Too Much Pollution

State and National Trends in Global Warming Emissions from 1990 to 2007

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Executive Summary

America's reliance on fossil fuels—oil, coal and natural gas—for energy creates a host of problems, including air and water pollution, global warming pollution, high and unpredictable bills for consumers and businesses, and the need to import oil from unstable parts of the world. Moving to clean energy—such as solar and wind power, more efficient homes, and plug-in cars—will cut pollution, help rebuild our economy, and reduce America's dependence on oil.

For decades, America's use of fossil fuels—and the global warming pollution that results—has been on the rise nationally and in states across the country. But this trend is starting to change in some states—in part because of the move to clean energy. Following the lead of those states will start to put the United States on a path to lower global warming emissions and help drive the creation of a clean energy economy.

This report analyzes the most recent data available from the federal Department of Energy to calculate emissions of carbon dioxide from the use of oil, coal and natural gas at the national and state level from 1990 to 2007. Our analysis finds that:

- Emissions of carbon dioxide, the leading global warming pollutant, from fossil fuel consumption increased by 19 percent in the United States from 1990 to 2007. Nationally, the rate of emissions growth has slowed in recent years, and emissions peaked in many states in 2004 and 2005.

- Seventeen states saw declines in carbon dioxide emissions from fossil fuel use between 2004 and 2007.

Those emission reductions—while far short of what will be needed to address the threat of global warming—could be a sign of a new trend, particularly if the United States adopts strong policies to move the nation toward a clean energy future.

States that are highly reliant on coal-fired power plants, have energy-intensive industries, and/or have high levels of pollution from cars and trucks tend to produce the most carbon dioxide pollution from fossil fuel use.

- Texas remained the nation's number

one emitter of carbon dioxide from fossil fuel use in 2007, followed by California, Pennsylvania, Ohio and Florida. (See Table ES-1.)

- Wyoming produced the most carbon dioxide pollution per capita, followed by North Dakota, West Virginia, Alaska and Louisiana. Rhode Island produced the least carbon dioxide per capita in 2007, followed by New York, Vermont, Idaho and California.

- Electricity generation and transportation are by far the largest sources of carbon dioxide emissions in the United States, responsible for 40 percent and 33 percent of fossil fuel-related emissions, respectively, in 2007. Power plants and transportation were also the fastest-growing sources of emissions between 1990 and 2007.

Nationally, the rate of growth in carbon dioxide pollution has slowed but emissions still remain above the levels of two decades ago and well above the levels needed to prevent the worst impacts of global warming.

- Between 2000 and 2007, emissions of carbon dioxide from fossil fuel consumption increased at one-fifth the rate they did during the 1990s.

- Carbon dioxide emissions are estimated to have declined by 2.8 percent in 2008 (to their lowest level since 2001) and are projected to fall still farther in 2009, due to high oil prices in 2008, the recession, and the declining carbon intensity of the economy.

- However, these emission reductions are far from the roughly 35 percent cut in global warming emissions the United States must make by 2020 in order to do our share to avert the worst impacts of global warming.

Table ES-1. Top 10 States for Fossil Fuel Carbon Dioxide Emissions, 2007

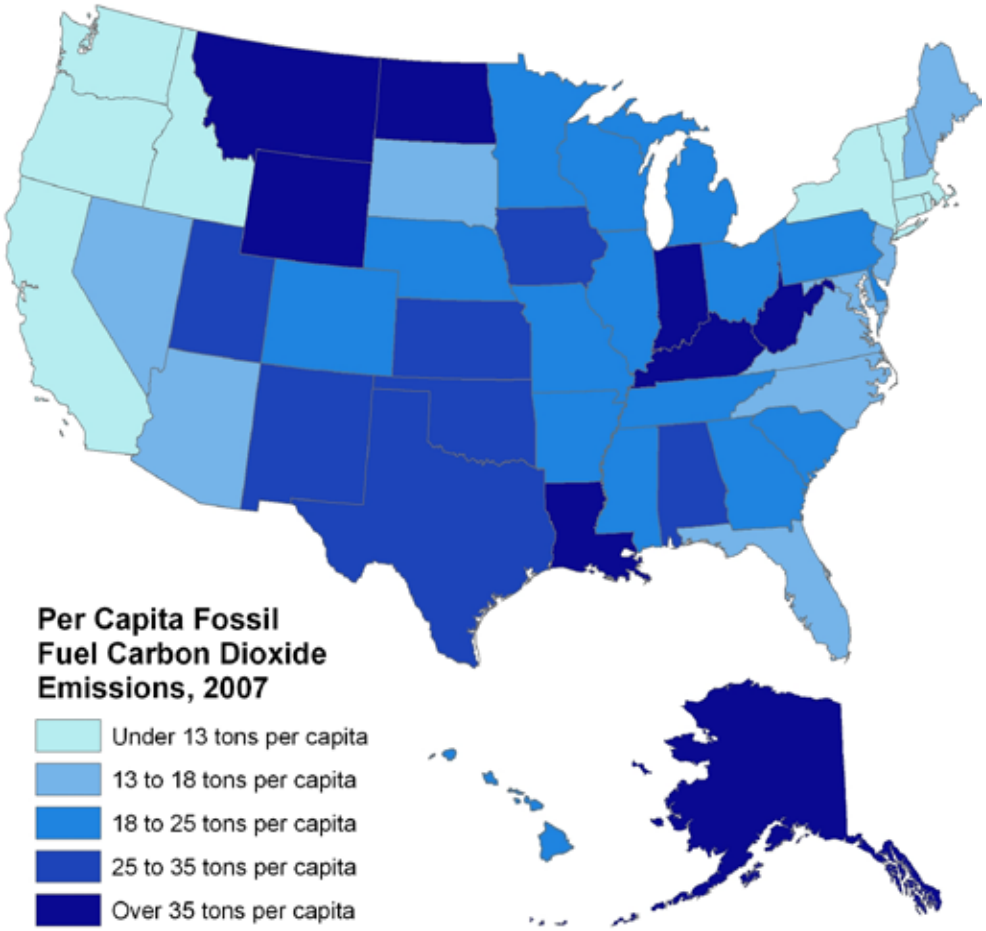
State	Energy-Related CO_2 Emissions (million metric tons)
Texas	675
California	400
Pennsylvania	277
Ohio	270
Florida	258
Illinois	244
Indiana	234
New York	201
Louisiana	195
Georgia	186

Carbon dioxide emissions from fossil fuel use are declining in a growing number of states as they invest in the clean, renewable technologies that are part of a new energy future. Emissions remain on the rise in other states that have not eased their reliance on dirty fuels.

- Four Northeastern states—Connecticut, Delaware, Massachusetts and New York—emitted less carbon dioxide from fossil fuel consumption in 2007 than they did in 1990. Since 1997, gross state product in these four states increased by 65 percent while carbon dioxide emissions decreased by 5 percent.

- Seventeen states and the District of Columbia have seen total emissions decline since 2004, a year of peak emissions for many states. Maine saw the largest percentage decline over this period, while New York and

Figure ES-1. Carbon Dioxide Pollution Per Capita from Fossil Fuels, 2007



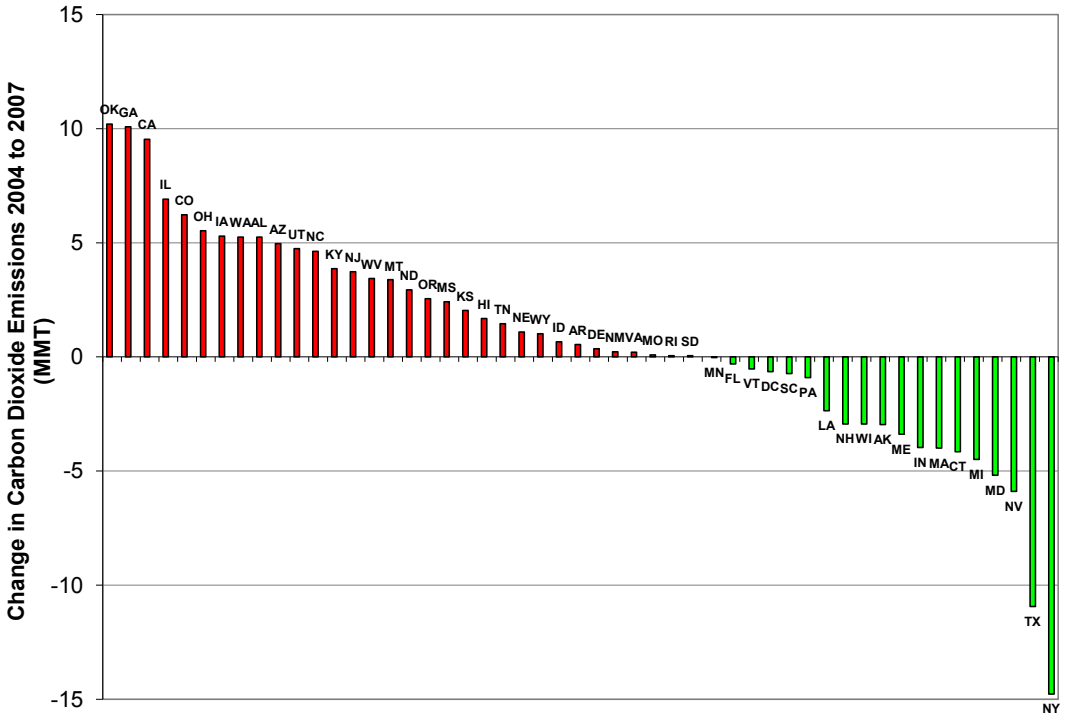
Texas—the nation's eighth-highest and highest emitters of carbon dioxide, respectively—saw the greatest absolute declines.

- Still, emissions in 33 states increased between 2004 and 2007. Emissions in Oklahoma saw the greatest percentage increase, followed by Montana and Hawaii. Oklahoma and Georgia experienced the greatest increase in absolute terms.

The experiences of states that have reduced carbon dioxide emissions, or have low per capita emissions, have lessons for how the nation can reshape its energy system and reduce emissions in the future.

- Many northeastern states have reduced carbon dioxide emissions from electric power plants by switching from polluting (and expensive) oil to cleaner natural gas. Texas, meanwhile, has led the nation in wind energy installations, helping to stabilize emissions from its power sector. These states show that switching from highly polluting fuels such as coal and oil to cleaner sources of power, including renewable energy, can lead to rapid and substantial reductions in emissions.

Figure ES-2. Change in Total Carbon Dioxide Emissions, 2004 to 2007



- Washington and Oregon are the only two states in which the number of vehicle-miles traveled on highways per capita declined between 1990 and 2007—leading to significant reductions in per capita emissions from gasoline use in both states. Both states are noted for their leadership in promoting "smart growth" and both have experienced strong increases in transit ridership, suggesting that states that provide transportation alternatives to reduce reliance on fossil fuels can reduce carbon dioxide emissions.

- States that have made investments in improving the energy efficiency of their economies tend to produce fewer carbon dioxide emissions, suggesting that energy efficiency can be a critical tool in efforts to address global warming at the same time it creates jobs locally.

Creating a new energy future and achieving the carbon dioxide emission reductions necessary to avoid the worst impacts of global warming will require strong action at the federal and state levels, including:

- Science-based limits on global warming pollution from the American economy, with the goal of reducing U.S. emissions by 35 percent below 2005 levels by 2020 and at least 80 percent below 2005 levels by 2050. A cap on overall pollution must be paired with strong emission standards for vehicles, coal-fired power plants, and other large sources to ensure that America moves to clean energy and can achieve ambitious science-based pollution-reduction goals.

- Renewable electricity standards that would ensure that the United States

receives at least 25 percent of its electricity from clean, renewable sources of energy by 2025—reducing the need for continued dependence on high-polluting fossil fuels.

- Policies to improve the energy efficiency of our homes, businesses and factories, including strong building codes and appliance efficiency standards, as well as funding for efforts to retrofit existing buildings to achieve greater energy efficiency.

- Greater investment in transportation alternatives, including high-speed rail and modern public transportation, as well as efforts to reduce the carbon intensity of transportation fuels and improve the fuel economy of vehicles.

These and other measures to cut carbon dioxide emissions are essential to limiting the effects of global warming and will help shift the U.S. economy away from its reliance on dirty and expensive fossil fuels and toward a clean energy economy.

Introduction

The reliance of the U.S. economy on coal, oil and natural gas creates a host of problems for our environment and our economy, including that fossil fuel consumption is the primary source of global warming pollution, and that purchases of oil, coal and natural gas are a major financial drain on consumers and businesses.

Global warming poses a severe threat to America's future. The early effects of global warming are evident across the United States and around the world. Over the past 50 years, global average temperatures have increased at a rate unprecedented in the last 1,300 years of world history.[1] The effects the United States has experienced include, among other changes:

- More frequent warm spells and heat waves.
- More intense hurricanes, particularly in the Atlantic Ocean.
- Decreases in snow cover.
- More frequent heavy downpours, with a greater proportion of total rainfall coming in heavy bursts.[2]

Scientists warn that if population, economic output and fossil fuel consumption grow substantially, global average temperatures by the end of the century will be approximately 7.2° F (4.0° C) higher than in 1990, and temperatures will continue to rise for generations to come.[3]

Temperature increases of only 3.6° F higher than pre-industrial levels could have catastrophic consequences—and 1.4° F of warming has already occurred.[4] Stopping temperatures from increasing beyond this rough threshold requires immediate and sustained reductions in pollution.

Cutting global warming emissions will also help us reshape how we use energy by increasing efficiency and renewable energy and keeping more money in the American economy.

Our current reliance on fossil fuels is costly: we spend billions of dollars on energy—often to import fuel, money that otherwise could be spent supporting local economies and jobs. Our national bill for fossil fuels in 2008 exceeded $1 trillion for the first time ever—more than was spent on education or the military. A large portion of that money was spent to import energy from other countries. In 2007, consumers

and businesses spent more than $360 billion importing fossil fuels, with the vast majority of that money spent on crude oil. That money is a direct transfer of wealth from U.S. consumers and businesses to oil companies and foreign governments.

In coming decades, costs will rise even higher. By 2030, we could spend as much as $1.7 trillion per year on fossil fuels—an additional $1,500 for every man, woman, and child nationwide.[5]

Reducing fossil fuel use through improved efficiency and greater use of clean energy technologies can provide a much needed boost to the economy. Using energy more efficiently in cars, homes and offices means that consumers and businesses will be able to spend less money on energy. For example, the Obama Administration's recent requirement that passenger vehicles be made more efficient—by 2016, new vehicles will have to meet a federal fuel economy standard of 35.5 miles per gallon—will deliver $20 billion in net savings to consumers in 2020 at gasoline prices of only $2.25 per gallon.[6] When consumers spend less on imported fossil fuels, they have more money to spend in the domestic economy.

In addition to saving money for consumers and businesses, clean energy and energy efficiency investments that reduce emissions improve the economy and create jobs here in the United States. A recent Energy Information Administration (EIA) analysis of the American Recovery and Reinvestment Act (ARRA) found that the act's provisions for energy efficiency improvements will reduce residential and commercial energy bills by $13 billion in 2020, effectively putting more money in consumers' pockets.[7]

Clean energy projects tend to create more jobs than fossil fuel production: wind energy may produce up to three times as many jobs as coal.[8] Furthermore, boosting clean energy can involve installing energy efficient features in homes, the construction of wind turbines, and other labor-intensive activities that create local jobs that can never be outsourced.

Despite the urgent and powerful reasons to reduce fossil fuel use, consumption continues to increase. This report—our third analysis of state-by-state data on emissions of carbon dioxide from energy use—shows that the trend toward increased global warming emissions continued right up to the onset of economic recession in 2007.[9]

But, for the first time in recent years, the data also indicate some bright spots—several states have experienced declines in emissions over the last several years. In some cases, emission reductions can be linked, either in whole or in part, to actions states have taken to reduce fossil fuel consumption by using energy more efficiently and switching to cleaner forms of energy.

The message of this report is that, while recent emission trends provide the first glimmer of hope that we can change how we use energy to cut carbon dioxide emissions, America has a long way to go to do its part to address global warming. Fortunately, the examples of states that have succeeded in cutting emissions show that it is possible to curb global warming pollution, to do it quickly, and to do it with benefits to our economy. By employing tools such as renewable energy, energy efficiency, and smart transportation policies, America can achieve the emission reductions we need to prevent the worst impacts of global warming and repower America with clean energy, reduce our dependence on oil, and help rebuild our economy.

The Big Picture: Nationwide Emission Trends

This report analyzes trends in carbon dioxide emissions from fossil fuel use. Using data from the U.S. Department of Energy, we calculate emissions of carbon dioxide from the use of coal, natural gas and oil at the national and state level and by different sectors of the economy. Our analysis extends from 1990, the year that the international community uses as its baseline from which emission-reduction targets are calculated, to 2007, the most recent year for which state-by-state data are available. Because emissions in a number of states peaked in 2004 or 2005, we frequently use 2004 as significant comparison point.

In 2007, emissions of carbon dioxide from fossil fuel use in the United States reached a new record. But the pace of emission growth in the current decade is significantly slower than the rapid rise in emissions during the 1990s. Moreover, emissions are estimated to have declined in 2008 and are projected to decline in 2009 as well. Whether these emission reductions represent a temporary side-effect of economic recession or the beginning of a longer-term trend toward a cleaner economy remains to be seen.

Carbon Dioxide Emissions Increased in 2007

Carbon dioxide released in the use of fossil fuels—coal, oil and natural gas—is responsible for the lion's share of global warming pollution in the United States. Total U.S. emissions of carbon dioxide from fossil fuel consumption increased by 19 percent (949 million metric tons of carbon dioxide ($MMTCO_2$)) from 1990 to 2007. Emissions rose steadily during the 1990s, while emission growth has occurred at a far slower rate so far in this decade. From 1990 to 2000, emissions rose at a rate of 1.5 percent annually compared with a rate of 0.3 percent annually from 2000 to 2007. (See Figure 1.)

The two largest contributors of carbon dioxide pollution in the American economy are electric power plants (particularly coal-fired plants) and transportation (particularly gasoline-powered cars and light trucks). Electricity production is responsible for 40 percent of fossil fuel-related carbon dioxide pollution, while transportation is responsible for 33 percent. Direct consumption of fossil fuels in homes, businesses and industry accounts for the other 27 percent of carbon dioxide emissions. (See Figure 2.)

Figure 1. U.S. Total Carbon Dioxide Emissions from Fossil Fuel Use, 1990 to 2007

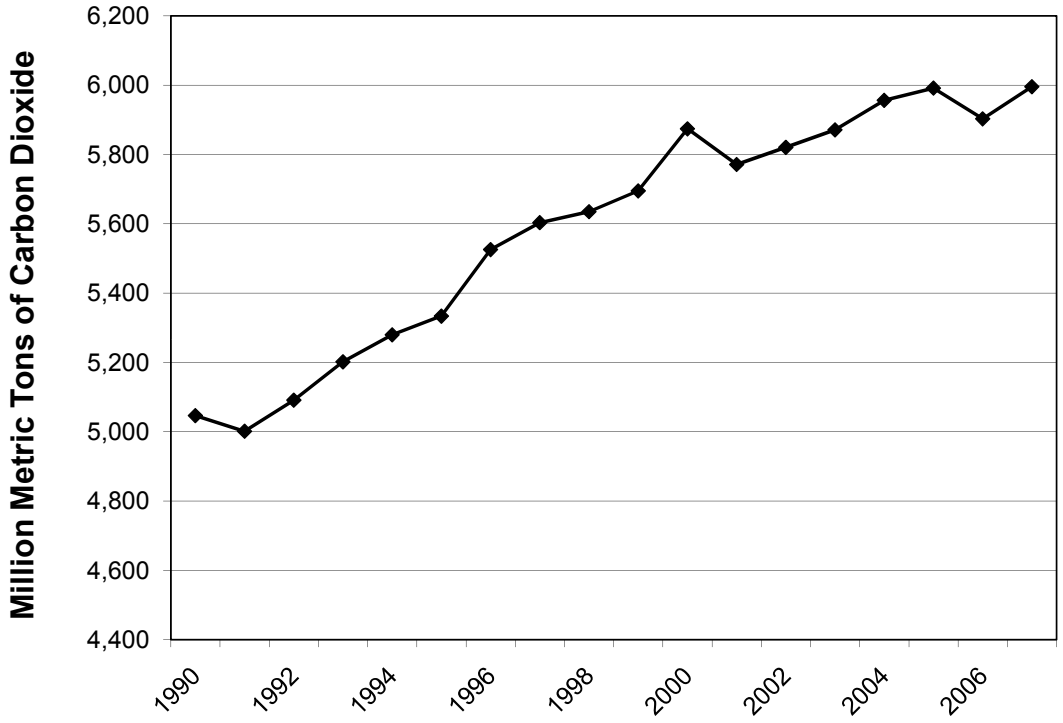
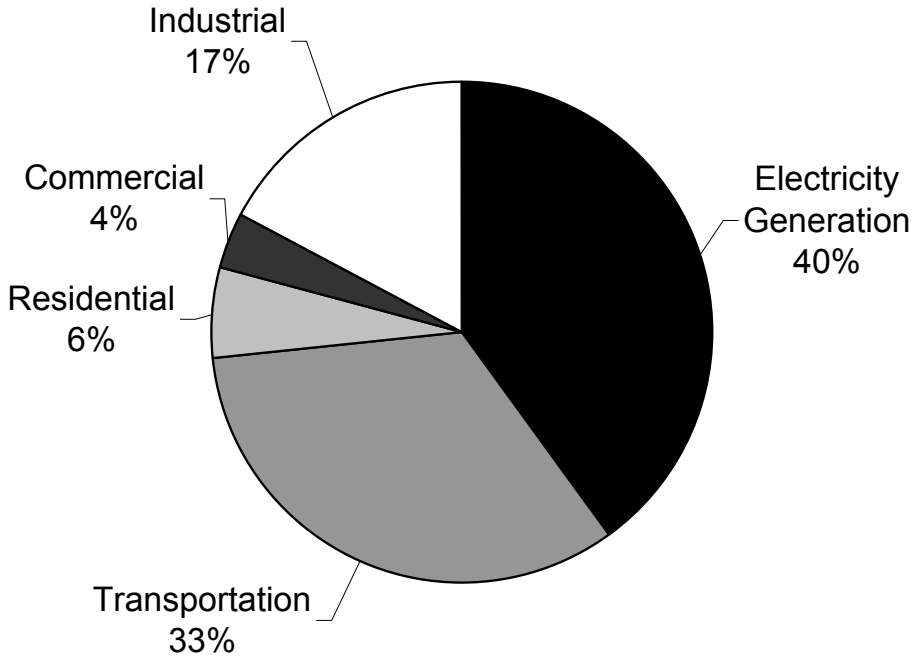


Figure 2. Sources of U.S. Carbon Dioxide Emissions from Energy Consumption, 2007



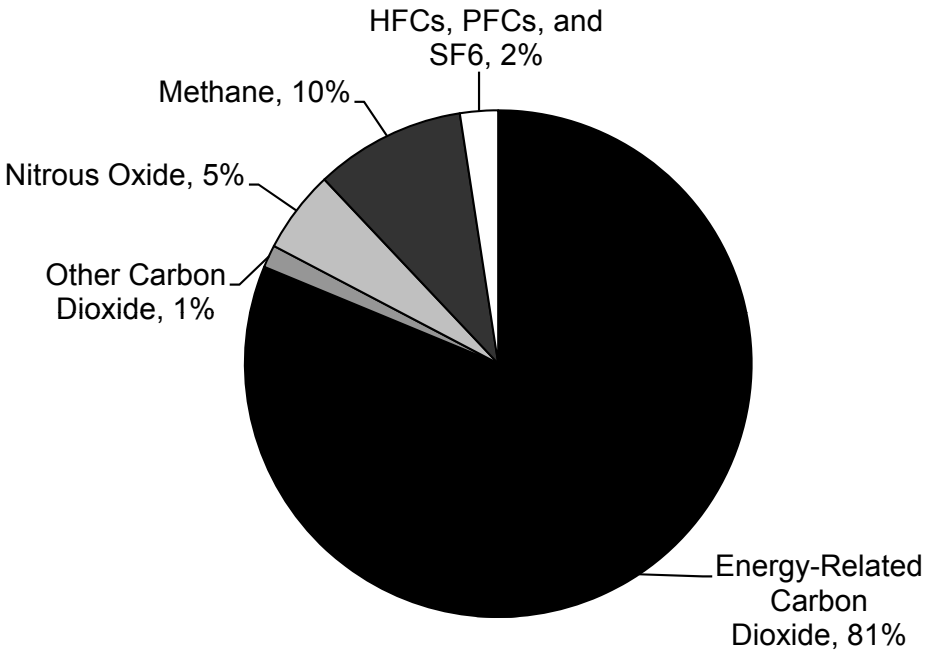
Carbon Dioxide and Other Global Warming Pollutants

Though many activities and gases contribute to global warming, this report focuses on carbon dioxide emissions from combustion and other uses of fossil fuels. Most fossil fuel emissions are from energy use, but fossil fuels not used for energy production can release carbon dioxide, too, such as when fertilizer is manufactured from natural gas.

Carbon dioxide (CO_2) emissions comprised 83 percent of U.S. global warming emissions in 2007 (see Figure 3).[10] Other global warming pollutants include methane, nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF_6). These pollutants are released from agricultural practices, waste in landfills, air conditioners, insulation around electrical equipment, and other sources.

Some gases have a greater ability to trap heat and warm the atmosphere. Methane can trap 56 times as much heat as carbon dioxide, while nitrous oxide is 260 times more powerful. HFCs have up to 9,100 times more heating potential than carbon dioxide, and SF_6 can hold 16,300 times more heat.[11] Thus, addressing all global warming pollutants is important.

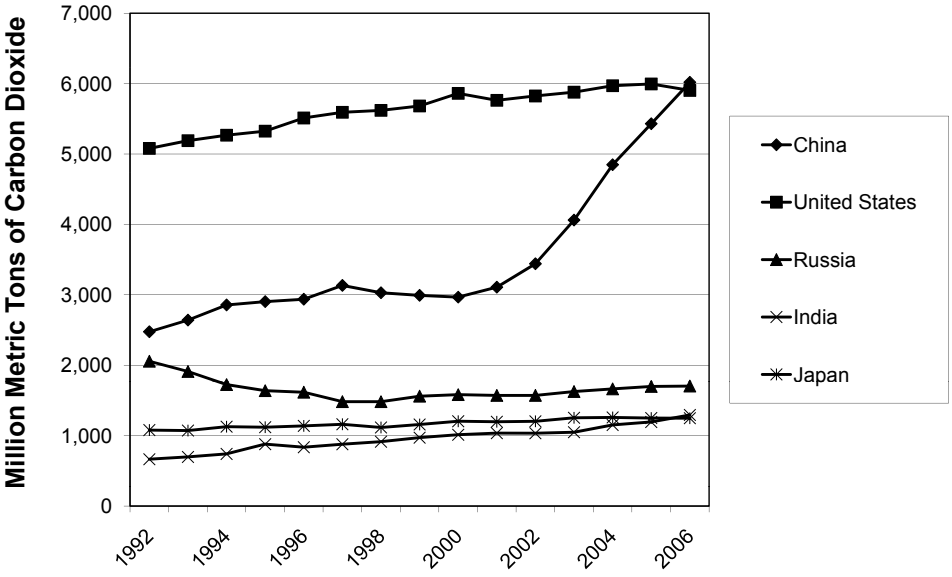
Figure 3. U.S. Global Warming Emissions by Pollutant, 2007[12]



U.S. Emissions in a Global Context

The United States is responsible for more of the carbon dioxide in the atmosphere than any other country. Cumulatively, the United States emitted approximately 28 percent of the carbon dioxide released into the earth's atmosphere through 2005. The next largest historic emitters, Russia and China, each accounted for only 8 percent of the world's total.[13] In 2006, China's yearly carbon dioxide emissions surpassed those of the United States for the first time, making it the world's largest annual emitter.[14]

Figure 4. Total Carbon Dioxide Emissions from Fossil Fuels, Countries with Highest Total Emissions, 2006[15]



China's surge to the top of the list of the world's leading polluters, however, is no reason for celebration—or for the United States to shirk its ample responsibility to address global warming. For one thing, the United States continues to release approximately 20 percent of the world's carbon dioxide emissions.[16] And because carbon dioxide persists in the atmosphere for decades to centuries, America remains responsible for an outsized share of the carbon dioxide that is causing global warming now and will be so in the years to come.[17]

America continues to emit far more carbon dioxide per capita than many other industrialized nations. On a per capita basis, the United States emits more than twice as much carbon dioxide as the United Kingdom or Japan, more than four times as much as China, and 17 times as much as India.[18]

Not surprisingly, trends in electricity and transportation emissions have a large impact on overall U.S. emissions of carbon dioxide. Indeed, these two sectors were entirely responsible for the increase in U.S. emissions between 1990 and 2007, with emissions from direct fossil fuel use in homes increasing by a scant 1 percent, and emissions from the commercial and industrial sectors actually declining.

Electricity: More and Dirtier Power Means More Global Warming Pollution

Emissions from electricity generation have risen since 1990 because demand for electricity has increased, and the increase in demand has primarily been met with greater use of coal and other fossil fuels. Coal has the highest carbon content of any fossil fuel per unit of energy, meaning that burning coal for electricity produces more carbon per kilowatt-hour generated than does burning oil or natural gas. Coal releases 75 percent more carbon dioxide to produce one kilowatt-hour of electricity than does natural gas and 27 percent more than oil.[19] Renewable fuels, such as wind and solar energy, produce no global warming pollution.

From 1990 to 2007, coal-fired electricity generation increased by 27 percent.[20] Generation from solar and wind power increased more quickly—the amount of wind power increased more than 12-fold—but renewable fuels still accounted for a small share of total generation, producing only 8 percent of all electricity in 2007.[21] (See Figure 5.)

As a result of this growing demand for electricity met with electricity produced from polluting sources, coal-fired power plants played a key role in driving up carbon dioxide emissions nationwide.

The trend toward dirtier power, however, has not occurred across the country. Indeed, some areas of the country—particularly the Northeast—have shifted from dirtier to cleaner fuels, while states such as Texas have begun to tap the nation's ample resources of renewable energy, helping to keep emissions down. (See pages 21 and 23.)

Figure 5. Increases in Electricity Generation, 1990 to 2007[22]

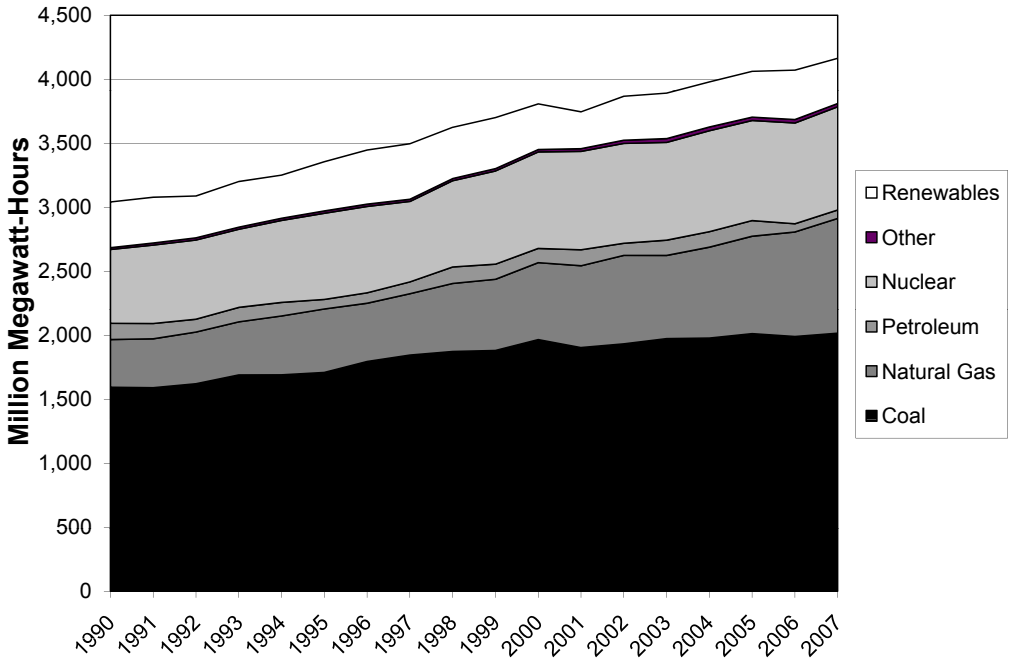
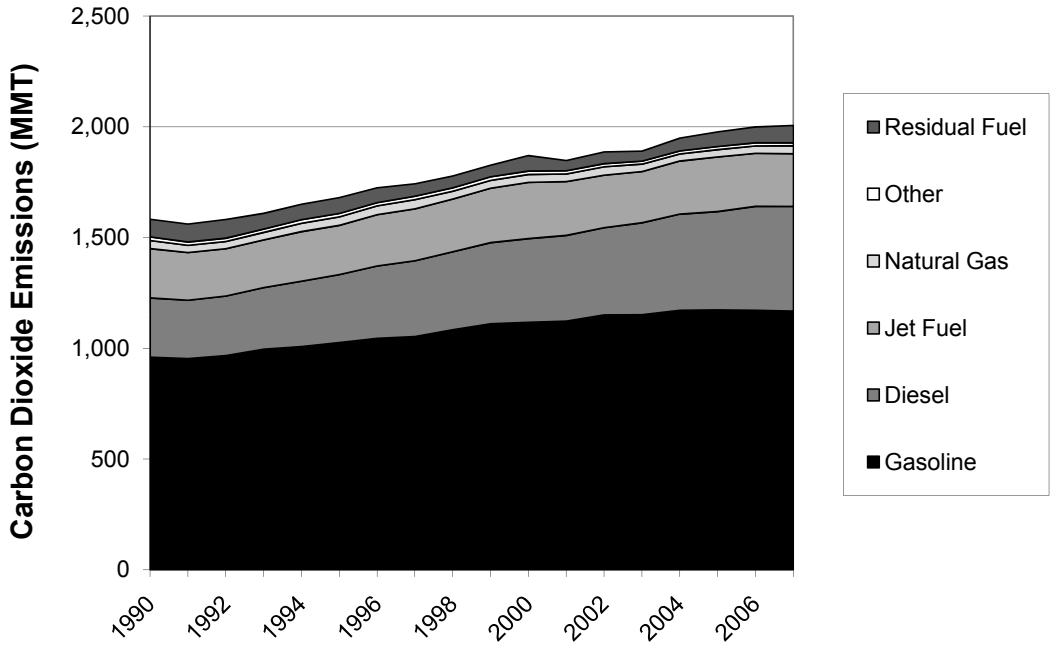


Figure 6. Carbon Dioxide Emissions from Transportation, by Fuel, 1990 to 2007[23]



Transportation: Driving Global Warming

Big increases in gasoline and diesel use have led to large increases in transportation sector emissions since 1990. Gasoline, almost all of which is used for personal transportation, is the largest source of carbon dioxide in the transportation sector, accounting for 58 percent of emissions in 2007. However, emissions from diesel—used primarily for hauling freight—rose most quickly, increasing 76 percent from 1990 to 2007. (See Figure 6.) Gasoline emissions increased due to higher per capita vehicle-miles of travel (VMT) in inefficient vehicles, such as the sport-utility vehicles (SUVs) that came to increasingly dominate American roads in the late 1990s and early 2000s.

The number of vehicle-miles traveled on America's highways increased by 41 percent from 1990 to 2007.[24] More driving means more carbon dioxide emissions from cars and light trucks. Most of that increase was the result of an increase in per capita driving that happened during the 1990s and early 2000s. From 1990 to 2004, per capita vehicle-miles of travel increased by 17 percent, rising from 8,600 miles per year to 10,100 miles. More recently, however, per capita vehicle-miles of travel have begun to decline, helping to slow the increase in transportation sector emissions.

During the period studied in this report, federal fuel economy standards for cars and light trucks increased very little. At the same time, the mix of vehicles on the road changed to include more SUVs, vans and trucks—which tend to have higher carbon dioxide emissions than cars. Together, these two trends caused the efficiency of the average passenger vehicle to remain flat.[25]

Emissions Declined in 2008 and Will Likely Fall Further in 2009

The state-by-state energy use data used to calculate carbon dioxide emissions in this report are currently available only through 2007. However, the federal Department of Energy has estimated carbon dioxide emissions from fossil fuel use for 2008 and has projected emissions for 2009.

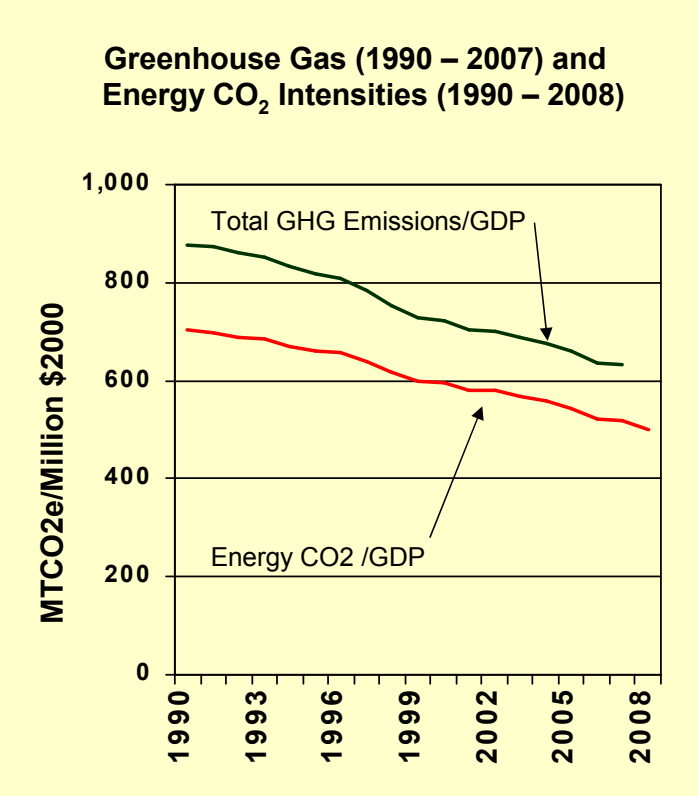
Energy-related carbon dioxide emissions in the United States fell by approximately 2.8 percent in 2008.[26] In percentage terms, the decline was the largest since the recession of 1982, and it leaves emissions at their lowest level since 2001.

The decline in emissions in 2008 is generally attributed to two factors: record-high oil prices for much of the year, which cut emissions from the transportation sector, and the economic recession that hit the nation starting in the second half of the year. Less commonly acknowledged is a third reason: the declining "carbon intensity" of the economy.

High oil prices led to a sharp reduction in driving and thus was a leading factor in reducing emissions from the transportation sector. The number of vehicle-miles traveled on America's roadways declined by 3.6 percent in 2008.[27] In total, carbon dioxide emissions from petroleum use declined by 6 percent. (At the same time, consumption of coal—the most polluting fossil fuel—declined by 1 percent in 2008, due largely to a reduction in demand for electricity. Natural gas consumption increased by 1 percent in 2008.[28])

The severe economic recession, which began to affect carbon dioxide emissions in late 2008, is expected to reduce emissions

Figure 7. Emission Intensities, Metric Tons Carbon Dioxide Equivalent Per Unit of Gross Domestic Product[31]



further in 2009. In the early months of 2009, the trend toward lower emissions appeared to be holding—with consumption of oil, natural gas and coal all down from their 2008 levels.[29]

The third reason for the decline in emissions tends to go unnoticed because it is more subtle: the United States experienced a sharp decline in emissions of carbon dioxide per unit of economic output—a measure called "carbon intensity." Declines in carbon intensity are not unusual—indeed, the United States has consistently reduced the amount of carbon dioxide produced per unit of gross domestic product (GDP). In 2008, the United States produced 29 percent less carbon dioxide per unit of economic output than it did in 1990.[30] But the decline in carbon intensity in 2008 was unusually high at 3.8 percent—a rate twice as fast as the average over the 1990-2008 period.

Emission levels are not directly tied to economic output. In both good times and bad, the United States has reduced its emissions of carbon dioxide. In many states, investing in energy efficiency, non-polluting renewable energy, and public transportation infrastructure has helped to boost economic activity and employment while cutting emissions.

While the reduction in carbon dioxide emissions in the United States in 2008, and the likely reduction in emissions that will occur in 2009, are welcome, they pale in comparison with the reductions needed to prevent the worst impacts of global warming. The United States needs to achieve far more stringent targets—on the order of 35 percent below 2005 levels by 2020—to start to do its part to address global warming. As of the end of 2008, the nation had reduced carbon dioxide emissions by only 3 percent below 2005 levels.

Achieving large reductions in global warming emissions will be challenging. But several states across the country are reducing emissions now, using policies that help keep money and jobs in the local economy—and other states and the federal government can build on this initial progress and achieve much larger emission reductions if they adopt strong policies to move America to a clean energy future.

Emission Trends in the States

America's pattern of energy consumption is far from uniform from coast to coast. Our regional electricity grids range from those powered almost exclusively by high-polluting coal to those powered by sources that produce little carbon dioxide at all. We have cold-weather states, warm-weather states, and a temperate West Coast—all of which have different patterns of energy consumption and carbon dioxide emissions. There are states with large, energy-intensive industries, and those without. And while virtually all of our cars run on gasoline, residents of dense urban areas generally drive them far less than those who live in exurban and rural areas.

The discussion that follows explains what carbon dioxide emissions result from this energy use in different states and regions and identifies some of the promising (and unfortunate) recent trends in emissions.

Overview of Carbon Dioxide Pollution by State and Region

The distribution of carbon dioxide pollution regionally across the United States has been remarkably consistent since 1990, despite great shifts in population and the economy. (See Figure 8.) In 2007, the Great Lakes/Midwest region accounted for one-fifth of the nation's carbon dioxide pollution from fossil fuel use, followed by the Gulf South region, the Southeast, and the Mid-Atlantic.* (See "Regional Definitions" on page 17 and "Assigning Emissions Across State Lines" on page 20.)

*Except where noted, carbon dioxide emission data in this section have been calculated as described in the methodology.

Regional Definitions

The regions used in this report are defined as follows:

- **Great Lakes/Midwest:** Illinois, Indiana, Kentucky, Michigan, Minnesota, Ohio, and Wisconsin
- **Gulf South:** Arkansas, Louisiana, Mississippi, Oklahoma, and Texas
- **Mid-Atlantic:** Delaware, District of Columbia, Maryland, North Carolina, Pennsylvania, Virginia, and West Virginia
- **Mountain West:** Arizona, Colorado, Idaho, Montana, New Mexico, Nevada, Utah, and Wyoming
- **Northeast:** Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont
- **Pacific West:** Alaska, California, Hawaii, Oregon, and Washington
- **Plains:** Iowa, Kansas, Missouri, Nebraska, North Dakota, and South Dakota
- **Southeast:** Alabama, Florida, Georgia, South Carolina, and Tennessee

On a per capita basis, the Gulf South states produce the most carbon dioxide pollution, while the Northeast produces the least. The difference among the regions is dramatic, with the Gulf South and Plains regions producing twice as much carbon dioxide per capita as the Pacific West or Northeast regions. (See Figure 9.)

Carbon dioxide emissions per capita have declined or held steady in every region of the United States since 1990 except two: the Plains states and the Great Lakes/Midwest region. Both regions are heavily dependent on coal for electricity generation. (See page 27.)

Breaking emissions down to the state level, Texas remains the nation's number one emitter of carbon dioxide from fossil fuel use—as it has been in every year since 1990—with 675 million metric tons of carbon dioxide pollution in 2007, which is more than 11 percent of the national total. California ranked second with 400 million metric tons of emissions, followed by

Table 1. Top 10 States for Total Fossil Fuel Carbon Dioxide Emissions, 2007

State	Energy-Related CO_2 Emissions (million metric tons)
Texas	675
California	400
Pennsylvania	277
Ohio	270
Florida	258
Illinois	244
Indiana	234
New York	201
Louisiana	195
Georgia	186

Figure 8. Share of U.S. Carbon Dioxide Pollution by Region, 1990 and 2007

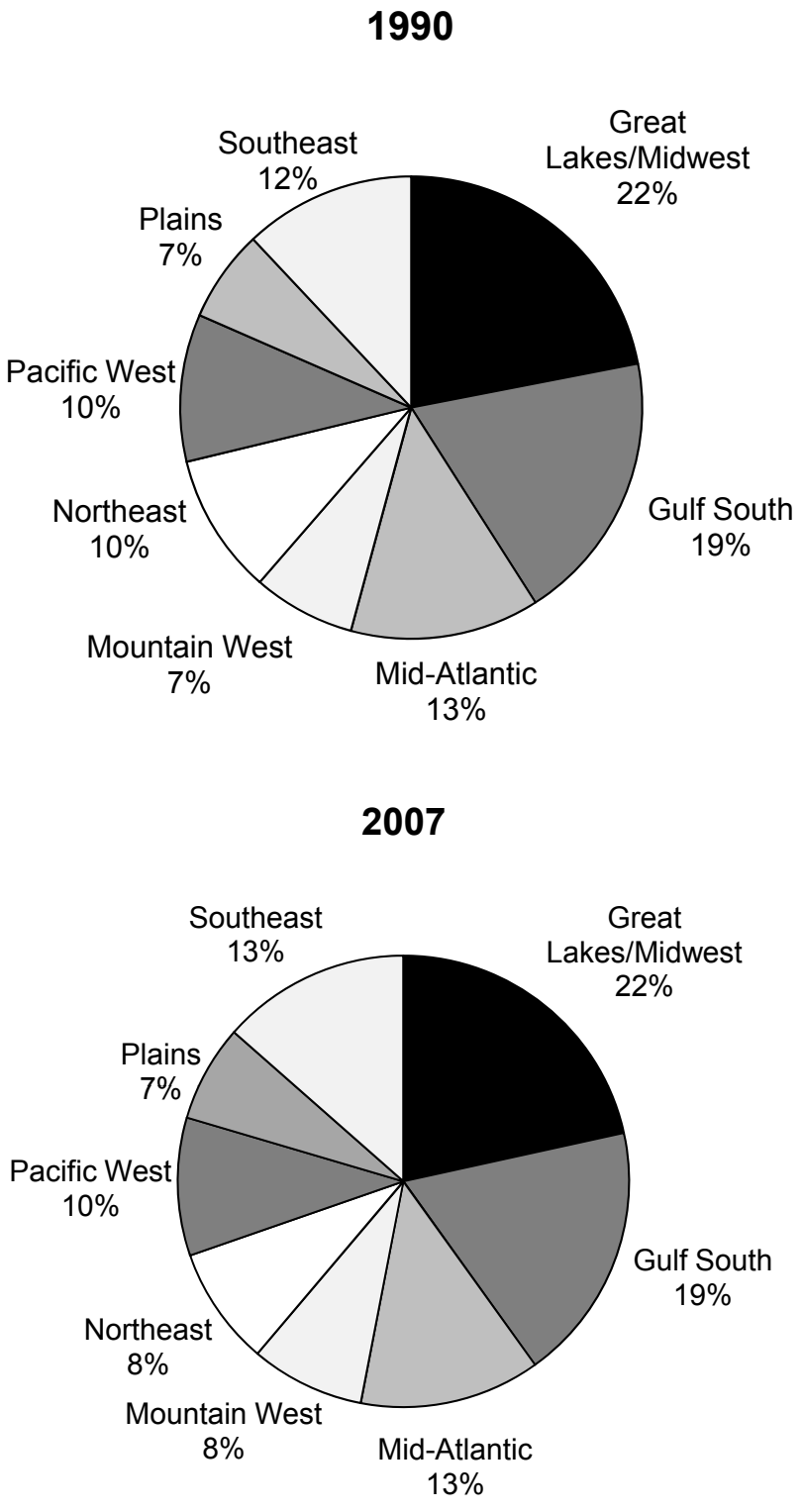
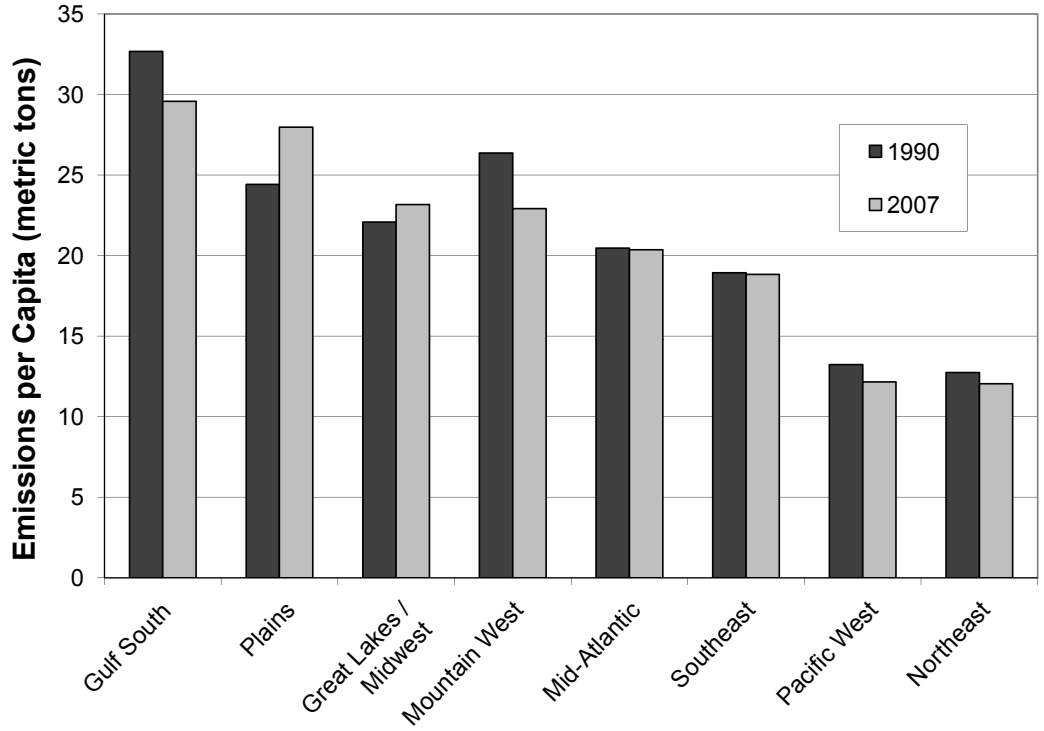


Figure 9. Per Capita Carbon Dioxide Pollution by Region, 1990 and 2007



Pennsylvania, Ohio and Florida. (See Table 1.) The states releasing the least amount of global warming pollution were Vermont, Rhode Island, South Dakota, Idaho and Delaware.

On a per capita basis, however, many states with fossil fuel-intensive industries and coal-fired power plants top the list for emissions. Wyoming leads the nation for per capita fossil fuel carbon dioxide emissions, followed by North Dakota, West Virginia, Alaska and Louisiana. Each of these states, with the exception of Wyoming, bucked the national trend toward lower per capita emissions and produced more carbon dioxide pollution per person in 2007 than they did in 1990.

At the other end of the spectrum are the states that produced the least amount of carbon dioxide per capita from fossil fuel use. The District of Columbia, which imports almost all of its electricity from neighboring Maryland and Virginia (see "Assigning Emissions Across State Lines"

Table 2. Top 10 States for Per Capita Fossil Fuel Carbon Dioxide Emissions, 2007

State	CO_2 Emissions (tons/capita)
Wyoming	124.2
North Dakota	82.1
West Virginia	64.9
Alaska	63.2
Louisiana	45.4
Montana	39.4
Kentucky	37.3
Indiana	36.8
Alabama	31.8
Oklahoma	30.3

below) has little industrial base and a robust public transportation system, produces only 5.5 tons of carbon dioxide per person per year. The remainder of the low-emitting states tend to be urban northeastern states with relatively low vehicle-miles traveled (Rhode Island, New York, Connecticut, Massachusetts), states that rely on low emission resources for electricity (Vermont, Pacific Northwest), or states on the temperate West Coast (Oregon, Washington, California). Another common feature of many of these states—on both coasts—is the presence of effective and long-standing energy efficiency standards and programs that curb increases in energy consumption. (For more on energy efficiency programs in low-carbon states, see page 26.)

Table 3. Bottom 10 States for Per Capita Fossil Fuel Carbon Dioxide Emissions, 2007

State	CO_2 Emissions (tons/capita)
District of Columbia	5.7
Rhode Island	10.4
New York	10.4
Vermont	10.4
Idaho	10.8
California	10.9
Connecticut	11.4
Oregon	11.6
Massachusetts	12.3
Washington	12.7

Assigning Emissions Across State Lines

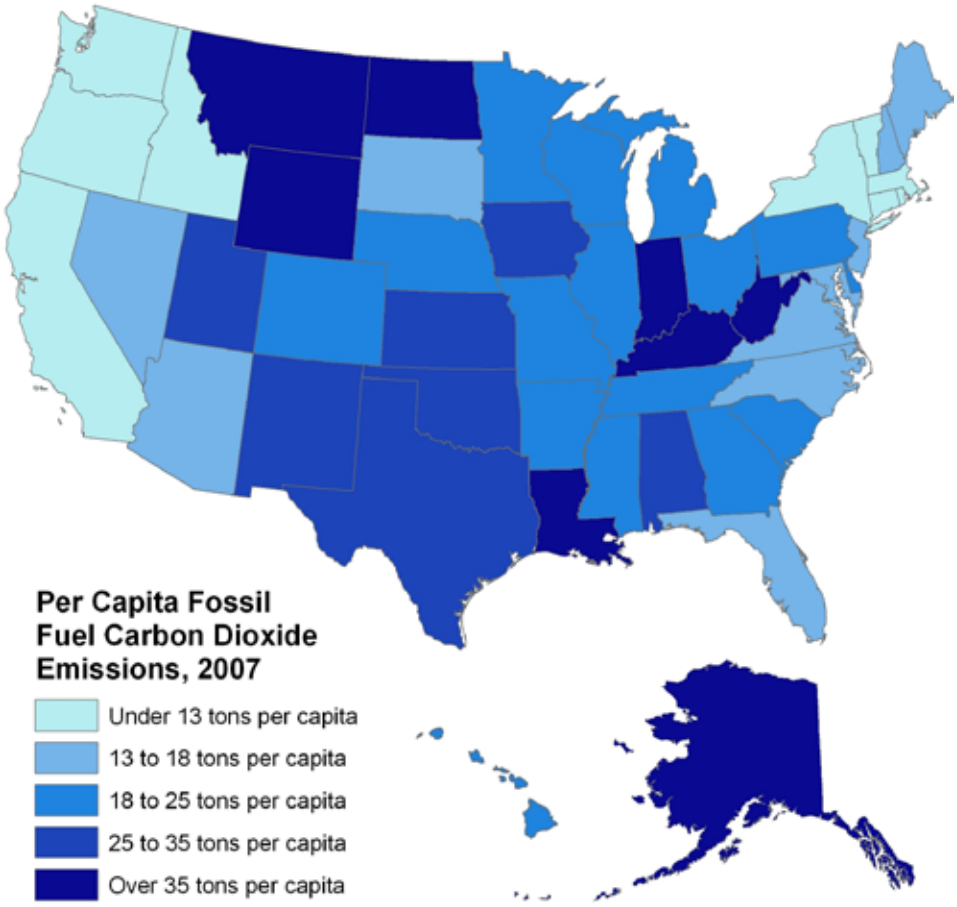
It is not always easy to assign responsibility for carbon dioxide emissions on a state-by-state basis. If a product is manufactured in California and consumed in New Jersey, for example, which state should be held accountable for the emissions produced?

Assigning responsibility for emissions is particularly difficult in the electricity sector. In most states, electricity consumers draw power from a regional electric grid and thus the electricity that is used to power an appliance in one state might have been generated several states away. Both the state consuming the electricity and the state supplying it have some responsibility for the emissions produced—the former with regard to the amount consumed, the latter with regard to the level of pollution produced in generating that electricity.

Analysts take a variety of approaches to assigning responsibility for electricity sector emissions. In this report, we assign responsibility for emissions to the state in which the electricity is generated. In jurisdictions that import most of their electricity—such as the District of Columbia—this method will tend to understate the state or district's impact on global warming. By contrast, this method will overstate the impact of states that export large amounts of power for use elsewhere.

States do have a fair amount of control over the amount of carbon dioxide produced by power plants within their borders—states may impose limits on carbon dioxide pollution from power plant smokestacks or set minimum standards for the use of renewable energy in an effort to reduce their emissions. Assigning responsibility for emissions to states based on their generation of electricity reinforces the importance of these strategies in reducing global warming pollution.

Figure 10. Per Capita Carbon Dioxide Emissions from Fossil Fuels, 2007



Assessing the Trends

Several states have succeeded in reducing emissions since 1990, and many more have done so in the shorter period of time since 2004, the year in which emissions began to peak in many states. The emission reductions achieved thus far in these states are far short of the reductions needed in the near- and mid-term to be able to prevent the worst impacts of global warming, but they do demonstrate that significant emission reductions are possible—and achievable on a very short timeline.

At the same time, however, emissions in most states have continued to increase. The pattern of emission changes in these states, and in states that have reduced emissions, presents important lessons for future U.S. efforts to address global warming.

Cleaner Fuels and Lower Emissions in the Northeast

Since 1990, four states, all of them in the Northeast, have actually reduced fossil fuel-related carbon dioxide emissions. Connecticut, Delaware, Massachusetts and New York, along with the District of Columbia, emitted less carbon dioxide from fossil fuel consumption in 2007 than they did in 1990. None of the emission

declines were dramatic (with the exception of the District of Columbia) with the largest decline coming in Massachusetts, where emissions fell by 5 percent. Figure 11 shows the change in carbon dioxide emissions for all 50 states.

These states have several things in common—they are relatively slow-growing and largely urban states in which heavy industry no longer plays as central a role in the economy as it once did. Indeed, emissions from industry declined significantly in all four states between 1990 and 2007. The largest share of the emission decline in each state, however, came from a shift to cleaner forms of electricity generation.

The Northeast is one of the few regions of the country in which oil was once a major fuel for the generation of electricity. As the price of oil has risen over the past decade, however, the region has largely weaned itself from petroleum for electricity generation, often replacing it with power from cleaner burning and more efficient natural gas-fired plants. In 1997, for example, oil provided 48 percent of Connecticut's electricity generation, 26 percent of generation in Massachusetts, and nearly 17 percent of generation in Delaware. By 2007, those percentages had declined to 4, 6.5 and 2.8 percent, respectively.[32] Connecticut and Massachusetts managed to achieve the

Figure 11. Increase in Total Carbon Dioxide Emissions from Fossil Fuels, 1990 to 2007

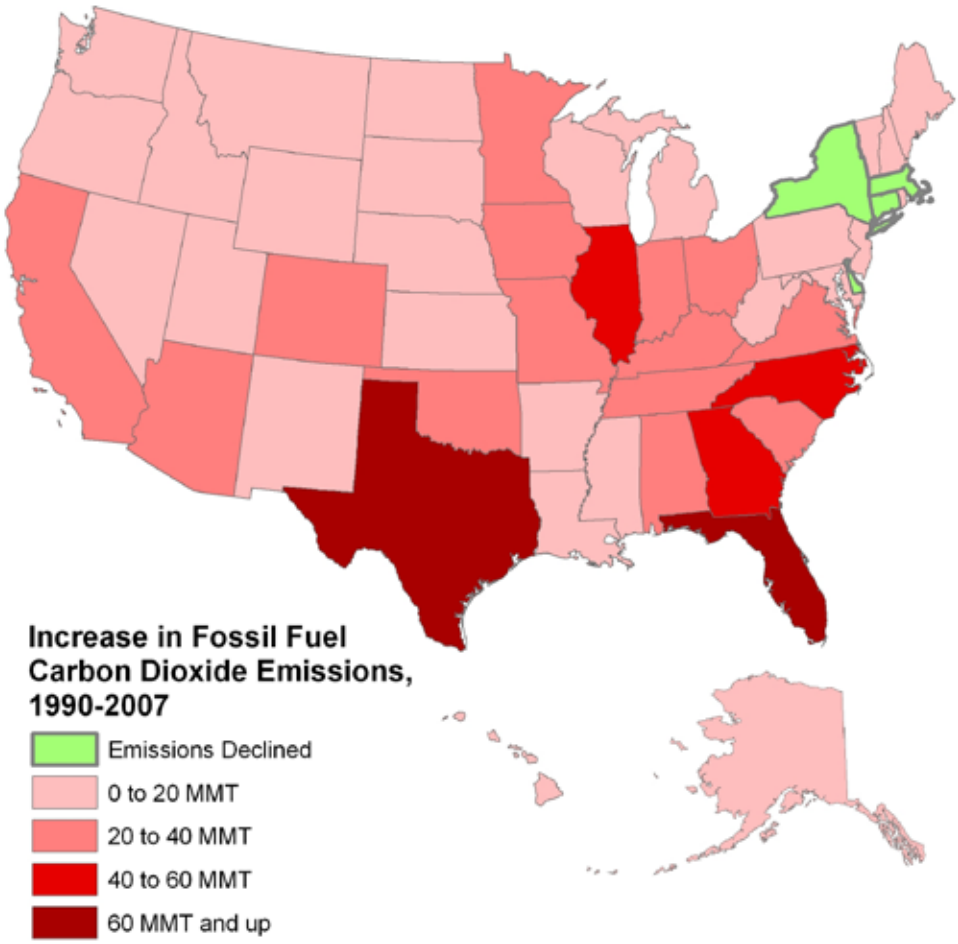
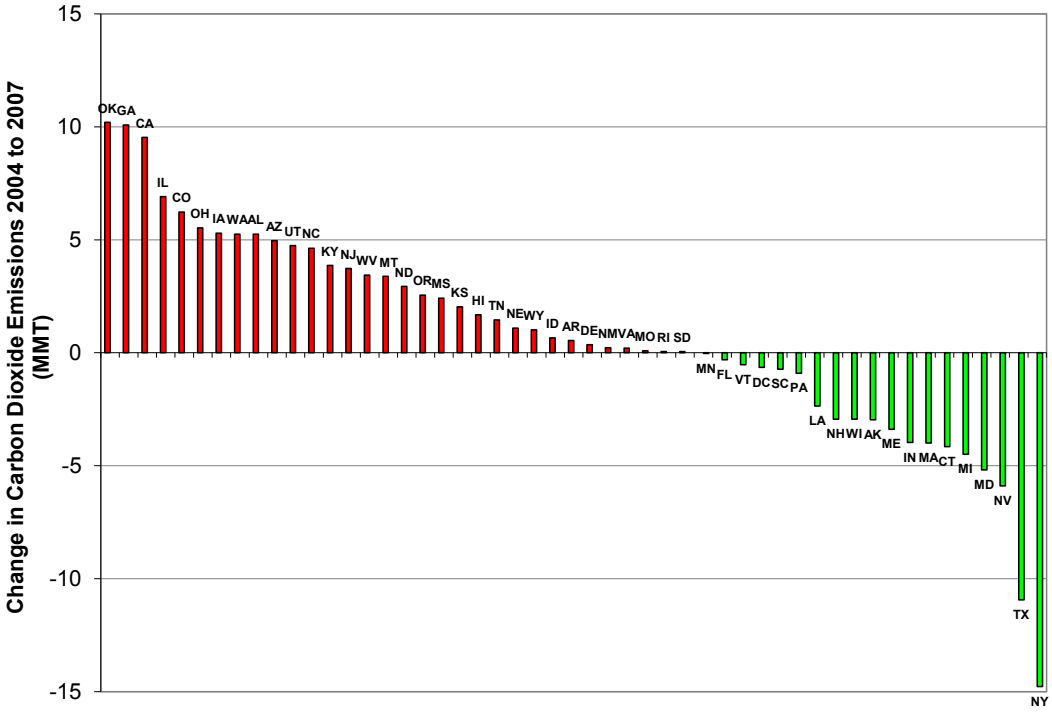


Figure 12. Change in Total Carbon Dioxide Emissions from Fossil Fuels, 2004 to 2007



switch without increasing their reliance on highly polluting coal.

Lower emissions have not threatened economic growth in these states. Since 1997, gross state product in these four states increased by 65 percent while carbon dioxide emissions decreased by 5 percent.[33]

The experience of these states shows that switching from dirty to cleaner forms of electric power generation can have a significant and immediate impact on overall emissions—and that emission reductions and robust economic growth can occur side by side.

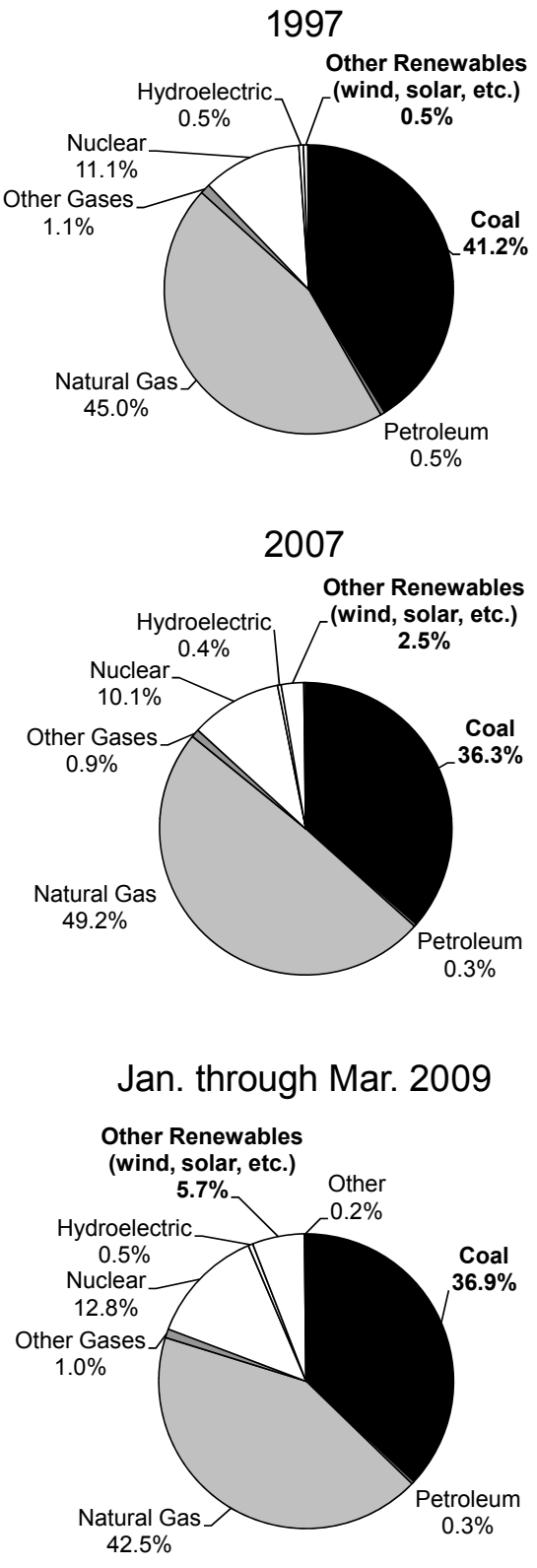
Recent Emission Declines: The Impact of Clean Power Choices

Since 2004, 17 states and the District of Columbia have seen total emissions decline. (See Figure 12.) Maine saw the largest percentage decline over this period, while New York and Texas—the nation's eighth-highest and highest emitters of carbon dioxide, respectively—saw the greatest absolute declines.

Texas and Nevada stand out for the reductions they have achieved in emissions since 2004—particularly since both states continue to add population at a rapid pace. The experience of both states reinforces the centrality of electricity generation in overall emission trends.

In Texas, the emission decline since 2004 has largely been the result of declining emissions from the industrial sector—more specifically, a reduction in industrial natural gas consumption. However, the state has also succeeded in holding the line on growth of emissions from its electricity sector. On a per capita basis, emissions from electric generators in Texas fell by 4 percent between 2004 and 2007—the result of reduced reliance on coal and an increase in the share of power produced by natural gas and wind.[34] Since 2005, the

Figure 13. Texas Electricity Generation Mix, 1997, 2007 and part of 2009[35]



amount of power produced by renewables (other than hydroelectric power) in Texas has more than doubled. By 2007, Texas was getting 2.5 percent of its power from these clean sources of energy compared with just 0.5 percent in 1997. (See Figure 13.) Texas—which is now America's number one producer of wind power—has been able to use its growing wind power portfolio to reduce the need for additional fossil fuel generation, keeping emission growth from the electricity sector at bay.

Texas' focus on wind power will continue to pay dividends in emission reductions for years to come. In the first three months of 2009, non-hydro renewables accounted for nearly 6 percent of the electricity produced in Texas.[36] This additional electricity from zero-emission wind power will offset the need to produce more electricity from coal and natural gas-fired power plants. Encouraging continued growth in wind power production nationally should help to reduce growth in electric sector emissions for decades into the future.

Nevada's reduction in emissions—even in the midst of a period of torrid economic and population growth—shows the potential benefits of shutting down particularly high-emitting power plants. The 2005 shutdown of the Mohave Power Station—one of the nation's largest coal-fired power plants—caused an immediate and precipitous drop in carbon dioxide emissions in Nevada. Between 2005 and 2007, carbon dioxide emissions from the state's power sector fell by nearly 10 million metric tons, or 36 percent.[37] Much of the plant's generation capacity has been replaced by cleaner natural gas-fired power plants.[38]

The recent experiences of Nevada and Texas show that a strategy of shutting down the most polluting power plants while simultaneously boosting production of electricity from renewable sources and cleaner sources can make a significant contribution to combating global warming—and do so in just a few years' time.

Emissions from Transportation: Oregon and Washington Blaze a New Trail

Transportation is the nation's second-leading source of carbon dioxide pollution, with gasoline consumption in cars and light trucks the leading source of transportation-sector emissions. The good news is that, in recent years, emissions from transportation have begun to stabilize after years of rapid growth. From 2004 to 2007, total emissions from all fuels used in cars, trucks, planes, trains and other vehicles declined in 15 states.

Improving the fuel economy of vehicles and switching to lower-carbon fuels are both important steps toward reducing carbon dioxide emissions from cars. But equally important are efforts to reduce vehicle travel and encourage the use of lower-carbon fuels and modes of transportation, such as public transit.

Two states have shown the way forward in reshaping the transportation system to encourage low-carbon alternatives. Washington and Oregon are the only two states in the nation in which fewer vehicle-miles were traveled per person in 2007 than in 1990.[39] Partially as a result, Oregon has reduced its per capita carbon dioxide emissions from gasoline in cars by 14 percent since 1990, while Washington has reduced those emissions by 11 percent. As a result, Oregon now ranks eighth-lowest for per capita emissions from transportation gasoline use, while Washington ranks tenth. In 1990, the states ranked 29th and 27th, respectively.

How did Washington and Oregon do it? Both states have used strong and consistent public policies to encourage the use of alternatives to vehicles and to promote patterns of development that reduce dependence on cars.

Washington and Oregon have both experienced large increases in public transportation ridership over the past two decades. The number of passenger miles traveled on Portland's TriMet transit system increased from 220 million miles in 1991 to 419 million miles in 2007, a 90 percent increase.[40] Seattle's King County Metro system grew from 448 million passenger miles traveled in 1991 to 572 million miles in 2007, a 28 percent increase, while the Seattle area's new regional transit system, which did not even exist in 1991, now provides 224 million passenger miles of travel per year.[41] Significant new investments have been made in transit infrastructure in both states, providing new transportation choices for thousands of riders.

Other public policies have also contributed to the reduction in per capita emissions from vehicles. Washington state has long been a leader in transportation demand management—the use of a variety of tools to improve the efficiency of the transportation system. For example, for nearly two decades, Washington has encouraged employers to find ways to reduce the number of workers coming to work each day in single-occupancy vehicles.[42] Oregon, meanwhile, has a track record of promoting "smart growth" policies that stretches back to the 1970s. Smart growth can reduce the number of miles driven by encouraging compact, mixed-use development where more tasks can be completed by bike, on foot, or via transit. Since the early 1970s, Oregon has also been a leader in investing in infrastructure for bicyclists and pedestrians. Those investments have paid dividends—residents of Portland bike to work at approximately eight times the national average rate.[43]

The experiences of Oregon and Washington suggest that policies to encourage the use of public transportation, provide alternatives to driving, and encourage more compact forms of development can succeed in reducing the rate of growth of vehicle travel. Combined with efforts to improve the fuel economy of vehicles and

encourage the use of cleaner fuels, these efforts can be a powerful tool in the race to reduce global warming pollution in the United States.

Energy Efficiency and Low Carbon Emissions Go Hand in Hand

Energy efficiency is generally considered to be the fastest and cheapest way to reduce global warming pollution. In many cases, energy efficiency investments can reduce energy consumption while saving money for consumers.

Historically, states have had the lion's share of the responsibility for setting energy efficiency policies. States determine the applicable codes used in the construction of new buildings, can require utilities to invest in energy efficiency programs, and can even impose new standards for some appliances. Some states have made a strong commitment to energy efficiency as a strategy for meeting their energy needs, while others have barely taken any action at all.

Tracking the direct impact of energy efficiency programs and investments on carbon dioxide emissions is difficult. Much of the variation in energy use in the commercial and residential sectors is due to variations in climate—both from state to state and year to year. As a result, lower per capita emissions in one state do not necessarily mean that the state is more energy efficient than its neighbors.

However, there is strong circumstantial evidence that states with a strong commitment to energy efficiency also produce less global warming pollution. The American Council for an Energy-Efficient Economy (ACEEE) produces an annual scorecard evaluating states' public policy commitments to energy efficiency. The most recent scorecard, produced in 2008, ranks the states in terms of their energy efficiency programs, building codes, appliance standards, transportation efficiency policies and other tangible efficiency policies.[44]

Of the top 10 states (excluding the District of Columbia, which imports all of its electricity) that produced the fewest per capita emissions of carbon dioxide from fossil fuel use in 2007, none ranked lower than 13th on the ACEEE energy efficiency scorecard. California, which ranked fifth in per capita emissions, ranked first on ACEEE's scorecard, followed by Oregon (7th lowest per capita emissions), Connecticut (6th lowest), Vermont (3rd lowest), and New York (2nd lowest). Idaho was the lowest ranking of the low-emission states on the ACEEE scorecard, ranking 13th.[45] (See Table 4.)

Table 4. States with the Lowest 2007 Per Capita Carbon Dioxide Emissions from Energy Use Have Strong Efficiency Programs[46]

State	CO_2 Emissions (tons/capita)	ACEEE Efficiency Scorecard Rank
Rhode Island	10.4	11
New York	10.4	5
Vermont	10.4	4
Idaho	10.8	13
California	10.9	1
Connecticut	11.4	3
Oregon	11.6	2
Massachusetts	12.3	7
Washington	12.7	6
Maryland	13.8	12

On the other hand, five of the 10 states with the lowest rankings on the ACEEE scorecard also ranked in the top 10 for highest per capita carbon dioxide pollution from energy use. Wyoming, which has the nation's highest per capita emissions, ranked dead last on the ACEEE scorecard—the only state to earn a zero

score in all eight areas of energy efficiency policy.[47]

These results show—albeit anecdotally—that low carbon emissions aren't just the result of a favorable climate or an economic base that is less reliant on heavy industry. In large part, low per capita carbon dioxide emissions are the result of deliberate public policy commitments to embrace clean energy solutions. States that have made significant and long-term public policy commitments to energy efficiency are reaping the benefits today in lower emissions of global warming pollution.

Continuing Challenges: Breaking Dependence on Coal

Despite some hopeful recent trends, carbon dioxide emissions have continued to increase in most states in recent years. Emissions in 33 states increased between 2004 and 2007. Emissions in Oklahoma saw the greatest percentage increase, followed by Montana and Hawaii. Oklahoma and Georgia experienced the greatest increase in absolute terms.

Table 5. Top 10 States for Biggest Percentage Increase in Fossil Fuel Carbon Dioxide Emissions, 2004 to 2007

State	% Increase 2004-2007
Oklahoma	10.3%
Montana	9.9%
Hawaii	7.4%
Utah	7.3%
Washington	6.8%
Colorado	6.7%
Iowa	6.6%
Oregon	6.2%
North Dakota	5.9%
Georgia	5.7%

Table 6. States with the Highest 2007 Per Capita Carbon Dioxide Emissions from Energy Use Rely on Coal to Generate Electricity[49]

State	CO_2 Emissions (tons/capita)	Percentage of Electricity from Coal
Wyoming	124.2	95%
North Dakota	82.1	93%
West Virginia	64.9	98%
Alaska	63.2	9%
Louisiana	45.4	25%
Montana	39.4	63%
Kentucky	37.3	93%
Indiana	36.8	94%
Alabama	31.8	54%
Oklahoma	30.3	47%

Why have some states succeeded in reducing emissions while others have not? The answers lie largely in how these states produce electricity and in the availability of transportation alternatives.

As noted above, Wyoming, the state with the greatest emissions per capita, produces approximately 12 times more carbon dioxide per person than the states with the lowest per capita emissions: New York and Rhode Island. One major reason for the discrepancy between high-emitting and low-emitting states is their reliance on coal for electricity generation. Of the top 10 states for per capita carbon dioxide emissions from fossil fuel use, seven rely on coal for more than half of their electricity production.[48] (See Table 6.) In five of those states—Wyoming, North Dakota, West Virginia, Kentucky and Indiana—coal accounts for more than 90 percent of all power production. While other states, ranging from those in the Northeast to Texas to Nevada, have reduced their de-

pendence on polluting fuels such as coal and oil, high-emitting states remain wedded to coal. Until these states diversify their electricity sources to include cleaner sources of energy, increases in electricity demand will continue to push up emissions from coal-fired power plants.

Fortunately, several of these states, including Wyoming and North Dakota, rank high for renewable energy potential. North Dakota has more potential to generate electricity from the wind than any other state, but currently ranks only 13th in installed wind capacity.[50] Wyoming is seventh in the nation for wind energy potential and 12th in installed capacity.[51] Taking advantage of renewable resources can offset the need to generate electricity from coal and enable many high-emitting states to diversify their sources of electricity and contribute to efforts to curb global warming, while at the same time providing a boost to local economies. A national Renewable Electricity Standard, which would set minimum thresholds for the percentage of America's power that comes from renewable energy, would provide a jump-start to this effort.

Similarly, many states remain wedded to automobiles for the overwhelming majority of their transportation needs. Thus, it is no surprise that when demand for travel increases, more of it takes place via car. In contrast to states such as Washington, Oregon, Massachusetts, Arizona and Nevada, which have kept per capita vehicle travel growth in check since 1990, many other states have experienced runaway growth in per capita VMT. In Mississippi, for example, the number of vehicle-miles traveled per capita has increased by an astounding 57 percent since 1990, and by 9 percent since 2004.[52] Other states that have experienced rapid growth in vehicle travel per capita since 1990 include Wyoming, Florida, North Dakota, West Virginia, Arkansas, Maryland, New Mexico and Alabama. In all of these states, with the exceptions of Wyoming and Florida, per capita VMT continued to increase in the 2004 to 2007 time period.

In many of these states, investment in transportation alternatives, coupled with land use policies that encourage more compact development patterns that can reduce the need for driving in the first place, can be an effective long-term strategy to reduce emissions.

Looking Forward: What the United States Must Do to Reduce Fossil Fuel Use

Recent changes in public policy—including the Obama administration's swift moves to promote energy efficiency throughout the economy—will make a significant contribution toward curbing fossil fuel use and reducing future growth in emissions. But these are only initial steps. To achieve the near- and mid-term emission reductions of the depth and scope needed to prevent the worst impacts of global warming, the United States will have to adopt a series of additional public policies.

Actions by the States, Congress and the Obama Administration Will Change Energy Use

America will need to adopt bold public policy solutions to move the nation toward a cleaner energy future. Policies adopted by some states over the past decade are beginning to make a dent in fossil fuel use and carbon dioxide emissions, and recently adopted policies at the federal level will begin to have a more uniform impact. But much more needs to be done to prevent the worst impacts of global warming.

State Actions Are Beginning to Deliver Benefits

Over the past decade, amid frustration at the federal government's failure to adopt a national energy policy that takes advantage of clean, cost-effective forms of energy, states have taken matters into their own hands, adopting a series of innovative public policies to encourage the development of clean energy.

Renewable electricity standards (RESs) are among the most widely implemented policies, adopted by 28 states. RESs set minimum thresholds for the share of electricity that must come from wind, solar and other forms of renewable energy. While market forces and other public policies have also helped to spur the rapid growth in renewable energy, RES policies have been a driving force, with more than three-quarters of all renewable energy development in 2007 taking place in states with an RES on the books.[53]

In part because of the adoption of RES policies, the amount of renewable energy on the U.S. electric grid is rising fast. In 2008, United States got 28 percent more electricity from renewable energy sources (other than hydroelectric power) than it had just two years before. America's production of wind power (see Figure 14) doubled over that same two-year span.[54]

In addition to pushing forward with renewable energy, many states have taken action to boost improve energy efficiency. They have adopted efficiency standards for appliances and other equipment and increased their investment in energy efficiency programs—although the level of investment ($4.5 billion in 2008) still falls well short of the level needed to tap the full potential of efficiency improvements to save money and reduce emissions.[56] In 2007, energy efficiency programs in the United States and Canada avoided 41 million metric tons of carbon dioxide pollution, up from 36 million metric tons the year before.[57]

Other policies being pursued at the state or regional level should help to reduce fossil fuel use and carbon dioxide emissions in coming years. For example, seven states, including California, Connecticut, Hawaii, Maryland, Massachusetts, New Jersey and Washington, have adopted statewide limits on global warming pollution. Emission reductions from those policies should become apparent in coming years. In addition, California has adopted a low carbon fuel standard to cut the carbon intensity of transportation fuels, and 11 northeastern states have agreed to work together to create a regional low carbon fuel standard.

Figure 14. U.S. Wind Power Generation[55]

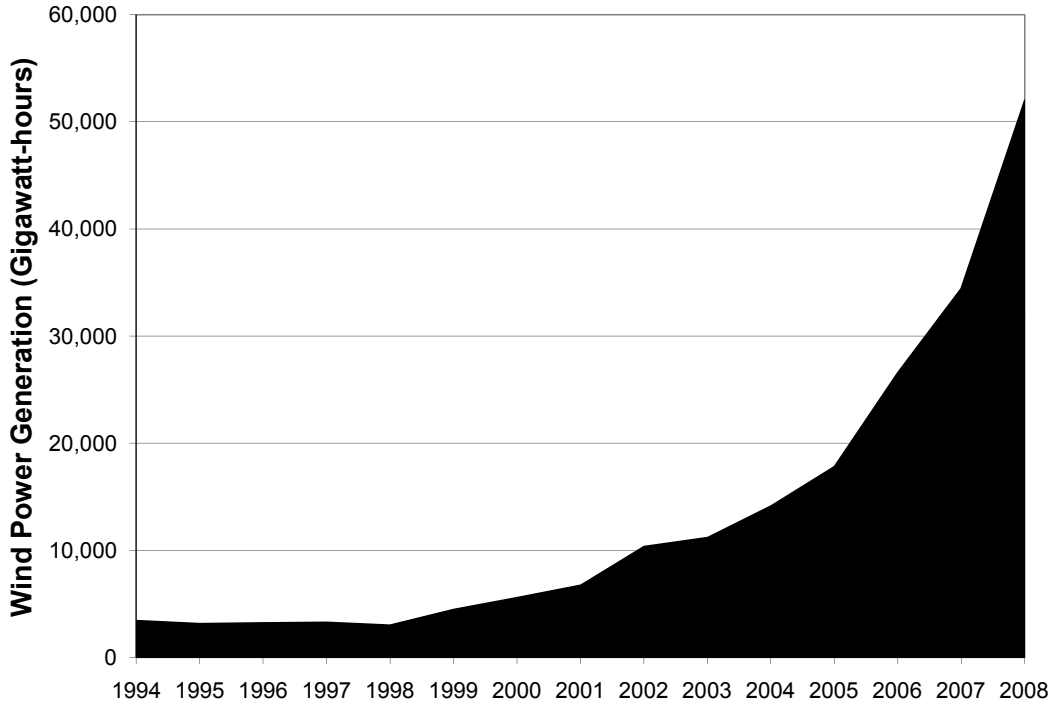
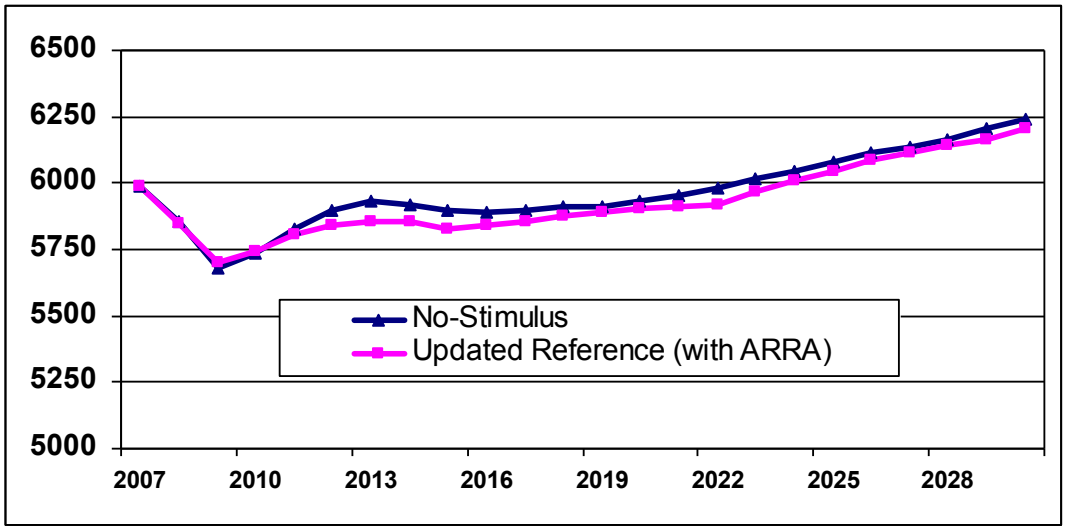


Figure 15. Projected Energy-Related Carbon Dioxide Emissions[61]



Source: National Energy Modeling System runs STIMULUS.D041409A and NOSTIMLS.D041409A.

Federal Initiatives Are Beginning to Make an Impact

Additional declines in fossil fuel use and carbon dioxide emissions will result from federal policy actions taken in the early months of the Obama administration. The American Recovery and Reinvestment Act (ARRA)—otherwise known as the economic recovery bill—included a host of clean energy measures, including increased funding for clean energy research and development, a large investment in weatherization assistance for low-income homeowners, energy efficiency assistance for state and local governments, and investments in clean transportation infrastructure, including high-speed rail. The Energy Information Administration (EIA) projects that the ARRA will reduce emissions by 1.3 percent annually below business-as-usual projections by 2013.[58]

Similarly, the administration announced its intention to increase fuel economy standards for vehicles to 35.5 miles per gallon by 2016. The new standards mean that global warming pollution from vehicles will be an estimated 900 million metric tons less than would otherwise be the case.[59]

Additional Emission Reductions Are Still Needed

These state and federal actions to change the way we use energy could lead to the stabilization of carbon dioxide emissions in the United States in the medium term. The EIA projected (prior to the Obama administration's announcement of tighter fuel economy standards for cars) that carbon dioxide emissions from energy use would not surpass 2007 levels again until the early 2020s.[60] (See Figure 15.) Stronger fuel economy standards will result in additional reductions.

Stabilization of U.S. carbon dioxide emissions would be welcome. Had it occurred two decades ago, when emission levels were lower and scientific consensus had already begun to coalesce around the dangers of global warming, it would have been an important achievement. Today,

however, just stabilizing emissions is much too little, much too late. Now, we need stronger action. America must move quickly to adopt clean energy policies capable of achieving dramatic reductions in global warming pollution.

Policy Recommendations

There are many policy tools the United States can use to help create a new energy future and reduce emissions of global warming pollution.

Cap Global Warming Pollution

To ensure that the United States achieves the emission reductions science tells us are necessary to prevent the worst impacts of global warming, the nation should cap emissions of global warming pollution. The cap should be consistent with the goal of reducing U.S. emissions by 35 percent below 2005 levels by 2020 and by at least 80 percent below 2005 levels by 2050.

A cap on carbon emissions must be paired with strong emission standards for vehicles, coal-fired power plants, and other large sources, and avoid loopholes (such as allowing emitters to use poorly designed offsets in place of emission reductions) to ensure that the nation's emission reduction goals are met. In addition, the value of the emission allowances created under a cap-and-trade program should be harnessed for important public purposes—including investments in renewable energy, energy efficiency improvements, and efforts to reduce the cost of the program to consumers—and not be given away to polluters for free.

Enact a Renewable Electricity Standard

States that increase their production of clean, renewable electricity are able to reduce their reliance on polluting sources of power such as coal and other fossil fuels. Many states with high carbon dioxide emissions also have tremendous potential to generate electricity from the wind and the sun. The United States should follow the example of 28 states and enact a renewable electricity standard. The standard should ensure that the United States receives at least 25 percent of its electricity from clean, renewable sources of energy by 2025—reducing the need for continued dependence on high-polluting fossil fuels.

In addition, states and the federal government should take additional steps to encourage the deployment of solar power. Generating electricity from solar power is possible nationwide, but, unlike wind power which now attracts investment from mainstream utilities, solar power generation is still a niche market. Greater investment in solar power now will speed its widespread integration. Specifically, the state and federal governments should ramp up investment through tax credits, targets for solar power generation in renewable electricity standards, requirements for "solar ready homes," rebate programs, and other measures.

Improve Energy Efficiency

Following in the footsteps of the low-emitting states that have invested in energy efficiency improvements, the states and the federal government should move forward aggressively with efforts to improve the energy efficiency of our homes, businesses and factories. Among the policies that can promote America's vast and low-cost energy efficiency resources are strong building codes and appliance efficiency standards, energy efficiency resource standards (EERS) that require utilities to meet specific targets for energy efficiency improvements, and funding for efforts to retrofit existing buildings to achieve greater energy efficiency.

Reduce Emissions from Transportation

Transportation is the second-leading source of carbon dioxide emissions from fossil fuel use, trailing only electricity generation. Earlier this year, the Obama administration announced new global warming emissions and fuel economy standards for cars and light trucks that will help to reduce global warming pollution. The Environmental Protection Agency and Department of Transportation must draft rules that ensure the program meets the global warming and fuel economy goals identified by President Obama.

While recent steps to improve fuel economy and reduce carbon dioxide emissions from cars and light trucks are important and encouraging, other steps will also be needed. Among them are greater investments in low-carbon transportation alternatives, including high-speed rail, modern public transportation, bicycling and walking. States can also contribute by promoting development practices that concentrate new development around transit stations and encourage compact, balanced communities with a healthy, walkable mix of homes and businesses—providing more Americans with transportation choices. Finally, the nation should take steps to reduce carbon dioxide emissions from vehicle fuels by establishing a low-carbon fuel standard (LCFS) that encourages the use of lower-carbon fuels (such as electricity in plug-in hybrid vehicles) and discourages the use of fuels with greater global warming impact than conventional gasoline, such as fuels from tar sands, oil shale and coal-to-liquids fuel.[62]

Conclusion

Reducing our reliance on fossil fuels, cutting global warming pollution, and building a clean energy economy will not be easy, nor will it happen overnight. But to protect our environment, our economy and our future, we must begin to make changes.

The states that have reduced their carbon dioxide pollution in recent years suggest a starting point for what other states could do and what policies they could improve upon. Their investments in renewable energy and energy efficiency have helped to slash emissions from electricity generation and consumption while creating new jobs. Their efforts to reduce driving by providing better transportation alternatives have reduced our need for imported oil, leaving more money in the domestic economy. And their willingness to reconsider how they use energy has created the beginning of a new energy economy.

Methodology

The carbon dioxide emission estimates in this document reflect emissions from fossil fuel consumption—including both fossil fuels used for energy and those used for "non-energy" purposes, such as oil used as a lubricant. These estimates also include fossil fuel consumption for international shipping and aviation ("bunker fuels"). The emission estimates in this report do not include carbon dioxide emissions from other sources (such as land use), carbon dioxide emissions from geothermal energy production or the production of electricity from non-biogenic wastes, emissions from natural gas flaring, or emissions of other global warming pollutants.

All estimates are based on state-specific fossil fuel consumption data (in British Thermal Units (BTU)) through 2007 from the U.S. Energy Information Administration (EIA), *State Energy Consumption, Price and Expenditure Estimates*. For the residential, commercial, transportation and electricity generating sectors, we followed the methodology for converting energy use data to carbon dioxide emissions found in U.S. EPA, *Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2007*, *Annex 2: Methodology and Data for Estimating CO2 Emissions from Fossil Fuel Combustion ("Annex 2")*, 15 April 2009. To calculate emissions from the industrial sector, we relied on both *Annex 2* and the methodology used by the EIA, in *Documentation for Emissions of Greenhouse Gases in the United States 2006 ("Documentation")*, October 2008. The following section describes sources of data used as well as places where we deviated from the methodology or data sources described in *Annex 2* or *Documentation*.

Emissions are attributed to the state where fossil fuels were burned or sold. In the case of electric power plants, the energy use and emissions data is based on consumption of fuel at the power plant, not consumption of electricity by the end user. As such, the data does not take into account that some states generate little electricity within their borders and import much from neighboring states' power plants. Emissions from power plants are attributed to the states in which they are located, rather than the states that consumed the power. For petroleum, consumption data is based

on sales; therefore, emissions are attributed to the state in which the fuel was purchased. This is particularly salient for the transportation sector, in which cars, trucks or other vehicles may purchase fuel in one state and consume it in another.

Adjustments to Energy Consumption Data

EIA state energy data for gasoline consumption include ethanol used as a blending component. EIA assumes that ethanol produces no net emissions of carbon dioxide. (The production of ethanol does generate global warming pollution, some of which is accounted for in the industrial sector.) Therefore, the ethanol component of gasoline must be separated from total gasoline consumption for the purposes of calculating carbon dioxide emissions. To achieve this, we calculated the percentage of ethanol used in motor gasoline by volume for each state in 1990-2007 using EIA state energy data. We then reduced consumption of motor gasoline (in BTU) by this percentage, thus reducing estimated carbon dioxide emissions from gasoline use by a corresponding amount.

Adjustments Not Made

Annex 2 calls for several small adjustments to be made with regard to natural gas emissions to avoid double-counting of emissions related to injections of synthetic gas, still gas, and biogas (landfill gas) into natural gas pipelines. The volume of these gases injected into pipelines is very small. For the sake of simplicity and to avoid the need to split out emission reductions into various sectors of the economy, we assumed that these reductions would have a minimal impact on total emissions and did not make them.

In addition, *Annex 2*, consistent with international norms, treats international bunker fuels as a separate category of emissions that are not attributed to the United States. State-by-state estimates of bunker fuel use for international aviation were unavailable. As a result, we opted not to adjust for bunker fuel use for aviation or shipping. This may result in somewhat higher transportation sector emissions in states with international ports or vigorous international air traffic compared with other analyses.

Adjustments for Non-Energy Use

Many fossil energy sources are also used for non-energy purposes (for example, petrochemicals used in the manufacture of plastics or natural gas used in the production of fertilizer). Energy sources used for non-energy purposes emit carbon dioxide at different rates than those used for energy. To account for this, we calculated or obtained the percentage of various energy products used for non-energy purposes and accounted for the percentage of carbon that is "sequestered" (not emitted) from those uses.

State-specific information on the quantity of fossil fuel products used for non-energy purposes is not available. Thus, in the transportation sector, we used national-level data from *Annex 2* to estimate the percentage of lubricants used for non-energy purposes.

For the industrial sector, we used national data on non-energy use of coal, natural gas and petroleum as presented in *Annex 2*, with one exception. *Annex 2* does not include data on non-energy use of

residual fuel, so we obtained that data from EIA, *Manufacturing Energy Consumption Survey 2002*, 8 March 2005. We applied the 2002 data to all years.

We used estimates of the percentage of carbon sequestered for non-energy uses of energy from *Annex 2*, with a few exceptions. *Annex 2* treats emissions from the consumption of some fuels as emissions from industrial processes rather than from fossil fuel consumption. For six of these seven fuels—distillate fuel, industrial other coal, petroleum coke, natural gas, residual fuel oil, and other oil (>401° F)—we followed *Documentation*. The explanation for treatment of coking coal in *Documentation* provides incomplete data on carbon sequestration rates, so we used the sequestration data from *Annex 2*.

Carbon Coefficients and Emission Factors

Carbon coefficients were based on data presented in *Annex 2*.

Weighted emission factors were then calculated for energy and non-energy uses of various energy sources. The weighted emission factor for energy uses was obtained by multiplying the carbon coefficient by the percentage of the source consumed for energy uses. For non-energy uses, the weighted emission factor was calculated by multiplying the carbon coefficient by the percentage of energy used for non-energy purposes, and then multiplying the product by the percentage of carbon not sequestered. The weighted emission factors for energy and non-energy uses were then summed to arrive at an emission factor that, when applied to EIA's estimates of state energy consumption, yielded estimates of carbon dioxide emissions by fuel and by economic sector. We converted emissions from carbon to carbon dioxide by multiplying the resulting figures by 44/12.

Per Capita Calculation

We obtained state population data for 1990 to 2006 from EIA, *State Energy Data System*, *Consumption*, *Price*, *and Expenditure Estimates*, 28 November 2008. We added 2007 population data from U.S. Census Bureau, Population Division, *Table 1: Annual Estimates of the Population for the United States*, *Regions*, *States*, *and Puerto Rico: April 1, 2000 to July 1, 2007 (NST-EST2007-01)*, 27 December 2007.

Appendix A.

Fossil Fuel-Related Carbon Dioxide Emissions from All Sources, 1990, 2004 and 2007, by State

State	Fossil Fuel CO_2 Emissions 2007 (MMT)	% Increase 1990-2007	% Increase 2004-2007	Rank 1990	Rank 2007	$MMTCO_2$ Increase 1990-2007	$MMTCO_2$ Increase 2004-2007
Texas	674.9	16%	-2%	1	1	93.3	-10.9
California	399.6	10%	2%	2	2	36.5	9.5
Pennsylvania	276.9	5%	-0.3%	3	3	14.3	-0.9
Ohio	269.7	10%	2%	4	4	23.8	5.5
Florida	257.6	36%	-0.1%	9	5	68.8	-0.3
Illinois	243.6	26%	3%	7	6	49.6	6.9
Indiana	233.6	15%	-2%	6	7	29.9	-4.0
New York	200.6	-4%	-7%	5	8	-9.0	-14.8
Louisiana	194.8	2%	-1%	8	9	4.2	-2.4
Georgia	185.7	33%	6%	11	10	46.4	10.1
Michigan	183.4	1%	-2%	10	11	2.4	-4.5
Kentucky	158.3	33%	3%	12	12	39.1	3.9
North Carolina	154.9	39%	3%	14	13	43.4	4.6
Alabama	147.1	34%	4%	15	14	37.4	5.3
Missouri	140.7	36%	0.1%	18	15	36.9	0.1
New Jersey	133.0	16%	3%	13	16	18.2	3.7
Tennessee	129.3	21%	1%	16	17	22.9	1.5
Virginia	127.9	35%	0.2%	19	18	32.8	0.2
West Virginia	117.5	11%	3%	17	19	11.3	3.4
Oklahoma	109.5	24%	10%	20	20	21.5	10.2
Wisconsin	104.3	22%	-3%	21	21	18.7	-2.9
Arizona	101.4	61%	5%	29	22	38.6	5.0
Minnesota	99.5	27%	0.0%	23	23	21.0	0.0
Colorado	98.6	49%	7%	27	24	32.3	6.2
South Carolina	90.1	46%	-1%	30	25	28.6	-0.7
Iowa	85.6	35%	7%	28	26	22.2	5.3
Washington	82.1	15%	7%	24	27	10.7	5.3
Massachusetts	79.4	-5%	-5%	22	28	-4.4	-4.0
Kansas	79.0	15%	3%	26	29	10.1	2.0
Maryland	77.7	10%	-6%	25	30	7.4	-5.2
Utah	70.2	30%	7%	32	31	16.2	4.7
Mississippi	68.2	41%	4%	35	32	19.7	2.4
Wyoming	64.9	14%	2%	31	33	8.1	1.0
Arkansas	63.9	26%	1%	34	34	13.1	0.5
New Mexico	58.8	12%	0.4%	33	35	6.2	0.2

State	Fossil Fuel CO_2 Emissions 2007 (MMT)	% Increase 1990-2007	% Increase 2004-2007	Rank 1990	Rank 2007	$MMTCO_2$ Increase 1990-2007	$MMTCO_2$ Increase 2004-2007
North Dakota	52.5	18%	6%	36	36	8.0	2.9
Nebraska	44.0	35%	3%	39	37	11.3	1.1
Oregon	43.4	41%	6%	40	38	12.5	2.6
Alaska	43.2	26%	-6%	38	39	9.0	-3.0
Nevada	41.6	36%	-12%	41	40	11.0	-5.9
Connecticut	39.9	-3%	-9%	37	41	-1.1	-4.2
Montana	37.8	36%	10%	42	42	10.0	3.4
Hawaii	24.3	12%	7%	43	43	2.6	1.7
Maine	19.8	5%	-15%	44	44	0.9	-3.4
New Hampshire	19.0	29%	-13%	46	45	4.3	-2.9
Delaware	17.3	-4%	2%	45	46	-0.8	0.4
Idaho	16.2	43%	4%	48	47	4.9	0.7
South Dakota	13.7	17%	0.4%	47	48	2.0	0.1
Rhode Island	11.0	24%	1%	49	49	2.1	0.1
Vermont	6.5	19%	-8%	50	50	1.0	-0.5
District of Columbia	3.4	-25%	-16%	51	51	-1.1	0.6

Appendix B.

Per Capita Fossil Fuel Carbon Dioxide Emissions by State

State	Per Capita CO_2 Emissions (Metric Tons) 2007	% Change 1990-2007	% Change 2004-2007	Rank 1990	Rank 2007
Wyoming	124.2	-1%	-2%	1	1
North Dakota	82.1	18%	5%	2	2
West Virginia	64.9	9%	3%	4	3
Alaska	63.2	2%	-9%	3	4
Louisiana	45.4	1%	3%	5	5
Montana	39.4	14%	6%	7	6
Kentucky	37.3	16%	0%	10	7
Indiana	36.8	0%	-4%	6	8
Alabama	31.8	17%	1%	14	9
Oklahoma	30.3	8%	7%	12	10
New Mexico	29.9	-14%	-4%	8	11
Iowa	28.7	26%	5%	17	12
Kansas	28.5	3%	1%	13	13
Texas	28.2	-17%	-8%	9	14
Utah	26.5	-15%	-1%	11	15
Nebraska	24.8	20%	1%	23	16
Missouri	23.9	18%	-2%	24	17
Ohio	23.5	4%	2%	18	18
Mississippi	23.4	24%	3%	28	19
Arkansas	22.6	5%	-2%	21	20
Pennsylvania	22.3	1%	-1%	19	21
Tennessee	21.0	-3%	-3%	20	22
South Carolina	20.4	16%	-5%	30	23
Colorado	20.3	1%	1%	25	24
Delaware	20.0	-26%	-2%	15	25
U.S. AVERAGE	19.9	-2%	-2%		
Georgia	19.5	-9%	-1%	22	26
Minnesota	19.1	7%	-2%	29	27
Illinois	19.0	12%	2%	33	28
Hawaii	18.9	-3%	5%	26	29
Wisconsin	18.6	7%	-4%	31	30
Michigan	18.2	-6%	-2%	27	31
South Dakota	17.2	3%	-2%	34	32
North Carolina	17.1	2%	-3%	35	33

State	Per Capita CO_2 Emissions (Metric Tons) 2007	% Change 1990-2007	% Change 2004-2007	Rank 1990	Rank 2007
Virginia	16.6	8%	-3%	37	34
Nevada	16.2	-35%	-20%	16	35
Arizona	16.0	-6%	-5%	32	36
New Jersey	15.3	4%	2%	38	37
Maine	15.0	-2%	-15%	36	38
New Hampshire	14.4	9%	-15%	43	39
Florida	14.1	-3%	-5%	41	40
Maryland	13.8	-6%	-8%	39	41
Washington	12.7	-13%	2%	40	42
Massachusetts	12.3	-12%	-5%	42	43
Oregon	11.6	7%	2%	48	44
Connecticut	11.4	-8%	-10%	44	45
California	10.9	-10%	0%	45	46
Idaho	10.8	-3%	-3%	47	47
Vermont	10.4	8%	-8%	49	48
New York	10.4	-11%	-7%	46	49
Rhode Island	10.4	18%	2%	50	50
District of Columbia	5.7	-22%	-17%	51	51

Appendix C.

Detailed State Emission Data by Sector

Note: Emissions for each sector include direct use of fossil fuels only, not emissions from electricity generated for use in that sector.

State	Sector	Fossil Fuel CO_2 Emissions 2007 (MMT)	Share of State's Emissions 2007	% Change 1990-2007	% Change 2004-2007	CO_2 Change 1990-2007 (MMT)	CO_2 Change 2004-2007 (MMT)
Alabama	Commercial	1.9	1.3%	-19%	-8%	-0.4	-0.2
Alabama	Electricity generation	85.9	58.4%	69%	11%	35.0	8.3
Alabama	Industrial	21.1	14.3%	-16%	-13%	-4.1	-3.1
Alabama	Residential	2.4	1.6%	-24%	-23%	-0.8	-0.7
Alabama	Transportation	35.8	24.3%	27%	3%	7.7	0.9
Alabama	**Total**	**147.1**				**37.4**	**5.3**
Alaska	Commercial	2.1	4.9%	-2%	-4%	0.0	-0.1
Alaska	Electricity generation	3.3	7.6%	26%	3%	0.7	0.1
Alaska	Industrial	18.2	42.2%	16%	-9%	2.5	-1.9
Alaska	Residential	1.8	4.3%	16%	2%	0.3	0.0
Alaska	Transportation	17.7	41.0%	47%	-6%	5.7	-1.1
Alaska	**Total**	**43.2**				**9.0**	**-3.0**
Arizona	Commercial	2.1	2.1%	12%	9%	0.2	0.2
Arizona	Electricity generation	55.2	54.4%	70%	7%	22.7	3.5
Arizona	Industrial	4.9	4.8%	27%	6%	1.1	0.3
Arizona	Residential	2.3	2.2%	24%	4%	0.4	0.1
Arizona	Transportation	37.0	36.4%	62%	3%	14.2	0.9
Arizona	**Total**	**101.4**				**38.6**	**5.0**
Arkansas	Commercial	1.9	2.9%	16%	-7%	0.3	-0.1
Arkansas	Electricity generation	28.6	44.7%	34%	5%	7.3	1.4
Arkansas	Industrial	10.5	16.5%	13%	-7%	1.2	-0.8
Arkansas	Residential	2.1	3.2%	-19%	-14%	-0.5	-0.3
Arkansas	Transportation	20.9	32.7%	30%	2%	4.8	0.4
Arkansas	**Total**	**63.9**				**13.1**	**0.5**
California	Commercial	14.7	3.7%	-22%	7%	-4.1	1.0
California	Electricity generation	50.1	12.5%	24%	8%	9.8	3.7
California	Industrial	73.1	18.3%	3%	-8%	2.3	-6.5
California	Residential	28.2	7.1%	-5%	-5%	-1.4	-1.4
California	Transportation	233.5	58.4%	15%	6%	29.9	12.8
California	**Total**	**399.6**				**36.5**	**9.5**

State	Sector	Fossil Fuel CO_2 Emissions 2007 (MMT)	Share of State's Emissions 2007	% Change 1990-2007	% Change 2004-2007	CO_2 Change 1990-2007 (MMT)	CO_2 Change 2004-2007 (MMT)
Colorado	Commercial	3.8	3.8%	-6%	-5%	-0.2	-0.2
Colorado	Electricity generation	43.0	43.6%	39%	7%	12.1	2.6
Colorado	Industrial	13.1	13.3%	89%	9%	6.2	1.1
Colorado	Residential	7.7	7.9%	45%	9%	2.4	0.6
Colorado	Transportation	30.9	31.4%	62%	7%	11.8	2.1
Colorado	**Total**	**98.6**				**32.3**	**6.2**
Connecticut	Commercial	3.3	8.2%	-13%	-13%	-0.5	-0.5
Connecticut	Electricity generation	8.8	22.1%	-22%	2%	-2.5	0.2
Connecticut	Industrial	2.4	6.1%	-21%	-11%	-0.7	-0.3
Connecticut	Residential	8.3	20.9%	2%	-18%	0.2	-1.8
Connecticut	Transportation	17.0	42.7%	16%	-9%	2.4	-1.7
Connecticut	**Total**	**39.9**				**-1.1**	**-4.2**
Delaware	Commercial	0.7	3.9%	20%	-9%	0.1	-0.1
Delaware	Electricity generation	6.7	38.5%	-12%	11%	-0.9	0.7
Delaware	Industrial	3.9	22.3%	-12%	-4%	-0.5	-0.1
Delaware	Residential	1.0	5.9%	-6%	-20%	-0.1	-0.2
Delaware	Transportation	5.1	29.4%	12%	3%	0.6	0.1
Delaware	**Total**	**17.3**				**-0.8**	**0.4**
District of Columbia	Commercial	1.2	36.2%	-2%	-4%	0.0	-0.1
District of Columbia	Electricity generation	0.1	2.5%	-80%	52%	-0.3	0.0
District of Columbia	Industrial	0.0	1.3%	12%	-41%	0.0	0.0
District of Columbia	Residential	0.8	24.4%	-11%	-14%	-0.1	-0.1
District of Columbia	Transportation	1.2	35.7%	-35%	-28%	-0.6	-0.5
District of Columbia	**Total**	**3.4**				**-1.1**	**-0.6**
Florida	Commercial	4.3	1.7%	-24%	-16%	-1.4	-0.8
Florida	Electricity generation	124.8	48.5%	44%	-2%	37.9	-2.0
Florida	Industrial	12.2	4.7%	-3%	-6%	-0.3	-0.8
Florida	Residential	1.8	0.7%	-15%	-18%	-0.3	-0.4
Florida	Transportation	114.4	44.4%	40%	3%	33.0	3.7
Florida	**Total**	**257.6**				**68.8**	**-0.3**
Georgia	Commercial	3.2	1.7%	-16%	-15%	-0.6	-0.5
Georgia	Electricity generation	91.4	49.2%	47%	18%	29.3	14.2
Georgia	Industrial	18.0	9.7%	-5%	-12%	-0.9	-2.6
Georgia	Residential	6.8	3.6%	15%	-15%	0.9	-1.2
Georgia	Transportation	66.3	35.7%	37%	0%	17.8	0.2
Georgia	**Total**	**185.7**				**46.4**	**10.1**
Hawaii	Commercial	0.2	1.0%	-69%	-16%	-0.5	0.0
Hawaii	Electricity generation	8.3	34.0%	8%	-1%	0.6	0.0
Hawaii	Industrial	1.7	7.1%	-17%	10%	-0.4	0.2
Hawaii	Residential	0.1	0.4%	57%	-9%	0.0	0.0
Hawaii	Transportation	14.0	57.5%	25%	13%	2.8	1.6
Hawaii	**Total**	**24.3**				**2.6**	**1.7**

State	Sector	Fossil Fuel CO_2 Emissions 2007 (MMT)	Share of State's Emissions 2007	% Change 1990-2007	% Change 2004-2007	CO_2 Change 1990-2007 (MMT)	CO_2 Change 2004-2007 (MMT)
Idaho	Commercial	1.0	6.3%	28%	8%	0.2	0.1
Idaho	Electricity generation	0.7	4.2%	*	5%	0.7	0.0
Idaho	Industrial	3.4	21.2%	1%	-9%	0.0	-0.3
Idaho	Residential	1.6	10.0%	104%	4%	0.8	0.1
Idaho	Transportation	9.5	58.3%	50%	10%	3.2	0.8
Idaho	**Total**	**16.2**				**4.9**	**0.7**
Illinois	Commercial	11.8	4.9%	-5%	-1%	-0.7	-0.2
Illinois	Electricity generation	96.9	39.8%	69%	3.0%	39.7	2.8
Illinois	Industrial	38.7	15.9%	-14%	1%	-6.3	0.5
Illinois	Residential	24.6	10.1%	-4%	-1%	-0.9	-0.2
Illinois	Transportation	71.7	29.4%	33%	6%	17.8	3.9
Illinois	**Total**	**243.6**				**49.6**	**6.9**
Indiana	Commercial	5.1	2.2%	-7%	-22%	-0.4	-1.4
Indiana	Electricity generation	122.2	52.3%	27%	3%	26.3	3.0
Indiana	Industrial	52.9	22.6%	1%	-8%	0.8	-4.7
Indiana	Residential	9.0	3.8%	-7%	-8%	-0.6	-0.8
Indiana	Transportation	44.5	19.0%	10%	-0.1%	3.9	-0.1
Indiana	**Total**	**233.6**				**29.9**	**-4.0**
Iowa	Commercial	4.0	4.6%	23%	11%	0.7	0.4
Iowa	Electricity generation	39.2	45.8%	49%	8%	13.0	2.8
Iowa	Industrial	15.8	18.4%	23%	2%	2.9	0.3
Iowa	Residential	4.7	5.5%	-4%	-1%	-0.2	0.0
Iowa	Transportation	21.9	25.6%	36%	9%	5.8	1.8
Iowa	**Total**	**85.6**				**22.2**	**5.3**
Kansas	Commercial	1.9	2.4%	-42%	-22%	-1.4	-0.5
Kansas	Electricity generation	38.5	48.8%	44%	3%	11.8	1.3
Kansas	Industrial	15.6	19.7%	0%	10%	-0.1	1.4
Kansas	Residential	3.9	4.9%	-5%	-6%	-0.2	-0.2
Kansas	Transportation	19.2	24.3%	0%	1%	-0.1	0.1
Kansas	**Total**	**79.0**				**10.1**	**2.0**
Kentucky	Commercial	2.5	1.6%	-5%	-18%	-0.1	-0.5
Kentucky	Electricity generation	94.5	59.7%	41%	6%	27.3	5.3
Kentucky	Industrial	23.7	15.0%	24%	-2%	4.5	-0.5
Kentucky	Residential	3.4	2.2%	-15%	-13%	-0.6	-0.5
Kentucky	Transportation	34.2	21.6%	30%	0%	8.0	0.1
Kentucky	**Total**	**158.3**				**39.1**	**3.9**
Louisiana	Commercial	2.7	1.4%	44%	27%	0.8	0.6
Louisiana	Electricity generation	38.2	19.6%	12%	-7%	4.0	-2.8
Louisiana	Industrial	101.1	51.9%	-1%	3%	-1.0	3.0
Louisiana	Residential	2.2	1.1%	-31%	-15%	-1.0	-0.4
Louisiana	Transportation	50.7	26.0%	3%	-5%	1.4	-2.7
Louisiana	**Total**	**194.8**				**4.2**	**-2.4**

* Emissions from electricity generation increased 1000-fold in Idaho from 1990 to 2007.

State	Sector	Fossil Fuel CO_2 Emissions 2007 (MMT)	Share of State's Emissions 2007	% Change 1990-2007	% Change 2004-2007	CO_2 Change 1990-2007 (MMT)	CO_2 Change 2004-2007 (MMT)
Maine	Commercial	2.0	9.9%	-11%	-7%	-0.2	-0.1
Maine	Electricity generation	2.6	13.1%	21%	-43%	0.5	-1.9
Maine	Industrial	2.3	11.5%	-30%	-14%	-1.0	-0.4
Maine	Residential	4.0	20.4%	33%	-23%	1.0	-1.2
Maine	Transportation	8.9	45.1%	8%	3%	0.7	0.3
Maine	**Total**	**19.8**				**0.9**	**-3.4**
Maryland	Commercial	4.6	5.9%	59%	-9%	1.7	-0.5
Maryland	Electricity generation	30.2	38.9%	15%	-2%	3.9	-0.7
Maryland	Industrial	5.6	7.2%	-50%	-36%	-5.7	-3.1
Maryland	Residential	6.5	8.4%	5%	-9%	0.3	-0.6
Maryland	Transportation	30.8	39.6%	30%	-1%	7.1	-0.3
Maryland	**Total**	**77.7**				**7.4**	**-5.2**
Massachusetts	Commercial	5.3	6.6%	-37%	-20%	-3.1	-1.3
Massachusetts	Electricity generation	23.7	29.8%	-8%	-1%	-2.0	-0.2
Massachusetts	Industrial	4.5	5.7%	-21%	-1%	-1.2	0.0
Massachusetts	Residential	13.5	17.0%	-10%	-10%	-1.6	-1.5
Massachusetts	Transportation	32.4	40.9%	12%	-3%	3.5	-1.0
Massachusetts	**Total**	**79.4**				**-4.4**	**-4.0**
Michigan	Commercial	10.1	5.5%	-6%	-6%	-0.6	-0.6
Michigan	Electricity generation	75.3	41.1%	13%	3%	8.5	2.1
Michigan	Industrial	23.1	12.6%	-31%	-8%	-10.6	-2.0
Michigan	Residential	20.8	11.3%	-5%	-10%	-1.1	-2.4
Michigan	Transportation	54.0	29.4%	13%	-3%	6.3	-1.6
Michigan	**Total**	**183.4**				**2.4**	**-4.5**
Minnesota	Commercial	5.9	5.9%	4%	-1%	0.2	-0.1
Minnesota	Electricity generation	34.3	34.5%	19%	-2%	5.4	-0.6
Minnesota	Industrial	15.1	15.2%	23%	6%	2.9	0.9
Minnesota	Residential	8.7	8.8%	9%	-6%	0.7	-0.6
Minnesota	Transportation	35.4	35.6%	50%	1%	11.7	0.3
Minnesota	**Total**	**99.5**				**21.0**	**0.0**
Mississippi	Commercial	1.7	2.5%	33%	19%	0.4	0.3
Mississippi	Electricity generation	27.5	40.3%	106%	9%	14.1	2.3
Mississippi	Industrial	11.0	16.2%	-6%	-5%	-0.7	-0.6
Mississippi	Residential	1.6	2.4%	-13%	-12%	-0.2	-0.2
Mississippi	Transportation	26.4	38.7%	31%	2%	6.2	0.6
Mississippi	**Total**	**68.2**				**19.7**	**2.4**
Missouri	Commercial	3.9	2.8%	-10%	-11%	-0.5	-0.5
Missouri	Electricity generation	75.4	53.6%	58%	0%	27.8	0.3
Missouri	Industrial	12.7	9.1%	20%	-4%	2.1	-0.6
Missouri	Residential	6.7	4.8%	-11%	-9%	-0.8	-0.7
Missouri	Transportation	41.9	29.8%	25%	4%	8.3	1.5
Missouri	**Total**	**140.7**				**36.9**	**0.1**

State	Sector	Fossil Fuel CO_2 Emissions 2007 (MMT)	Share of State's Emissions 2007	% Change 1990-2007	% Change 2004-2007	CO_2 Change 1990-2007 (MMT)	CO_2 Change 2004-2007 (MMT)
Montana	Commercial	0.9	2.3%	-1%	-20%	0.0	-0.2
Montana	Electricity generation	19.8	52.4%	28%	4%	4.3	0.8
Montana	Industrial	6.6	17.6%	55%	34%	2.4	1.7
Montana	Residential	1.6	4.2%	27%	1%	0.3	0.0
Montana	Transportation	8.9	23.5%	52%	14%	3.0	1.1
Montana	**Total**	**37.8**				**10.0**	**3.4**
Nebraska	Commercial	1.8	4.1%	-15%	0%	-0.3	0.0
Nebraska	Electricity generation	20.3	46.2%	55%	-1%	7.2	-0.3
Nebraska	Industrial	7.0	15.8%	54%	17%	2.4	1.0
Nebraska	Residential	2.5	5.7%	0%	2%	0.0	0.0
Nebraska	Transportation	12.4	28.2%	19%	2%	2.0	0.3
Nebraska	**Total**	**44.0**				**11.3**	**1.1**
Nevada	Commercial	1.7	4.2%	69%	8%	0.7	0.1
Nevada	Electricity generation	16.8	40.3%	0%	-34%	0.0	-8.6
Nevada	Industrial	2.8	6.8%	32%	13%	0.7	0.3
Nevada	Residential	2.3	5.6%	91%	10%	1.1	0.2
Nevada	Transportation	17.9	43.1%	91%	13%	8.5	2.1
Nevada	**Total**	**41.6**				**11.0**	**-5.9**
New Hampshire	Commercial	1.3	7.0%	1%	-26%	0.0	-0.5
New Hampshire	Electricity generation	6.7	35.4%	38%	-14%	1.9	-1.1
New Hampshire	Industrial	0.9	4.5%	6%	-23%	0.1	-0.3
New Hampshire	Residential	2.8	14.8%	14%	-17%	0.3	-0.6
New Hampshire	Transportation	7.2	38.2%	39%	-7%	2.0	-0.5
New Hampshire	**Total**	**19.0**				**4.3**	**-2.9**
New Jersey	Commercial	11.0	8.2%	0%	1%	0.0	0.1
New Jersey	Electricity generation	19.4	14.6%	58%	2%	7.1	0.3
New Jersey	Industrial	15.4	11.6%	-19%	-11%	-3.6	-1.8
New Jersey	Residential	16.1	12.1%	4%	-8%	0.6	-1.4
New Jersey	Transportation	71.1	53.5%	24%	10%	14.0	6.5
New Jersey	**Total**	**133.0**				**18.2**	**3.7**
New Mexico	Commercial	1.5	2.6%	-7%	-10%	-0.1	-0.2
New Mexico	Electricity generation	31.1	52.9%	14%	1%	3.8	0.4
New Mexico	Industrial	8.6	14.6%	23%	5%	1.6	0.4
New Mexico	Residential	2.2	3.8%	13%	-4%	0.3	-0.1
New Mexico	Transportation	15.3	26.1%	4%	-2%	0.6	-0.3
New Mexico	**Total**	**58.8**				**6.2**	**0.2**
New York	Commercial	27.0	13.4%	0%	-22%	-0.1	-7.6
New York	Electricity generation	49.7	24.8%	-23%	-7%	-14.5	-3.7
New York	Industrial	14.8	7.4%	-29%	-2%	-5.9	-0.4
New York	Residential	36.1	18.0%	7%	-5%	2.5	-1.9
New York	Transportation	73.1	36.4%	14%	-2%	9.1	-1.2
New York	**Total**	**200.6**				**-9.0**	**-14.8**

State	Sector	Fossil Fuel CO_2 Emissions 2007 (MMT)	Share of State's Emissions 2007	% Change 1990-2007	% Change 2004-2007	CO_2 Change 1990-2007 (MMT)	CO_2 Change 2004-2007 (MMT)
North Carolina	Commercial	3.9	2.5%	9%	-22%	0.3	-1.1
North Carolina	Electricity generation	77.6	50.1%	67%	9%	31.2	6.7
North Carolina	Industrial	13.4	8.7%	-24%	-12%	-4.3	-1.8
North Carolina	Residential	5.7	3.7%	7%	-22%	0.4	-1.6
North Carolina	Transportation	54.1	35.0%	41%	5%	15.9	2.4
North Carolina	**Total**	**154.9**				**43.4**	**4.6**
North Dakota	Commercial	1.0	2.0%	24%	-3%	0.2	0.0
North Dakota	Electricity generation	30.7	58.5%	14%	5%	3.7	1.4
North Dakota	Industrial	12.6	23.9%	14%	7%	1.6	0.9
North Dakota	Residential	1.2	2.2%	6%	-8%	0.1	-0.1
North Dakota	Transportation	7.0	13.4%	53%	12%	2.4	0.8
North Dakota	**Total**	**52.5**				**8.0**	**2.9**
Ohio	Commercial	10.2	3.8%	-4%	-10%	-0.4	-1.2
Ohio	Electricity generation	130.7	48.5%	19%	5%	21.0	6.6
Ohio	Industrial	38.8	14.4%	-22%	3%	-10.6	1.1
Ohio	Residential	18.8	7.0%	-8%	-7%	-1.7	-1.5
Ohio	Transportation	71.2	26.4%	28%	1%	15.5	0.5
Ohio	**Total**	**269.7**				**23.8**	**5.5**
Oklahoma	Commercial	2.7	2.5%	7%	17%	0.2	0.4
Oklahoma	Electricity generation	49.6	45.2%	42%	11%	14.7	4.9
Oklahoma	Industrial	21.4	19.5%	-7%	8%	-1.6	1.7
Oklahoma	Residential	3.9	3.6%	2%	6%	0.1	0.2
Oklahoma	Transportation	32.0	29.2%	34%	11%	8.1	3.0
Oklahoma	**Total**	**109.5**				**21.5**	**10.2**
Oregon	Commercial	1.8	4.2%	-3%	3%	-0.1	0.1
Oregon	Electricity generation	9.6	22.2%	447%	19%	7.9	1.5
Oregon	Industrial	5.2	11.9%	0%	-9%	0.0	-0.5
Oregon	Residential	2.7	6.2%	33%	5%	0.7	0.1
Oregon	Transportation	24.1	55.5%	20%	6%	4.1	1.4
Oregon	**Total**	**43.4**				**12.5**	**2.6**
Pennsylvania	Commercial	12.1	4.4%	-8%	-6%	-1.0	-0.7
Pennsylvania	Electricity generation	126.3	45.6%	20%	5%	21.4	6.5
Pennsylvania	Industrial	45.8	16.5%	-26%	-6%	-15.8	-3.1
Pennsylvania	Residential	21.8	7.9%	-8%	-14%	-1.8	-3.7
Pennsylvania	Transportation	71.0	25.6%	19%	0%	11.5	0.1
Pennsylvania	**Total**	**276.9**				**14.3**	**-0.9**
Rhode Island	Commercial	1.0	9.5%	-6%	-13%	-0.1	-0.2
Rhode Island	Electricity generation	2.8	25.6%	319%	44%	2.1	0.9
Rhode Island	Industrial	0.6	5.5%	-5%	0%	0.0	0.0
Rhode Island	Residential	2.3	21.0%	-2%	-18%	0.0	-0.5
Rhode Island	Transportation	4.2	38.4%	2%	-3%	0.1	-0.1
Rhode Island	**Total**	**11.0**				**2.1**	**0.1**

State	Sector	Fossil Fuel CO_2 Emissions 2007 (MMT)	Share of State's Emissions 2007	% Change 1990-2007	% Change 2004-2007	CO_2 Change 1990-2007 (MMT)	CO_2 Change 2004-2007 (MMT)
South Carolina	Commercial	1.5	1.7%	15%	-1%	0.2	0.0
South Carolina	Electricity generation	41.8	46.4%	88%	7%	19.6	2.8
South Carolina	Industrial	13.1	14.6%	-6%	-17%	-0.8	-2.7
South Carolina	Residential	1.9	2.1%	-11%	-20%	-0.2	-0.5
South Carolina	Transportation	31.8	35.3%	45%	-1%	9.8	-0.3
South Carolina	**Total**	**90.1**				**28.6**	**-0.7**
South Dakota	Commercial	0.7	5.2%	5%	4%	0.0	0.0
South Dakota	Electricity generation	3.0	21.8%	2%	-22%	0.0	-0.8
South Dakota	Industrial	2.7	19.9%	31%	25%	0.6	0.5
South Dakota	Residential	1.0	7.6%	-23%	-1%	-0.3	0.0
South Dakota	Transportation	6.2	45.5%	35%	6%	1.6	0.3
South Dakota	**Total**	**13.7**				**2.0**	**0.1**
Tennessee	Commercial	3.5	2.7%	2%	-7%	0.1	-0.2
Tennessee	Electricity generation	56.6	43.8%	20%	6%	9.5	3.2
Tennessee	Industrial	20.1	15.5%	0%	-6%	0.1	-1.3
Tennessee	Residential	4.0	3.1%	22%	-9%	0.7	-0.4
Tennessee	Transportation	45.1	34.9%	38%	0%	12.5	0.2
Tennessee	**Total**	**129.3**				**22.9**	**1.5**
Texas	Commercial	10.3	1.5%	-12%	-9%	-1.4	-1.0
Texas	Electricity generation	229.6	34.0%	26%	2%	47.1	5.2
Texas	Industrial	221.0	32.7%	0%	-10%	-0.7	-25.0
Texas	Residential	12.3	1.8%	-6%	5%	-0.7	0.6
Texas	Transportation	201.7	29.9%	32%	5%	49.0	9.3
Texas	**Total**	**674.9**				**93.3**	**-10.9**
United States	Commercial	214.9	3.6%	-4%	-8%	-10.1	-19.0
United States	Electricity generation	2393.5	39.9%	32%	3.4%	583.9	78.0
United States	Industrial	1037.2	17.3%	-5%	-4%	-50.3	-48.6
United States	Residential	344.0	5.7%	1%	-8%	2.1	-28.0
United States	Transportation	2006.0	33.5%	27%	3%	423.3	56.8
United States	**Total**	**5995.7**				**949.0**	**39.3**
Utah	Commercial	2.2	3.2%	34%	-9%	0.6	-0.2
Utah	Electricity generation	38.1	54.3%	29%	8%	8.6	2.9
Utah	Industrial	8.0	11.5%	-15%	4%	-1.4	0.3
Utah	Residential	3.6	5.2%	30%	0%	0.8	0.0
Utah	Transportation	18.2	25.9%	71%	11%	7.6	1.7
Utah	**Total**	**70.2**				**16.2**	**4.7**
Vermont	Commercial	0.6	9.1%	12%	-20%	0.1	-0.1
Vermont	Electricity generation	0.0	0.1%	-87%	-76%	0.0	0.0
Vermont	Industrial	0.5	7.8%	11%	-16%	0.0	-0.1
Vermont	Residential	1.6	24.1%	10%	-15%	0.1	-0.3
Vermont	Transportation	3.8	58.9%	27%	0%	0.8	0.0
Vermont	**Total**	**6.5**				**1.0**	**-0.5**

State	Sector	Fossil Fuel CO_2 Emissions 2007 (MMT)	Share of State's Emissions 2007	% Change 1990-2007	% Change 2004-2007	CO_2 Change 1990-2007 (MMT)	CO_2 Change 2004-2007 (MMT)
Virginia	Commercial	5.0	3.9%	15%	-9%	0.6	-0.5
Virginia	Electricity generation	41.8	32.7%	80%	2%	18.5	0.8
Virginia	Industrial	17.7	13.9%	-9%	-5%	-1.8	-0.9
Virginia	Residential	7.4	5.8%	15%	-11%	0.9	-1.0
Virginia	Transportation	55.9	43.7%	35%	3%	14.5	1.7
Virginia	**Total**	**127.9**				**32.8**	**0.2**
Washington	Commercial	3.4	4.1%	7%	9%	0.2	0.3
Washington	Electricity generation	11.9	14.4%	59%	-15%	4.4	-2.2
Washington	Industrial	14.4	17.5%	-10%	22%	-1.7	2.5
Washington	Residential	5.3	6.4%	48%	8%	1.7	0.4
Washington	Transportation	47.2	57.5%	15%	10%	6.1	4.2
Washington	**Total**	**82.1**				**10.7**	**5.3**
West Virginia	Commercial	1.5	1.3%	-22%	-18%	-0.4	-0.3
West Virginia	Electricity generation	86.9	73.9%	24%	6%	16.6	4.9
West Virginia	Industrial	14.9	12.7%	-30%	-3%	-6.3	-0.4
West Virginia	Residential	1.9	1.6%	-22%	-23%	-0.5	-0.6
West Virginia	Transportation	12.3	10.5%	19%	-1%	2.0	-0.1
West Virginia	**Total**	**117.5**				**11.3**	**3.4**
Wisconsin	Commercial	5.6	5.4%	15%	-2%	0.7	-0.1
Wisconsin	Electricity generation	43.9	42.1%	34%	-2%	11.0	-0.8
Wisconsin	Industrial	15.3	14.7%	7%	-7%	1.0	-1.2
Wisconsin	Residential	9.3	8.9%	-1%	-8%	-0.1	-0.8
Wisconsin	Transportation	30.2	29.0%	25%	0%	6.0	-0.1
Wisconsin	**Total**	**104.3**				**18.7**	**-2.9**
Wyoming	Commercial	0.8	1.3%	0%	-4%	0.0	0.0
Wyoming	Electricity generation	43.5	67.0%	11%	-1%	4.3	-0.6
Wyoming	Industrial	10.9	16.7%	7%	9%	0.7	0.9
Wyoming	Residential	0.9	1.4%	10%	8%	0.1	0.1
Wyoming	Transportation	8.8	13.5%	53%	9%	3.0	0.7
Wyoming	**Total**	**64.9**				**8.1**	**1.0**

Appendix D:

Detailed State Emissions by Fuel

State	Fuel	Fossil Fuel CO_2 Emissions 2007 (MMT)	Share of State's Emissions 2007	% Change 1990-2007	% Change 2004-2007	CO_2 Change 1990-2007 (MMT)	CO_2 Change 2004-2007 (MMT)
Alabama	Coal	83.5	56.8%	31.8%	4.2%	20.1	3.3
Alabama	Natural gas	22.6	15.4%	71.1%	8.5%	9.4	1.8
Alabama	Oil	41.0	27.9%	23.9%	0.3%	7.9	0.1
Alabama	**Total**	**147.1**	**100.0%**	**34.1%**	**3.7%**	**37.4**	**5.3**
Alaska	Coal	1.2	2.9%	5.4%	-7.5%	0.1	-0.1
Alaska	Natural gas	19.2	44.6%	12.9%	-9.9%	2.2	-2.1
Alaska	Oil	22.7	52.6%	42.6%	-3.2%	6.8	-0.8
Alaska	**Total**	**43.2**	**100.0%**	**26.5%**	**-6.4%**	**9.0**	**-3.0**
Arizona	Coal	41.4	40.8%	28.1%	3.1%	9.1	1.2
Arizona	Natural gas	21.3	21.0%	207.9%	14.0%	14.4	2.6
Arizona	Oil	38.7	38.2%	64.1%	3.0%	15.1	1.1
Arizona	**Total**	**101.4**	**100.0%**	**61.4%**	**5.1%**	**38.6**	**5.0**
Arkansas	Coal	26.0	40.6%	29.7%	1.8%	5.9	0.5
Arkansas	Natural gas	12.0	18.7%	-2.8%	1.9%	-0.3	0.2
Arkansas	Oil	26.0	40.7%	40.7%	-0.5%	7.5	-0.1
Arkansas	**Total**	**63.9**	**100.0%**	**25.8%**	**0.9%**	**13.1**	**0.5**
California	Coal	6.3	1.6%	-20.9%	-3.6%	-1.7	-0.2
California	Natural gas	128.1	32.1%	15.6%	-0.7%	17.3	-0.9
California	Oil	265.2	66.4%	8.5%	4.2%	20.8	10.7
California	**Total**	**399.6**	**100.0%**	**10.1%**	**2.4%**	**36.5**	**9.5**
Colorado	Coal	36.7	37.2%	15.5%	-0.4%	4.9	-0.2
Colorado	Natural gas	27.1	27.5%	107.2%	17.8%	14.0	4.1
Colorado	Oil	34.8	35.3%	62.2%	7.0%	13.3	2.3
Colorado	**Total**	**98.6**	**100.0%**	**48.7%**	**6.7%**	**32.3**	**6.2**
Connecticut	Coal	3.8	9.5%	4.0%	-9.3%	0.1	-0.4
Connecticut	Natural gas	9.7	24.4%	69.2%	12.8%	4.0	1.1
Connecticut	Oil	26.4	66.1%	-16.4%	-15.6%	-5.2	-4.9
Connecticut	**Total**	**39.9**	**100.0%**	**-2.6%**	**-9.4%**	**-1.1**	**-4.2**
Delaware	Coal	6.0	34.8%	7.6%	19.1%	0.4	1.0
Delaware	Natural gas	2.6	15.1%	23.8%	-0.4%	0.5	0.0
Delaware	Oil	8.7	50.1%	-16.7%	-6.5%	-1.7	-0.6
Delaware	**Total**	**17.3**	**100.0%**	**-4.5%**	**2.1%**	**-0.8**	**0.4**
District of Columbia	Coal	0.0	1.3%	-73.4%	-38.0%	-0.1	0.0
District of Columbia	Natural gas	1.8	53.4%	16.4%	2.3%	0.3	0.0
District of Columbia	Oil	1.5	45.3%	-44.7%	-30.3%	-1.2	-0.7
District of Columbia	**Total**	**3.4**	**100.0%**	**-24.6%**	**-16.2%**	**-1.1**	**-0.6**

State	Fuel	Fossil Fuel CO_2 Emissions 2007 (MMT)	Share of State's Emissions 2007	% Change 1990-2007	% Change 2004-2007	CO_2 Change 1990-2007 (MMT)	CO_2 Change 2004-2007 (MMT)
Florida	Coal	68.1	26.4%	14.1%	3.1%	8.4	2.0
Florida	Natural gas	50.3	19.5%	178.9%	25.8%	32.3	10.3
Florida	Oil	139.2	54.0%	25.3%	-8.3%	28.1	-12.7
Florida	**Total**	**257.6**	**100.0%**	**36.5%**	**-0.1%**	**68.8**	**-0.3**
Georgia	Coal	88.3	47.5%	31.3%	11.9%	21.0	9.4
Georgia	Natural gas	23.8	12.8%	42.2%	10.3%	7.1	2.2
Georgia	Oil	73.6	39.6%	33.0%	-2.1%	18.3	-1.6
Georgia	**Total**	**185.7**	**100.0%**	**33.3%**	**5.7%**	**46.4**	**10.1**
Hawaii	Coal	1.8	7.4%	2572.0%	-0.6%	1.7	0.0
Hawaii	Natural gas	0.2	0.6%	-1.5%	1.6%	0.0	0.0
Hawaii	Oil	22.3	91.9%	4.1%	8.2%	0.9	1.7
Hawaii	**Total**	**24.3**	**100.0%**	**12.0%**	**7.4%**	**2.6**	**1.7**
Idaho	Coal	1.0	5.9%	0.8%	-17.6%	0.0	-0.2
Idaho	Natural gas	4.4	27.2%	79.7%	8.7%	2.0	0.4
Idaho	Oil	10.9	66.9%	37.2%	5.0%	2.9	0.5
Idaho	**Total**	**16.2**	**100.0%**	**43.3%**	**4.2%**	**4.9**	**0.7**
Illinois	Coal	102.8	42.2%	47.2%	1.9%	33.0	1.9
Illinois	Natural gas	51.5	21.1%	1.8%	2.7%	0.9	1.4
Illinois	Oil	89.4	36.7%	21.3%	4.2%	15.7	3.6
Illinois	**Total**	**243.6**	**100.0%**	**25.6%**	**2.9%**	**49.6**	**6.9**
Indiana	Coal	147.0	62.9%	16.8%	-2.1%	21.2	-3.2
Indiana	Natural gas	28.6	12.2%	18.8%	0.9%	4.5	0.2
Indiana	Oil	58.0	24.8%	7.9%	-1.7%	4.3	-1.0
Indiana	**Total**	**233.6**	**100.0%**	**14.7%**	**-1.7%**	**29.9**	**-4.0**
Iowa	Coal	43.8	51.2%	39.0%	4.8%	12.3	2.0
Iowa	Natural gas	13.7	16.0%	18.4%	14.4%	2.1	1.7
Iowa	Oil	28.1	32.8%	38.1%	5.9%	7.7	1.6
Iowa	**Total**	**85.6**	**100.0%**	**34.9%**	**6.6%**	**22.2**	**5.3**
Kansas	Coal	37.4	47.4%	46.3%	2.8%	11.8	1.0
Kansas	Natural gas	15.2	19.3%	-17.8%	8.9%	-3.3	1.2
Kansas	Oil	26.4	33.4%	6.4%	-0.9%	1.6	-0.2
Kansas	**Total**	**79.0**	**100.0%**	**14.7%**	**2.6%**	**10.1**	**2.0**
Kentucky	Coal	96.1	60.7%	27.5%	6.1%	20.7	5.5
Kentucky	Natural gas	12.3	7.8%	22.3%	1.8%	2.2	0.2
Kentucky	Oil	49.9	31.5%	47.6%	-3.6%	16.1	-1.8
Kentucky	**Total**	**158.3**	**100.0%**	**32.8%**	**2.5%**	**39.1**	**3.9**
Louisiana	Coal	23.6	12.1%	20.0%	-2.7%	3.9	-0.7
Louisiana	Natural gas	73.7	37.8%	-14.7%	1.4%	-12.7	1.0
Louisiana	Oil	97.5	50.0%	15.3%	-2.7%	13.0	-2.7
Louisiana	**Total**	**194.8**	**100.0%**	**2.2%**	**-1.2%**	**4.2**	**-2.4**
Massachusetts	Coal	11.3	14.3%	5.7%	14.3%	0.6	1.4
Massachusetts	Natural gas	22.1	27.8%	52.4%	7.7%	7.6	1.6
Massachusetts	Oil	45.9	57.9%	-21.6%	-13.2%	-12.6	-7.0
Massachusetts	**Total**	**79.4**	**100.0%**	**-5.3%**	**-4.8%**	**-4.4**	**-4.0**

State	Fuel	Fossil Fuel CO_2 Emissions 2007 (MMT)	Share of State's Emissions 2007	% Change 1990-2007	% Change 2004-2007	CO_2 Change 1990-2007 (MMT)	CO_2 Change 2004-2007 (MMT)
Maine	Coal	0.6	3.1%	-36.8%	-10.5%	-0.4	-0.1
Maine	Natural gas	2.5	12.8%	955.4%	-37.3%	2.3	-1.5
Maine	Oil	16.6	84.1%	-5.8%	-9.8%	-1.0	-1.8
Maine	**Total**	**19.8**	**100.0%**	**4.8%**	**-14.6%**	**0.9**	**-3.4**
Maryland	Coal	31.0	39.9%	16.2%	0.2%	4.3	0.1
Maryland	Natural gas	11.0	14.2%	16.0%	4.0%	1.5	0.4
Maryland	Oil	35.7	45.9%	4.5%	-13.7%	1.5	-5.7
Maryland	**Total**	**77.7**	**100.0%**	**10.5%**	**-6.3%**	**7.4**	**-5.2**
Michigan	Coal	75.2	41.0%	1.8%	3.4%	1.3	2.4
Michigan	Natural gas	44.7	24.4%	-5.7%	-7.7%	-2.7	-3.7
Michigan	Oil	63.5	34.6%	6.3%	-4.8%	3.8	-3.2
Michigan	**Total**	**183.4**	**100.0%**	**1.3%**	**-2.4%**	**2.4**	**-4.5**
Minnesota	Coal	34.6	34.7%	12.8%	-3.4%	3.9	-1.2
Minnesota	Natural gas	20.8	21.0%	35.5%	8.9%	5.5	1.7
Minnesota	Oil	44.1	44.3%	35.7%	-1.2%	11.6	-0.5
Minnesota	**Total**	**99.5**	**100.0%**	**26.7%**	**0.0%**	**21.0**	**0.0**
Mississippi	Coal	17.5	25.6%	78.5%	0.0%	7.7	0.0
Mississippi	Natural gas	19.7	28.9%	43.1%	27.9%	5.9	4.3
Mississippi	Oil	31.1	45.5%	24.6%	-5.7%	6.1	-1.9
Mississippi	**Total**	**68.2**	**100.0%**	**40.7%**	**3.7%**	**19.7**	**2.4**
Missouri	Coal	75.8	53.9%	49.2%	-0.6%	25.0	-0.5
Missouri	Natural gas	14.6	10.4%	14.7%	3.3%	1.9	0.5
Missouri	Oil	50.3	35.7%	24.9%	0.2%	10.0	0.1
Missouri	**Total**	**140.7**	**100.0%**	**35.5%**	**0.1%**	**36.9**	**0.1**
Montana	Coal	19.1	50.7%	20.3%	3.5%	3.2	0.6
Montana	Natural gas	3.9	10.4%	67.7%	12.1%	1.6	0.4
Montana	Oil	14.7	38.9%	55.3%	18.7%	5.2	2.3
Montana	**Total**	**37.8**	**100.0%**	**36.3%**	**9.9%**	**10.0**	**3.4**
Nebraska	Coal	20.5	46.5%	53.1%	-3.0%	7.1	-0.6
Nebraska	Natural gas	7.7	17.4%	33.1%	27.4%	1.9	1.7
Nebraska	Oil	15.9	36.0%	16.9%	0.5%	2.3	0.1
Nebraska	**Total**	**44.0**	**100.0%**	**34.6%**	**2.5%**	**11.3**	**1.1**
Nevada	Coal	7.8	18.8%	-49.7%	-57.2%	-7.7	-10.5
Nevada	Natural gas	14.0	33.6%	294.5%	20.1%	10.4	2.3
Nevada	Oil	19.8	47.6%	72.7%	12.7%	8.3	2.2
Nevada	**Total**	**41.6**	**100.0%**	**36.0%**	**-12.4%**	**11.0**	**-5.9**
New Hampshire	Coal	4.2	22.4%	42.8%	3.3%	1.3	0.1
New Hampshire	Natural gas	3.4	18.0%	347.3%	0.2%	2.7	0.0
New Hampshire	Oil	11.3	59.6%	3.4%	-21.4%	0.4	-3.1
New Hampshire	**Total**	**19.0**	**100.0%**	**29.3%**	**-13.4%**	**4.3**	**-2.9**
New Jersey	Coal	10.6	7.9%	38.8%	-0.8%	3.0	-0.1
New Jersey	Natural gas	33.9	25.5%	40.0%	-0.6%	9.7	-0.2
New Jersey	Oil	88.6	66.6%	6.7%	4.8%	5.5	4.0
New Jersey	**Total**	**133.0**	**100.0%**	**15.8%**	**2.9%**	**18.2**	**3.7**

State	Fuel	Fossil Fuel CO_2 Emissions 2007 (MMT)	Share of State's Emissions 2007	% Change 1990-2007	% Change 2004-2007	CO_2 Change 1990-2007 (MMT)	CO_2 Change 2004-2007 (MMT)
New Mexico	Coal	28.0	47.5%	7.7%	-4.3%	2.0	-1.3
New Mexico	Natural gas	12.6	21.4%	-5.0%	4.3%	-0.7	0.5
New Mexico	Oil	18.3	31.1%	35.7%	5.5%	4.8	1.0
New Mexico	**Total**	**58.8**	**100.0%**	**11.7%**	**0.4%**	**6.2**	**0.2**
New York	Coal	24.2	12.1%	-25.6%	-6.8%	-8.3	-1.8
New York	Natural gas	64.5	32.2%	36.2%	8.8%	17.2	5.2
New York	Oil	111.8	55.7%	-13.8%	-14.0%	-17.9	-18.2
New York	**Total**	**200.6**	**100.0%**	**-4.3%**	**-6.9%**	**-9.0**	**-14.8**
North Carolina	Coal	78.2	50.5%	46.2%	5.8%	24.7	4.3
North Carolina	Natural gas	12.9	8.3%	47.0%	5.4%	4.1	0.7
North Carolina	Oil	63.8	41.2%	29.7%	-0.4%	14.6	-0.3
North Carolina	**Total**	**154.9**	**100.0%**	**39.0%**	**3.1%**	**43.4**	**4.6**
North Dakota	Coal	39.6	75.5%	12.5%	5.5%	4.4	2.1
North Dakota	Natural gas	3.3	6.3%	87.0%	4.3%	1.5	0.1
North Dakota	Oil	9.5	18.2%	27.0%	8.6%	2.0	0.8
North Dakota	**Total**	**52.5**	**100.0%**	**17.9%**	**5.9%**	**8.0**	**2.9**
Ohio	Coal	137.4	51.0%	3.4%	4.9%	4.6	6.5
Ohio	Natural gas	43.9	16.3%	7.3%	-1.3%	3.0	-0.6
Ohio	Oil	88.4	32.8%	22.6%	-0.4%	16.3	-0.4
Ohio	**Total**	**269.7**	**100.0%**	**9.7%**	**2.1%**	**23.8**	**5.5**
Oklahoma	Coal	35.2	32.2%	34.3%	0.3%	9.0	0.1
Oklahoma	Natural gas	36.2	33.1%	9.8%	24.1%	3.2	7.0
Oklahoma	Oil	38.1	34.8%	32.2%	8.8%	9.3	3.1
Oklahoma	**Total**	**109.5**	**100.0%**	**24.4%**	**10.3%**	**21.5**	**10.2**
Oregon	Coal	4.3	9.9%	190.4%	24.3%	2.8	0.8
Oregon	Natural gas	13.6	31.3%	131.4%	6.2%	7.7	0.8
Oregon	Oil	25.6	58.9%	8.5%	3.7%	2.0	0.9
Oregon	**Total**	**43.4**	**100.0%**	**40.5%**	**6.2%**	**12.5**	**2.6**
Pennsylvania	Coal	139.0	50.2%	2.5%	1.3%	3.4	1.8
Pennsylvania	Natural gas	41.1	14.9%	14.8%	6.7%	5.3	2.6
Pennsylvania	Oil	96.7	34.9%	6.1%	-5.2%	5.6	-5.3
Pennsylvania	**Total**	**276.9**	**100.0%**	**5.5%**	**-0.3%**	**14.3**	**-0.9**
Rhode Island	Coal	0.0	0.0%	-72.4%	-53.3%	0.0	0.0
Rhode Island	Natural gas	4.8	43.8%	124.5%	21.8%	2.7	0.9
Rhode Island	Oil	6.2	56.2%	-8.4%	-11.5%	-0.6	-0.8
Rhode Island	**Total**	**11.0**	**100.0%**	**23.6%**	**0.5%**	**2.1**	**0.1**
South Carolina	Coal	41.9	46.5%	54.0%	2.3%	14.7	1.0
South Carolina	Natural gas	9.4	10.5%	34.6%	10.1%	2.4	0.9
South Carolina	Oil	38.8	43.0%	41.8%	-6.2%	11.4	-2.6
South Carolina	**Total**	**90.1**	**100.0%**	**46.4%**	**-0.8%**	**28.6**	**-0.7**
South Dakota	Coal	3.1	22.9%	-4.4%	-23.7%	-0.1	-1.0
South Dakota	Natural gas	2.8	20.7%	111.0%	26.7%	1.5	0.6
South Dakota	Oil	7.7	56.4%	9.7%	5.9%	0.7	0.4
South Dakota	**Total**	**13.7**	**100.0%**	**17.4%**	**0.4%**	**2.0**	**0.1**

State	Fuel	Fossil Fuel CO_2 Emissions 2007 (MMT)	Share of State's Emissions 2007	% Change 1990-2007	% Change 2004-2007	CO_2 Change 1990-2007 (MMT)	CO_2 Change 2004-2007 (MMT)
Tennessee	Coal	63.5	49.1%	12.4%	3.8%	7.0	2.3
Tennessee	Natural gas	12.0	9.3%	0.7%	-4.1%	0.1	-0.5
Tennessee	Oil	53.8	41.6%	41.6%	-0.6%	15.8	-0.3
Tennessee	**Total**	**129.3**	**100.0%**	**21.5%**	**1.1%**	**22.9**	**1.5**
Texas	Coal	152.0	22.5%	21.0%	-1.0%	26.4	-1.6
Texas	Natural gas	190.4	28.2%	-6.3%	-7.3%	-12.8	-15.1
Texas	Oil	332.5	49.3%	31.5%	1.8%	79.7	5.7
Texas	**Total**	**674.9**	**100.0%**	**16.0%**	**-1.6%**	**93.3**	**-10.9**
United States	Coal	2141.3	35.7%	19.4%	1.3%	347.3	26.5
United States	Natural gas	1242.9	20.7%	19.7%	3.6%	204.7	43.0
United States	Oil	2611.5	43.6%	17.9%	-1.1%	397.0	-30.2
United States	**Total**	**5995.7**	**100.0%**	**18.8%**	**0.7%**	**949.0**	**39.3**
Utah	Coal	36.9	52.7%	8.0%	-2.1%	2.7	-0.8
Utah	Natural gas	12.2	17.4%	83.4%	40.9%	5.6	3.5
Utah	Oil	21.0	29.9%	60.9%	10.5%	7.9	2.0
Utah	**Total**	**70.2**	**100.0%**	**30.1%**	**7.3%**	**16.2**	**4.7**
Vermont	Coal	0.0	0.0%	-84.6%	22.8%	0.0	0.0
Vermont	Natural gas	0.5	7.2%	32.3%	1.6%	0.1	0.0
Vermont	Oil	6.0	92.8%	18.1%	-8.3%	0.9	-0.5
Vermont	**Total**	**6.5**	**100.0%**	**18.6%**	**-7.6%**	**1.0**	**-0.5**
Virginia	Coal	42.9	33.6%	29.4%	1.1%	9.7	0.5
Virginia	Natural gas	17.5	13.7%	73.5%	16.8%	7.4	2.5
Virginia	Oil	67.4	52.7%	30.3%	-4.0%	15.7	-2.8
Virginia	**Total**	**127.9**	**100.0%**	**34.6%**	**0.2%**	**32.8**	**0.2**
Washington	Coal	9.0	11.0%	12.2%	-14.9%	1.0	-1.6
Washington	Natural gas	14.7	17.9%	67.2%	4.1%	5.9	0.6
Washington	Oil	58.4	71.1%	7.0%	12.0%	3.8	6.3
Washington	Total	82.1	100.0%	15.0%	6.8%	10.7	5.3
Wisconsin	Coal	43.9	42.1%	18.2%	-6.9%	6.8	-3.2
Wisconsin	Natural gas	21.2	20.4%	29.7%	5.1%	4.9	1.0
Wisconsin	Oil	39.2	37.6%	21.9%	-1.8%	7.0	-0.7
Wisconsin	**Total**	**104.3**	**100.0%**	**21.8%**	**-2.7%**	**18.7**	**-2.9**
West Virginia	Coal	92.5	78.7%	13.1%	4.9%	10.7	4.3
West Virginia	Natural gas	6.4	5.5%	-5.0%	-14.5%	-0.3	-1.1
West Virginia	Oil	18.6	15.9%	4.9%	1.2%	0.9	0.2
West Virginia	Total	117.5	100.0%	10.6%	3.0%	11.3	3.4
Wyoming	Coal	46.7	71.9%	7.9%	-1.2%	3.4	-0.5
Wyoming	Natural gas	6.1	9.4%	15.5%	5.2%	0.8	0.3
Wyoming	Oil	12.1	18.6%	47.3%	11.6%	3.9	1.3
Wyoming	**Total**	**64.9**	**100.0%**	**14.3%**	**1.6%**	**8.1**	**1.0**

Appendix E: Sector Definitions

Below are the sector definitions used in this report, as presented at U.S. Department of Energy, Energy Information Administration, *Glossary*, downloaded from www.eia.doe.gov/glossary/index.html, 19 August 2009.

Commercial Sector: The commercial sector "consists of service-providing facilities and equipment of: businesses; Federal, State, and local governments; and other private and public organizations, such as religious, social, or fraternal groups. The commercial sector includes institutional living quarters. It also includes sewage treatment facilities. Common uses of energy associated with this sector include space heating, water heating, air conditioning, lighting, refrigeration, cooking, and running a wide variety of other equipment."

Electric Power Sector: The electric power sector includes electricity generating facilities and combined heat and power plants "whose primary business is to sell electricity, or electricity and heat, to the public."

Industrial Sector: The industrial sector "consists of all facilities and equipment used for producing, processing, or assembling goods. The industrial sector encompasses the following types of activity: manufacturing…; agriculture, forestry, fishing and hunting...; mining, including oil and gas extraction…; and construction…. Overall energy use in this sector is largely for process heat and cooling and powering machinery, with lesser amounts used for facility heating, air conditioning, and lighting. Fossil fuels are also used as raw material inputs to manufactured products."

Residential Sector: The residential sector "consists of living quarters for private households. Common uses of energy associated with this sector include space heating, water heating, air conditioning, lighting, refrigeration, cooking, and running a variety of other appliances. The residential sector excludes institutional living quarters."

Transportation Sector: The transportation sector "consists of all vehicles whose primary purpose is transporting people and/or goods from one physical location to another. Included are automobiles; trucks; buses; motorcycles; trains, subways, and other rail vehicles; aircraft; and ships, barges, and other waterborne vehicles. Vehicles whose primary purpose is not transportation (e.g., construction cranes and bulldozers, farming vehicles, and warehouse tractors and forklifts) are classified in the sector of their primary use."

Notes

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3 Corresponds to scenario A1F1 in Intergovernmental Panel on Climate Change, *IPCC Fourth Assessment Report*, *Climate Change 2007: The Physical Science Basis*, *Summary for Policy Makers*, 5 February 2007.

4 See note 1.

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12 See note 10.

13 G. Marland, Oak Ridge National Laboratory, *A Compendium of Data on Global Change*, 2006, cited in James Hansen, *Dangerous Human-Made Interference with Climate*, testimony before the U.S. House of Representatives, Select Committee on Energy Independence and Global Warming, 26 April 2007.

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16 Ibid.

17 Jim Hansen, "The Threat to the Planet," *New York Review of Books*, 53: 12, 13 July 2006, 12-16.

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19 U.S. EPA, *Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2007*, *Annex 2: Methodology and Data for Estimating CO2 Emissions from Fossil Fuel Combustion*, 15 April 2009.

20 U.S. Department of Energy, Energy Information Administration, *Electric Power Annual 2007*, *1990 - 2007 Net Generation by State by Type of Producer by Energy Source (EIA-906)*, 29 January 2009.

21 8 percent includes geothermal, hydropower, other biomass, solar, wind and wood. U.S. Department of Energy, Energy Information Administration, *Electric Power Annual 2007*, *1990 - 2007 Net Generation by State by Type of Producer by Energy Source (EIA-906)*, 29 January 2009.

22 See note 20.

23 "Other" includes aviation gasoline, lubricants and liquefied petroleum gas.

24 U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics*, *Table VM-202*, *Annual Vehicle Miles of Travel*, *by Functional System*, April 1997, and U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics*, *Table VM-2: Annual Vehicle Miles of Travel*, *by Functional System*, October 2008.

25 The average fuel economy of light-duty vehicles (cars and light trucks such as SUVs) declined from an adjusted 22 miles per gallon in model year 1987 to 19.3 miles per gallon in model year 2004, as SUVs came to make up a greater share of the light-duty vehicle marketplace. By model year 2008, average fuel economy had rebounded somewhat to 20.8 miles per gallon. See U.S. Environmental Protection Agency, *Light Duty Automotive Technology and Fuel Economy Trends: 1975 Through 2008*, September 2008.

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