | North Valmy | Sierra Pacific Power Co. | 1.98 | | | | |
| | 4 | Tracy | Sierra Pacific Power Co. | 1.29 | | | | |
| | 5 | TS Power Plant* | Newmont Nevada Energy Investment, LLC | 1.28 | | | | |
| NY | 1 | AES Somerset, LLC | AES Somerset, LLC | 3.51 | 11.0 | 32% | 22% | 7% |
| | 2 | Northport | National Grid Generation, LLC | 2.06 | | | | |
| | 3 | Dunkirk Generating Plant | Dunkirk Power, LLC | 2.05 | | | | |
| | 4 | Ravenswood | TC Ravenswood, LLC | 1.74 | | | | |
| | 5 | East River | Consolidated Edison Co. NY Inc. | 1.68 | | | | |
| OH | 1 | General James M. Gavin | Ohio Power Co. | 16.59 | 54.7 | 50% | 48% | 24% |
| | 2 | J. M. Stuart | Dayton Power & Light Co. | 12.75 | | | | |
| | 3 | FirstEnergy W. H. Sammis | FirstEnergy Generation Corp. | 10.55 | | | | |
| | 4 | Cardinal | Cardinal Operating Co. | 7.60 | | | | |
| | 5 | Miami Fort* | Duke Energy Ohio Inc. | 7.15 | | | | |

*Indicates that this power plant is scheduled for retirement.[113]

± Obtained by multiplying Emissions for Top 5 as a Share of Power-Sector Total (2011) by Emissions for Power-Sector as a Share of Statewide Total (2010) U.S. EIA does not have state-by-state data for power-sector emissions for 2011.

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**Table A-3. The Share of Each State's Electricity-Sector Carbon Dioxide Pollution Contributed by the Top 5 Most-Polluting Power Plants**

| State | Rank | Plant Name | Operator Name | Emissions (Millon Metric tons of $CO_2$) | Total Emissions of Top 5 Plants (MMT of $CO_2$) | Emissions for Top 5 as a Share of Power-Sector Total (2011) | Emissions for Power-Sector as a Share of Statewide Total (2010) | Estimated Share of Statewide Emissions Contributed by Top 5± |
|---|---|---|---|---|---|---|---|---|
| OK | 1 | Muskogee | Oklahoma Gas & Electric Co. | 9.20 | 35.0 | 69% | 46% | 32% |
| | 2 | Northeastern* | Public Service Co. of Oklahoma | 8.60 | | | | |
| | 3 | GRDA | Grand River Dam Authority | 7.17 | | | | |
| | 4 | Sooner | Oklahoma Gas & Electric Co. | 6.96 | | | | |
| | 5 | Hugo | Western Farmers Elec Coop, Inc. | 3.06 | | | | |
| OR | 1 | Boardman* | Portland General Electric Co. | 3.24 | 5.9 | 89% | 24% | 22% |
| | 2 | Hermiston Generating Plant | Hermiston Generating Co., L.P. | 0.92 | | | | |
| | 3 | Klamath Cogeneration Plant | Pacific Klamath Energy Inc. | 0.74 | | | | |
| | 4 | Port Westward | Portland General Electric Co. | 0.51 | | | | |
| | 5 | Hermiston Power Partnership | Hermiston Power Partnership | 0.45 | | | | |
| PA | 1 | FirstEnergy Bruce Mansfield | FirstEnergy Generation Corp. | 16.39 | 55.7 | 48% | 47% | 22% |
| | 2 | Hatfields Ferry Power Station* | Allegheny Energy Supply Co., LLC | 10.46 | | | | |
| | 3 | Keystone | GenOn Northeast Management Company | 10.00 | | | | |
| | 4 | Conemaugh | GenOn Northeast Management Company | 9.88 | | | | |
| | 5 | Homer City Station | Midwest Generations EME, LLC | 8.97 | | | | |
| RI | 1 | Entergy Rhode Island State Energy, L.P. | Entergy RISE | 1.17 | 3.5 | 99% | 28% | 28% |
| | 2 | Manchester Street | Dominion Energy New England, LLC | 1.01 | | | | |
| | 3 | Tiverton Power Plant | Tiverton Power Inc. | 0.61 | | | | |
| | 4 | Ocean State Power II | Ocean State Power II | 0.35 | | | | |
| | 5 | Ocean State Power | Ocean State Power Co. | 0.32 | | | | |
| SC | 1 | Cross | South Carolina Public Service Authority | 12.89 | 26.3 | 70% | 49% | 34% |
| | 2 | Winyah | South Carolina Public Service Authority | 5.03 | | | | |
| | 3 | Wateree | South Carolina Electric & Gas Co. | 3.76 | | | | |
| | 4 | Williams | South Carolina Genertg Co, Inc. | 2.46 | | | | |
| | 5 | Jasper | South Carolina Electric & Gas Co. | 2.16 | | | | |

*Indicates that this power plant is scheduled for retirement.[113]

± Obtained by multiplying Emissions for Top 5 as a Share of Power-Sector Total (2011) by Emissions for Power-Sector as a Share of Statewide Total (2010) U.S. EIA does not have state-by-state data for power-sector emissions for 2011.

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**Table A-3. The Share of Each State's Electricity-Sector Carbon Dioxide Pollution Contributed by the Top 5 Most-Polluting Power Plants**

| State | Rank | Plant Name | Operator Name | Emissions (Millon Metric tons of $CO_2$) | Total Emissions of Top 5 Plants (MMT of $CO_2$) | Emissions for Top 5 as a Share of Power-Sector Total (2011) | Emissions for Power-Sector as a Share of Statewide Total (2010) | Estimated Share of Statewide Emissions Contributed by Top 5± |
|---|---|---|---|---|---|---|---|---|
| SD | 1 | Big Stone | Otter Tail Power Co. | 2.63 | 2.9 | 100% | 23% | 23% |
| | 2 | Ben French* | Black Hills Power Inc. | 0.19 | | | | |
| | 3 | Groton Generating Station | Basin Electric Power Coop | 0.04 | | | | |
| | 4 | Angus Anson | Northern States Power Co. – Minnesota | 0.04 | | | | |
| | 5 | Lange Gas Turbines | Black Hills Power Inc. | 0.00 | | | | |
| TN | 1 | Cumberland | Tennessee Valley Authority | 12.36 | 34.4 | 83% | 40% | 34% |
| | 2 | Gallatin | Tennessee Valley Authority | 7.25 | | | | |
| | 3 | Johnsonville* | Tennessee Valley Authority | 5.49 | | | | |
| | 4 | Allen Steam Plant | Tennessee Valley Authority | 4.73 | | | | |
| | 5 | Kingston | Tennessee Valley Authority | 4.59 | | | | |
| TX | 1 | Martin Lake | Luminant Generation Company, LLC | 18.76 | 74.6 | 30% | 34% | 10% |
| | 2 | W. A. Parish | NRG Texas Power, LLC | 17.81 | | | | |
| | 3 | Monticello | Luminant Generation Company, LLC | 13.69 | | | | |
| | 4 | Limestone | NRG Texas Power, LLC | 13.30 | | | | |
| | 5 | Welsh* | Southwestern Electric Power Co. | 11.01 | | | | |
| UT | 1 | Intermountain Power Project* | Los Angeles Department of Water & Power | 12.05 | 30.6 | 90% | 54% | 49% |
| | 2 | Hunter | PacifiCorp | 8.43 | | | | |
| | 3 | Huntington | PacifiCorp | 5.54 | | | | |
| | 4 | Bonanza | Deseret Generation & Tran Coop | 3.22 | | | | |
| | 5 | Carbon* | PacifiCorp | 1.38 | | | | |
| VA | 1 | Chesterfield | Virginia Electric & Power Co. | 6.11 | 16.8 | 60% | 31% | 19% |
| | 2 | Clover | Virginia Electric & Power Co. | 4.92 | | | | |
| | 3 | Chesapeake* | Virginia Electric & Power Co. | 2.73 | | | | |
| | 4 | Tenaska Virginia Generating Station | Tenaska Virginia Partners, L.P. | 1.73 | | | | |
| | 5 | Clinch River* | Appalachian Power Co. | 1.32 | | | | |

*Indicates that this power plant is scheduled for retirement.[113]

± Obtained by multiplying Emissions for Top 5 as a Share of Power-Sector Total (2011) by Emissions for Power-Sector as a Share of Statewide Total (2010) U.S. EIA does not have state-by-state data for power-sector emissions for 2011.

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**Table A-3. The Share of Each State's Electricity-Sector Carbon Dioxide Pollution Contributed by the Top 5 Most-Polluting Power Plants**

| State | Rank | Plant Name | Operator Name | Emissions (Millon Metric tons of $CO_2$) | Total Emissions of Top 5 Plants (MMT of $CO_2$) | Emissions for Top 5 as a Share of Power-Sector Total (2011) | Emissions for Power-Sector as a Share of Statewide Total (2010) | Estimated Share of Statewide Emissions Contributed by Top 5± |
|---|---|---|---|---|---|---|---|---|
| VT | 1 | Middlebury College | Middlebury College Biomass | 0.01 | 0.0 | 96% | 0% | 0% |
| | 2 | Berlin 5 | Green Mountain Power Corp. | 0.01 | | | | |
| | 3 | J. C. McNeil | City of Burlington Electric (VT) | 0.00 | | | | |
| | 4 | Colchester 16 | Green Mountain Power Corp. | 0.00 | | | | |
| | 5 | Rutland | Central Vermont Pub Serv. Corp. | 0.00 | | | | |
| WA | 1 | Transalta Centralia Generation | TransAlta Centralia Gen, LLC | 5.36 | 6.7 | 88% | 17% | 15% |
| | 2 | River Road Gen Plant | PUD No 1 of Clark County (WA) | 0.39 | | | | |
| | 3 | March Point Cogeneration | March Point Cogeneration Co. | 0.36 | | | | |
| | 4 | Mint Farm Generating Station | Puget Sound Energy Inc. | 0.27 | | | | |
| | 5 | Chehalis Generating Facility | PacifiCorp | 0.27 | | | | |
| WI | 1 | Columbia | Wisconsin Power & Light Co. | 7.24 | 29.1 | 67% | 43% | 29% |
| | 2 | Pleasant Prairie | Wisconsin Electric Power Co. | 6.65 | | | | |
| | 3 | Weston | Wisconsin Public Service Corp. | 5.82 | | | | |
| | 4 | South Oak Creek | Wisconsin Electric Power Co. | 4.96 | | | | |
| | 5 | Edgewater* | Wisconsin Power & Light Co. | 4.42 | | | | |
| WV | 1 | John E. Amos | Appalachian Power Co. | 13.88 | 49.3 | 69% | 75% | 52% |
| | 2 | FirstEnergy Harrison Power Station | Allegheny Energy Supply Co., LLC | 10.37 | | | | |
| | 3 | Mountaineer | Appalachian Power Co. | 8.50 | | | | |
| | 4 | Mitchell | Ohio Power Co. | 8.37 | | | | |
| | 5 | Mt. Storm | Virginia Electric & Power Co. | 8.18 | | | | |
| WY | 1 | Jim Bridger | PacifiCorp | 12.87 | 38.1 | 89% | 66% | 59% |
| | 2 | Laramie River Station | Basin Electric Power Coop | 12.21 | | | | |
| | 3 | Dave Johnston | PacifiCorp | 5.50 | | | | |
| | 4 | Naughton | PacifiCorp | 5.34 | | | | |
| | 5 | Wyodak | PacifiCorp | 2.20 | | | | |

*Indicates that this power plant is scheduled for retirement.[113]

± Obtained by multiplying Emissions for Top 5 as a Share of Power-Sector Total (2011) by Emissions for Power-Sector as a Share of Statewide Total (2010) U.S. EIA does not have state-by-state data for power-sector emissions for 2011.

# Notes

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8. U.S. Energy Information Administration reports that there are 5,962 power plants with unique plant identification numbers that report fuel consumption data monthly or annually on EIA Form 923. This figure includes some wind and solar power plants, as well as combined heat-and-power facilities. See U.S. Energy Information Administration, *Form EIA-923 detailed data*, final data for 2011 released 23 January 2013, available at www.eia.gov/electricity/data/eia923/.

9. U.S. Energy Information Administration, *State-Level Energy-Related Carbon Dioxide Emissions*, 2000-2010, released 13 May 2013.

10. U.S. sources of carbon dioxide emissions: See note 7. Worldwide carbon dioxide emissions: European Commission, Joint Research Center and PBL Netherlands Environmental Assessment Agency, *Emission Database for Global Atmospheric Research (EDGAR*) (v. 4.2), 2011, available at edgar.jrc.ec.europa.eu/overview.php?v=CO2ts1990-2011&sort=des9. See methodology.

11. See note 10.

12. Emissions of U.S. power plants: See note 7; Emissions of passenger vehicles: We used the emissions from motor gasoline consumed in the transportation sector – adjusted for the percentage of motor gasoline used by light-duty passenger vehicles–as a proxy for emissions from passenger vehicles in each state and in the U.S. as a whole. Calculated by multiplying the $CO_2$ emissions from transportation-sector gasoline consumption for each state (per U.S. Energy Information Administration, *State $CO_2$ Emissions*, data for 2010, released 31 January 2013, available at www.

eia.gov/environment/emissions/state/state_emissions.cfm) by 95 percent, which is the percentage of transportation-sector motor gasoline that is consumed by light-duty passenger vehicles, per U.S. Energy Information Administration, "Transportation Sector Energy Use by Fuel Type Within a Mode, Reference case" *Annual Energy Outlook 2013,* released 15 April 2013.

13. See note 10.

14. Ibid.

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16. See note 9.

17. In the New England states of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont, 2011 residential electricity sales were 47,481,000 MWh (per U.S. Energy Information Administration, *Electric Sales, Revenue, and Average Price–Tabl*e 2. *Sales to Bundled and Unbundled Consumers by Sector, Census Division, and State*, released 27 September 2012). In the NPCC New England EPA *eGRID* subregion, electricity sources emit 728.41 lbs of $CO_2$/MWh, per U.S. Environmental Protection Agency, *eGRID2012 Version 1.0*, downloaded from www.epa.gov/cleanenergy/energy-resources/egrid/index.html on 28 August 2013. Residential electricity use in these states emitted 15.7 MMT of $CO_2$ in 2011.

18. See note 12, emissions of passenger vehicles.

19. Venezuela's energy-related emissions in 2011 were 178 million metric tons (MMT) of carbon dioxide. See note 10, European Commission.

20. See note 12, emissions of passenger vehicles.

21. See note 9.

22. See note 12, emissions of passenger vehicles.

23. Calculated using an annual *eGRID* $CO_2$ emissions output rate of 1,216.18 lbs $CO_2$/MWh for the U.S. as a whole (per U.S. Environmental Protection Agency, see note 17) and total U.S. residential electricity sales in 2011 (per U.S. Energy Information Administration, *Electric Sales, Revenue, and Average Price—Tabl*e 2. *Sales to Bundled and Unbundled Consumers by Sector, Census Division, and State*, released 27 September 2012). Residential sales in the U.S. were 1,422 million MWh in 2011, which resulted in emissions of 785 MMT of carbon dioxide pollution.

24. See note 7.

25. See note 7 and methodology. Note: To the extent that natural gas has replaced coal as a preferred fuel for power providers since 2011, the contribution of coal plants to U.S. carbon dioxide pollution may be reduced.

26. U.S. Energy Information Administration, *How Old Are U.S. Power Plants?*, updated 5 March 2013, available at www.eia.gov/energy_in_brief/article/age_of_elec_gen.cfm.

27. Union of Concerned Scientists, *Ripe for Retirement: The Case for Closing America's Costliest Coal Plants*, November 2012.

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30. Ibid.

31. See methodology.

32. State data for carbon dioxide emissions, seen note 9; pollution from top 5 plants: see methodology.

33. We obtained these estimates by multiplying the percentage of total statewide carbon dioxide pollution from each state's power sector in 2010 by the share of each state's power-sector emissions from the top 5 polluting plants in 2011. (State data for carbon dioxide emissions, see U.S. Energy Information Administration, note 9; pollution from top 5 plants, see methodology.) The Energy Information Administration does not have state-by-state data for power-sector emissions from 2011.

34. See notes 1 and 2.

35. See note 2.

36. See, for example, Eric Roeckner, et al., "Historical and Future Anthropogenic Emission Pathways Derived from Coupled Climate-Carbon Cycle Simulations," *Climatic Change* (online), DOI: 10.1007/s10584-010-9886-6, 21 July 2010. There is great uncertainty about the level of emission reductions required to prevent dangerous climate change, based both on the uncertain future pathway of emissions in developing countries as well as uncertainties regarding the sensitivity of the climate to global warming emissions. For example, a study published by Great Britain's Royal Society estimates that developed countries may

need to make more dramatic emission reductions to prevent a 2°C rise in global average temperatures, if it is even possible at all. See: Kevin Anderson and Alice Bows, "Beyond 'Dangerous' Climate Change: Emission Scenarios for a New World," *Philosophical Transactions of the Royal Society* A, 369: 20-44, doi:10.1098/rsta.2010.0290, 2011.

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38. Intergovernmental Panel on Climate Change, *Climate Change 2007: Synthesis Report: Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, 2007.

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61. See note 58.

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101. We used the value for residual fuel oils number 5 and number 6.

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103. We used a value representing the weighted national average for natural gas consumption for electricity generation.

104. We used a value representing the weighted national average for blast furnace gas consumption for electricity generation.

105. We used the value for fuel gas, per U.S. Environmental Protection Agency, see note 96.

106. We used the value for purchased steam and hot water, per U.S. Environmental Protection Agency, see note 96.

107. We used the value for tires, per U.S. Environmental Protection Agency, Center for Climate Leadership, see note 96.

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111. Differences between emissions data in Tables A-2 and A-3 are due to rounding.

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113. See note 110.