T2
& Associates

Key Investments in Greenhouse Gas Mitigation Technologies from 2000 Through 2010 by Energy Firms, Other Industry and the Federal Government

Thomas Tanton
President, T^2 and Associates
October 2011

Table of Contents

Undertaken for API

Preface

Glossary of Terms

Technology Categories

Fuel substitution technologies include liquefied natural gas (LNG), nuclear, and landfill gas.

*End-us*e technologies include efficiency improvements, such as cogeneration (CHP), improved lighting, and carbon capture and storage (CCS).

Non-hydrocarbon technologies include any energy form that is not a hydrocarbon energy source, such as wind and solar.

Enabling technologies include various consortia that are researching and developing a wide variety of technologies, and include several university programs.

Alternative Fuel Vehicles and Advanced Technology Vehicles use both petroleum and nonpetroleum based fuels (or mixtures) or fuel-cell technologies.

Biomass uses plant materials, animal fats and wastes, or woody construction debris to produce energy.

Biorefineries produce a broad slate of products from plant materials and/or animal fats.

Biodiesel is an increasingly important sub-group of this technology. Biodiesel is produced by chemically altering plant oils (e.g., soybean oil) and/or animal fats into diesel fuel substitutes. The term generally refers ONLY to diesel substitutes produced from vegetable oils and/or animal fats. However, we do include other bio-derivatives including those produced as refinery products, such as certain higher alcohols and alkanes.

Carbon Capture and Storage (CCS) is the capture and long term storage of carbon dioxide emissions from combustion processes.

Cogeneration, or combined heat and power (CHP), is the simultaneous production of both electricity and thermal energy (steam, hot water, hot air).

Ethanol is currently produced by the fermentation of various sugars, primarily from corn and sugar cane. Sugar cane is not a significant source in the North American market. Technologies to produce ethanol from cellulose are in the development stage.

Gasification is a thermal process for converting solid materials (e.g. biomass, coal or petroleum coke) into a synthetic gas. The gas may be used directly, or converted to hydrogen or liquid fuels.

Gas Flaring occurs when crude oil is extracted from the earth and natural gas associated with the oil is produced to the surface as well. In areas of the world lacking infrastructure and markets, this associated gas is usually flared (burned) or sometimes vented (emitted as un-burnt gas).

Liquefied natural gas (LNG) is natural gas that has been super-cooled to a liquid for transport. This dramatically reduces the volume for cost-effective transport over longer distances.

Landfill gas (LFG) is methane that is produced anaerobically in landfills from the decomposition of waste material.

SF6 is sulfur hexafluoride. It is used in the electrical industry as a dielectric and within the magnesium production industry. It is a potent greenhouse gas.

Fluorocarbons are various chemicals used as either refrigerants or industrial cleaning agents. Several of them are potent greenhouse gasses, while others can deplete ozone. Industry continues to develop substitutes for those fluorocarbons.

Nitrous Oxides (N_2O) are produced by both biogenic and anthropogenic sources. Primary anthropogenic sources of N_2O are agricultural practices related to the use of fertilizer. Nitrous oxide is also produced naturally from a wide variety of biological sources in soil and water, particularly microbial action in wet tropical forests. In agriculture, it can be reduced through improved farming practices, such as low-tillage.

Shale Gas is an important source of expanded supply of natural gas in the U.S., typically produced through a well tested process known as hydraulic fracturing. As a greenhouse gas emission reduction technology, shale gas increases the supply of natural gas to the North American market that may substitute for coal, and to a lesser extent for petroleum fuels. The potential for greenhouse gas mitigation is determined, however, by the amount of gas-on-gas substitution versus gas-on-coal.

A *Disruptive Technology* is a new technological innovation, product, or service that overturns the existing dominant technology in the market, despite the fact that the disruptive technology is radically different from the leading technology and requires fundamental infrastructure and support changes.

Global Warming Potential of Greenhouse Gases

Each greenhouse gas has a different impact or "global warming potential" that is measured relative to carbon dioxide (CO_2). The gases that are included within this analysis have the following global warming potentials[1]:

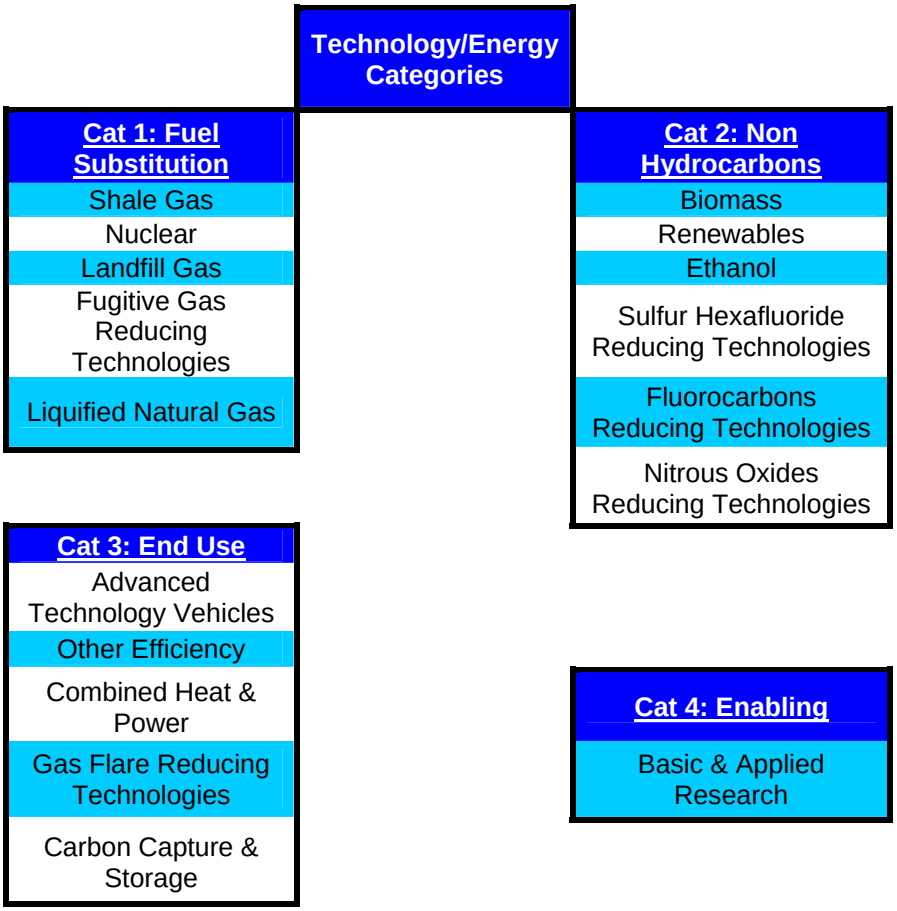
- Carbon Dioxide (CO2) 1
- Methane (CH_4) 25
- Nitrous Oxide (N_2O) 298
- Halogenated Fluorocarbons 1030-14,800*
- Fluorocarbons 7,400-10,300*
- Sulfur Hexafluoride (SF_6) 22,800

*Actual value depends on specific chemical within a class

[1] U.S. Environmental Protection Agency, Inventory Of U.S. Greenhouse Gas Emissions And Sinks: 1990-2007 (April 2009); http://www.epa.gov/climatechange/emissions/usinventoryreport.html GWP numbers from IPCC's Fourth Scientific Assessment Report.

Figure P-1

Categorization of GHG Mitigating Technologies



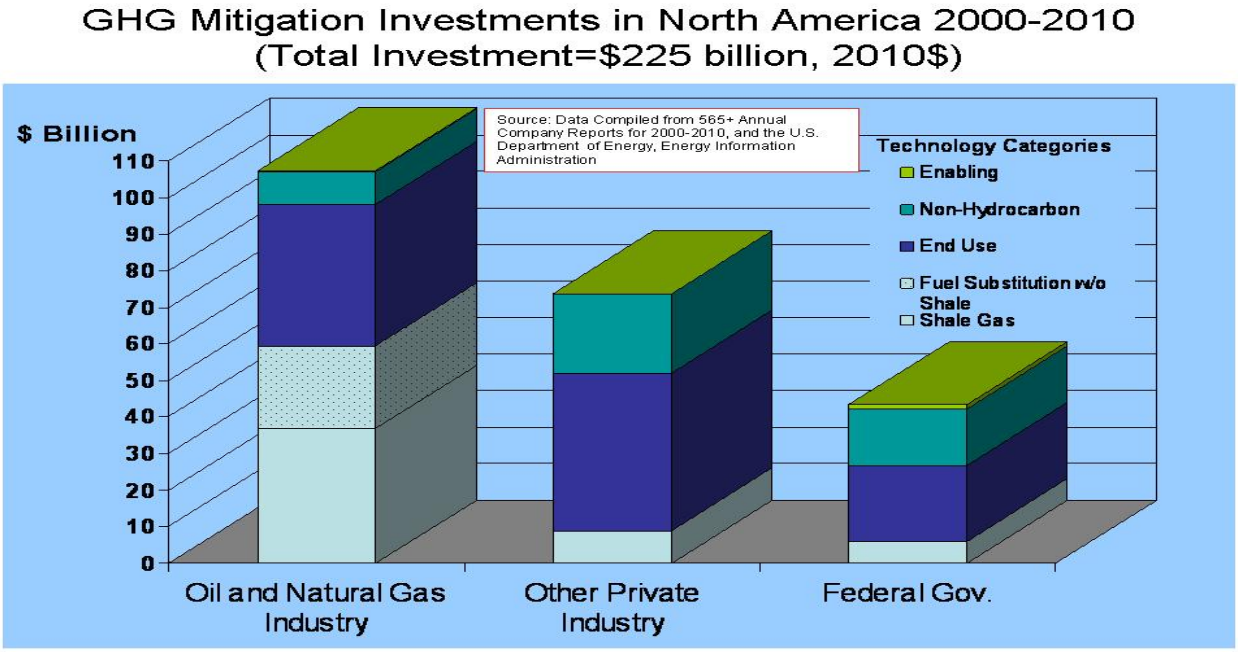
Executive Summary

This report provides estimates of the investments made from 2000 through 2010 in various greenhouse gas emission reduction technologies. Estimates are provided for the oil and gas industry, other private sector industries, and the Federal Government.

North American investments in GHG mitigating technologies are estimated to have totaled $225 billion between 2000 and 2010.[2] Figure ES-1 summarizes these greenhouse gas mitigation investments by investor type and by technology category. Over the 2000 – 2010 period, the U.S. based oil and natural gas industry invested an estimated $108 billion in GHG mitigating technologies including shale gas, and $71 billion without shale gas investments, other U.S. based private industries invested an estimated $74 billion, and the Federal Government invested an estimated $43 billion.

Major investments by the oil and natural gas industry included shale gas (especially over the 2009-10 period), efficiency improvements including combined heat and power, and advanced technology for vehicles. Investments in wind, biofuels and solar were also made. Other private industries' major investments included advanced technology vehicles, efficiency improvements in electricity generation, biofuels, wind and solar. The Federal Government has spread investment across all technology categories with major investments in energy efficient lighting, wind, solar, biofuels and basic research. It also made significant investments in renewables and efficiency during 2009 and 2010 as part of the American Recovery and Reinvestment Act of 2009 (ARRA).

Figure ES-1



[2] "North American market" is used herein to include Canada and the U.S. Percentages may not add to 100% due to rounding. All figures are provided in 2010 dollars.

Emission Reductions

The EIA[3] has recently reported that energy-related carbon dioxide emissions in the United States in 2010 increased by 213 million metric tons or 3.9 percent compared to 2009. 2010 was preceded by declines in three out of the four previous years. U.S. anthropogenic greenhouse gas emissions in 2009 were 5.8 percent below the 2008 total. The decrease in U.S. CO2 emissions in 2009 resulted primarily from three factors: an economy in recession, a particularly hard-hit energy-intensive industry sector, and a large drop in the price of natural gas that caused fuel switching away from coal to natural gas in the electric power sector. While the U.S. economy declined by 2.6 percent in 2009, a 5.8-percent decrease in total greenhouse gas emissions meant that U.S. greenhouse gas intensity improved by 3.3 percent from 2008 to 2009. In 2010 GDP grew by 3.0 percent, but emissions increased by 3.9 percent, largely as a result of a rebound in coal use for power generation. Since 1990, carbon dioxide emissions in the United States have grown much more slowly than GDP; in 2007 emissions reached a peak of about 20 percent greater than 1990, but even after the 2010 increase, carbon dioxide emissions are only about 12 percent more than in 1990. GDP has increased by 63 percent over that same time period.

The GHG mitigation investments catalogued in this report likely delivered greenhouse gas mitigation benefits in addition to the three factors just noted, but no connection is made between specific investments and reduction amounts. Reported emission reductions by the oil and gas industry in the North American market are shown in Table ES-1. These are reductions that occur from the various companies' operations, such as improved efficiency in energy use in their facilities and improved fugitive emission control.

Table ES-1
Reported Emission Reductions 2008 -2010 versus Prior Year
Oil and Gas Industry in North America
Million Metric Tons CO2e

	Fuel Substitution	End Use	Nonhydrocarbon	Total
2008	22.2	16.9	9.2	48.3
2009	22.2	21.6	9.0	52.8
2010	21.2	25.2	9.5	55.9

U.S. based oil and gas industry sources have reported direct emission reductions totaling 48.3 million metric tons CO_2 equivalent for 2008 compared to 2007. The reduction of

[3] Noted trends and statistics in this paragraph are from Energy Information Administration, U.S. Energy Related Carbon Dioxide Emissions, 2010, Release Date: August 18, 2011

48.3 million metric tons is equivalent to taking 9.7 million cars and light trucks off the road.[4] Comparable figures for 2009 are a 52.8 million metric ton reduction and 10.6 million cars taken off the roads. For 2010 the reported reduction of 55.9 million metric tons equates to 11.2 million cars taken off the roads. For comparison, there are 246 million cars and trucks in the US, according to the U.S. Department of Transportation.[5]

Major Changes Since Last Report

Oil and gas companies, other private sector companies, and the Federal government continue to invest in greenhouse gas mitigating technologies in the North American market. Since the last report that covered investment from 2000-08[6], total investment in these technologies has increased by approximately $88 billion in the 2009-10 period, or approximately 39 percent, from $137 billion to $225 billion[7]. In addition, shale gas has been added as a technology that reduces greenhouse gas emissions (see discussion on page iii.) Even without the addition of an additional technology, overall investment saw a surge in 2009 and 2010.

[4] Passenger vehicles estimate derived from http://www.epa.gov/otaq/climate/420f05004.htm, by dividing total reductions by average passenger vehicle emissions

[5] http://www.fhwa.dot.gov/policyinformation/statistics/2009

[6] Thomas Tanton, Foss, M., Volkov, D. *Key Investments in Greenhouse Gas Mitigation Technologies by Energy Firms, Other Industry and the Federal Government: an Update*, June 2009.

[7] Note that the last report provided estimated investments in nominal dollars; these have been adjusted to constant 2010 dollars throughout.

Chapter I: Investments From 2000-2010

Introduction

This report summarizes identified investment in GHG mitigation technologies in North America during the period 2000 through 2010.[8] Investments are reported for the private sector and the Federal government by technology/energy category. The data were compiled from a review of over 565 company annual reports, federal budget documents, and other public sources.[9] It should be noted that most of the investments provide benefits in addition to any ability to reduce greenhouse gas emissions, and were made for multiple reasons including to increase and/or diversify energy supplies, or to improve efficiency.

The issue of climate change has garnered the attention of scientists, government officials, the media and public over the last decade. As climate policy in the U.S. continues to evolve, it is important to understand how current and emerging greenhouse gas (GHG) mitigation technologies are being employed today by major stakeholders to address GHG emissions.

Greenhouse gas emissions can be reduced by a variety of measures, such as improving energy efficiency and, in some applications, by developing alternative energy sources, like wind and solar power. Another way to reduce atmospheric emissions is to capture the CO_2 that is released from fossil fuel-fired power plants and store it underground, referred to as carbon capture and storage (CCS). This is the focus of significant and increased attention, as power generation accounts for about one-third of CO_2 emissions from fossil fuel use. Oil and natural gas companies are reducing natural gas flaring and fugitive emissions to curb releases of methane, a potent greenhouse gas, while at the same time adding to energy supplies through various substitute fuels. The GHG mitigating technologies examined in this report were placed into four categories: *fuel substitution*, *nonhydrocarbon*, *end-use* and *enabling* technologies as laid out in the organizational chart on page iv.

This report does not include investments made by individual consumers (*e.g.* for more efficient appliances or hybrid and flexible fuel vehicles), or tax policies by the government intended to encourage specific technologies, nor monies paid in various legal settlements. Finally, many of the project investments were made by partnerships and/or joint ventures. While all reasonable efforts were made to allocate those project expenditures to the entities involved, this was not

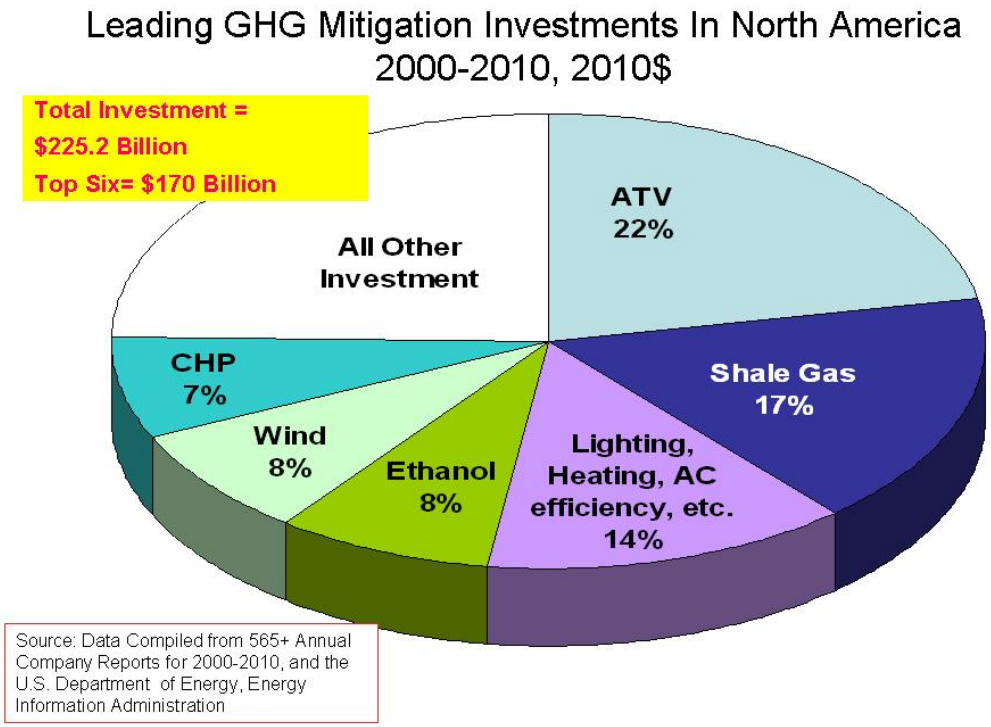
[8] No claim is made to have captured 100% of investments in each technology or for each GHG, but the author believes that further refinements to the database would change the relative distributions only at the margin.
[9] See bibliography for a list of data sources used in this study. Not all company reports reviewed provided data for the analysis undertaken in this report.

always possible. In those instances, project level expenditures were assigned to the lead sponsor and the corresponding sector.

Six Leading Technology Investments

The six leading emission mitigation technologies for private and public sector investment (***Figure 1***), as measured by expenditure share, are: advanced technology vehicles (ATV), 22 percent ($49.5 billion); shale gas, 17 percent ($37.7 billion); other efficiency, 14 percent ($30.7 billion)[10]; ethanol, 8 percent ($18.4 billion); wind, 8 percent ($17.4 billion) and Combined Heat and Power (CHP), 7 percent ($16.3 billion.) These top six technologies commanded 76 percent of the estimated total investments, or $170 billion over the 2000 – 2010 period in the North American market. All other technologies (including LNG, 6%, fugitive gas reduction, 5% and nuclear, 4%) combined comprised 24 percent of the estimated total investments.[11]

Figure 1



[10] "Efficiency" comprises all 'other' efficiency technologies except for combined heat and power (CHP) and vehicle efficiency, such as more efficient lighting, heating, ventilation , air conditioning, *etc.*

[11] Percentages may not add to 100% due to rounding.

Major Movers

During the 2000 to 2010 period, different technologies captured attention in certain years, as opportunities and challenges developed or played out. Within the oil and gas industry, the most significant technology mover was shale gas, seeing a virtual boom in 2009 and 2010, with a two-year increase in investments and operational spending of approximately $31 billion. This increased attention on domestic natural gas sources also drove a reduction in investment levels for imported LNG. In addition, as CHP markets became saturated (at least within the large scale projects) investment levels dropped off, with $400 million invested during 2009 and 2010, compared to $2.8 billion in 2005 and 2006.

The Federal Government significantly increased their investment participation, mostly under the American Recovery and Reinvestment Act of 2009 (ARRA). Direct expenditures by the Federal Government helped drive a 2009 and 2010 investment surge in wind and ethanol as well as efficiency improvements. The Federal Government also increased its investments in conventional technologies and fuels. Other private companies increased their investments in renewables, largely driven by the Federal government's own direct expenditures under ARRA, often in the form of direct grants to private sector investors. Other private sector investments were further accelerated by various government policies and mandates, such as state Renewable Portfolio Standards and the Federal Renewable Fuel Standard that encouraged or required investments by other private companies in wind and ethanol production, over and above the direct Federal investments.

Table 1 summarizes the major changes in technology focus, showing the percent of total investments in the 2000 to 2008 and 2009 to 2010 periods.

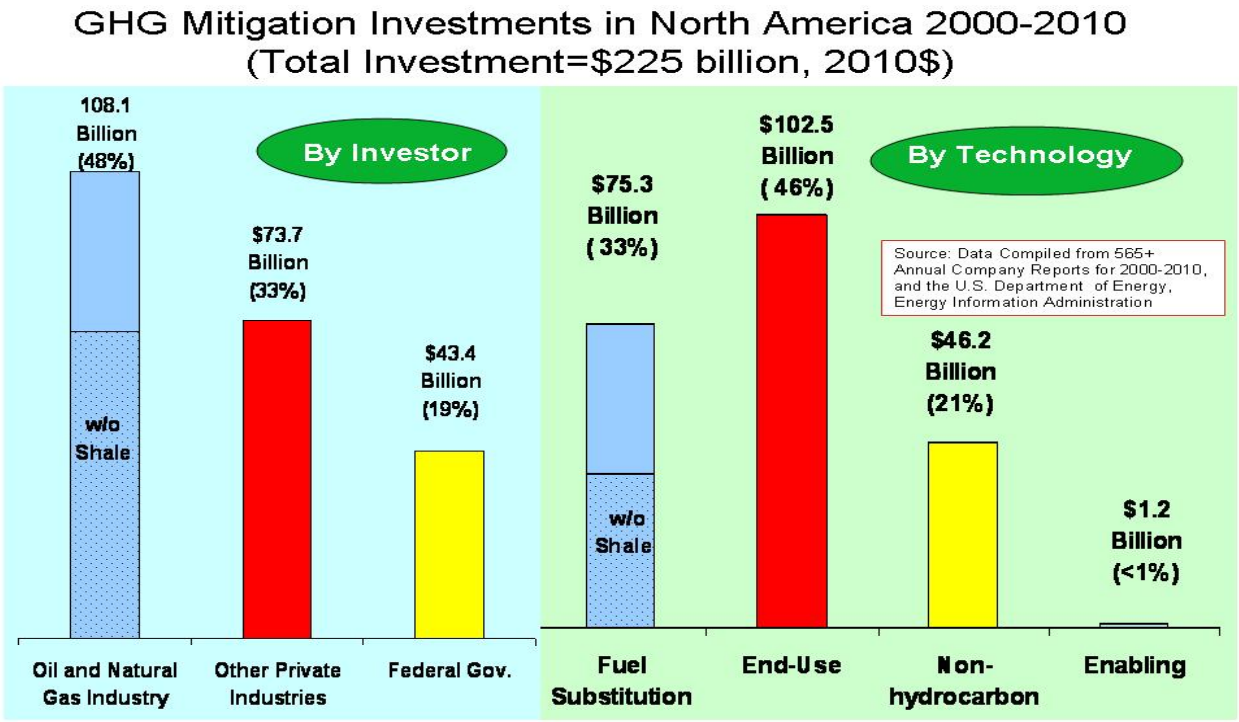
Table 1
Change in Investment Share 2000-2008 Compared to 2009-2010

Technology	Share 2000 to 2008	Share 2009 to 2010
Shale Gas	5%	39%
Alt. Tech. Vehicles	27%	13%
Com. Heat and Power	11%	0.5%
LNG	9%	0.5%
Fugitive Emissions	8%	0.6%
Nuclear	3%	7%
Ethanol(corn)	9%	6%
Wind	7%	9%

Greenhouse Gas Mitigation Technology Investments

U.S. based companies[12] and the Federal government invested approximately $225.2 billion from 2000 to 2010 on greenhouse gas mitigating technologies in the North American market. The U.S. based oil and gas industry invested $108.1 billion ($71.1 billion without shale gas), 48 percent of the $225.2 billion total, in end-use, fuel substitution, non-hydrocarbon, and enabling technologies. Other private industries invested an estimated $73.7 billion or 33 percent of the total, predominantly in end-use and non-hydrocarbon technologies. During the same period, the Federal government invested in a wide array of greenhouse gas mitigation technologies, with expenditures of approximately $43.4 billion, or 19 percent of the total North American investment ***(Figure 2)***.[13]

Figure 2



Oil and Gas Industry Investments from 2000 through 2010

It is estimated that U.S. based oil and gas companies invested $108.1 billion ($71.1 billion without shale gas) from 2000 through 2010 in GHG mitigating technologies in the North

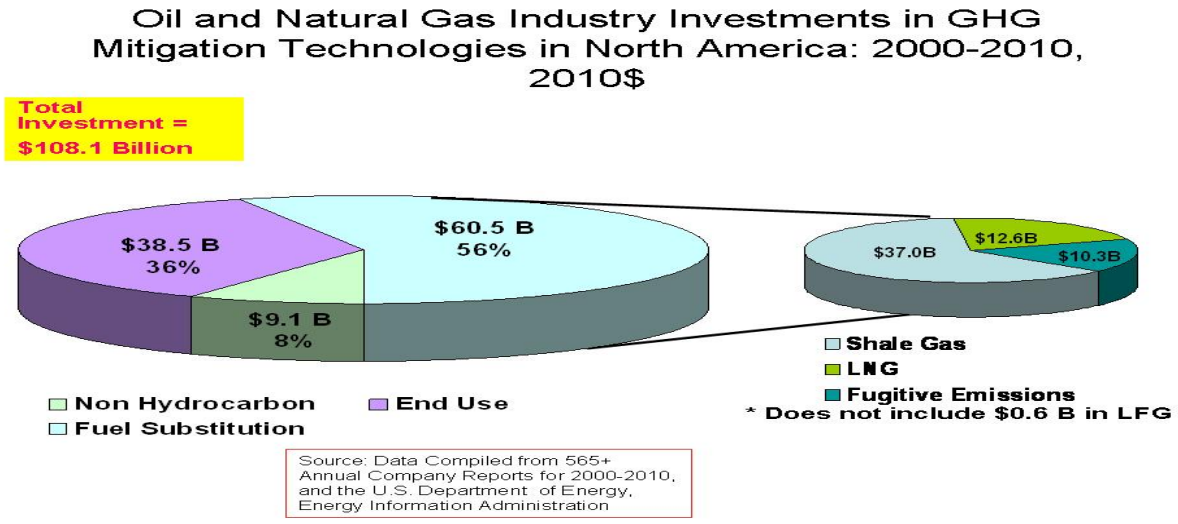
[12] U.S. based companies include both U.S. companies and foreign-owned companies operating in the U.S.
[13] State and local alternative-energy investment would add approximately $2 billion to this total on the public-sector side. http://www.dsireusa.org/

American market.[14] (***Figure 3***) This expenditure represents 48 percent of the estimated total of $225.2 billion spent by U.S. companies and the Federal government. Publicly announced nonhydrocarbon investment by the U.S. based oil and gas industry in the North American market is estimated at just more than $9 billion over the 2000 – 2010 period, or about 8 percent of the total industry's investments. This represents 20 percent of the total industry and Federal government investments of approximately $46.2 billion in this technology class ***(Figure 9a)***. The oil and gas industry's top publicly announced non-hydrocarbon investments are in wind and biofuels; expenditures were also made in solar, geothermal, and landfill digester gas.

The largest share of investments made by the oil and gas industry, roughly 56 percent or $60.5 billion, was in the fuel substitution category. This $60.5 billion investment in fuel substitution technologies represents 80 percent of the estimated $75.3 billion invested in total in this technology class ***(Figure 9b)***. Of this $60.5 billion, $37 billion was invested to expand shale gas development. The remaining fuel substitution technologies received $23.5 billion.

The oil and gas industry invested $38.5 billion (or 35 percent of its $108.1 billion total) for advanced end-use technologies, mostly for efficiency improvements including combined heat and power in the early part of the period, carbon capture and storage[15] and for advanced technology for vehicles. Significantly, this $38.5 billion investment in end-use technologies represents 38 percent of the estimated total amount ($102.5 billion) spent by all U.S. companies and the Federal government in this technology category ***(Figure 9c)***.

Figure 3

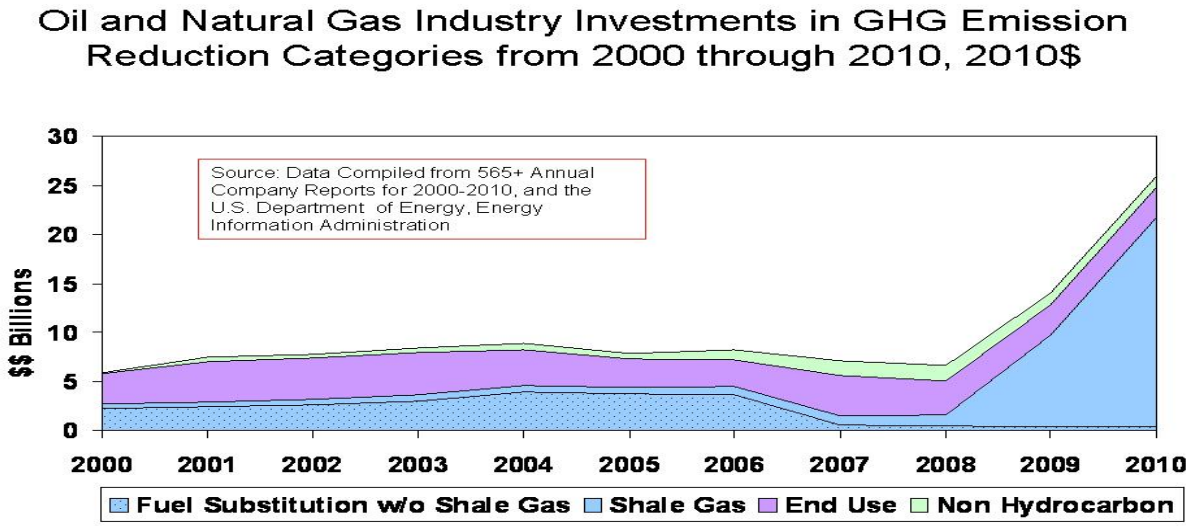


[14] "North American market" is used herein to include Canada and the U.S.

[15] Carbon Capture and Storage has been moved from "enabling" in the May 2008 Report to "end-use" here. As described on page 24, this technology has progressed beyond basic research, with demonstration plants now under construction.

Figure 4 shows the investment pattern over the 2000-2010 period for the oil and gas industry. Significant new levels of investment occurred during 2009 and 2010 in the fuel substitution category. This surge was driven by investments for shale gas development, as advancing technology enabled companies to efficiently develop the very large US shale gas resources. These significant new investments were made in the face of a persistent recession.

Figure 4



Other Private Industries' and Federal Government Investments from 2000 to 2010

In addition to the oil and gas industry, other significant technology investments were made by the motor-vehicle industry, agricultural industry, electric utilities, and the renewable-fuels industry. These other private industries are estimated to have invested $73.7 billion (or 33 percent of the $225.2 billion total) from 2000 to 2010 (***Figure 5***). Other private industries made significant investments in (1) the *end-use* market (mostly automotive companies investing in advanced-technology vehicles), and (2) the *non-hydrocarbon* market (mostly agricultural firms in the ethanol market, independent power producers in the electricity market, and manufacturing firms in the wind and solar markets).

Of the $73.7 billion sector total, $43.2 billion (57 percent) is associated with end-use technologies, $21.5 billion (30 percent) with non-hydrocarbons and $9 billion (13 percent) with fuel substitution technologies. End-use technologies include advanced technology vehicles, efficiency improvements and combined heat and power. Non-hydrocarbons include industrial gas replacements (*e.g.* for SF_6), and renewables such as wind, and ethanol. By technology

class, other private industries' investment share was 42 percent of the end-use category, 46 percent of the non-hydrocarbon investment and 12 percent of the fuel substitution category (***Figures 9a-c***).

Figure 5

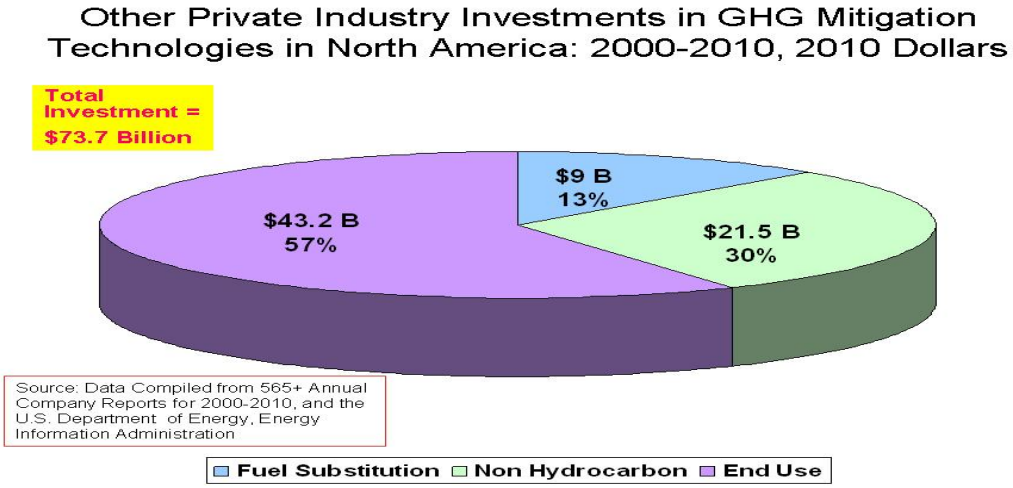
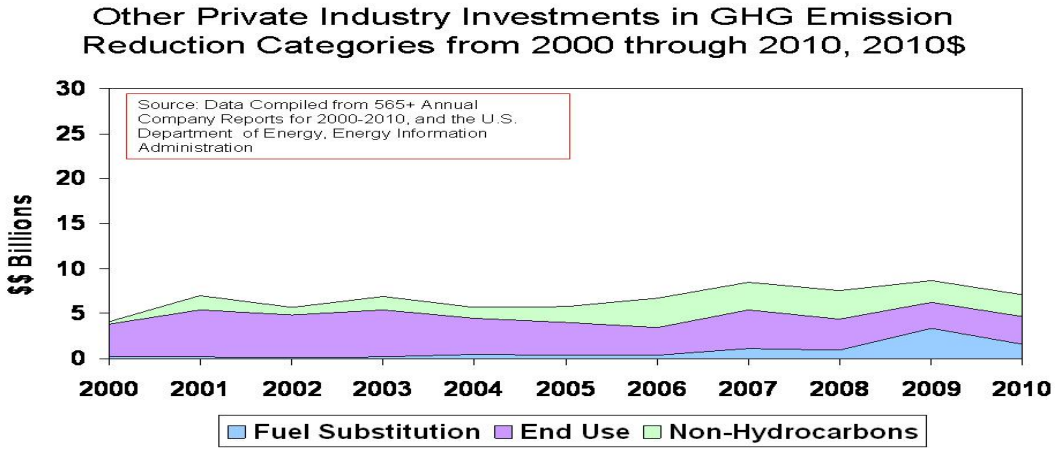


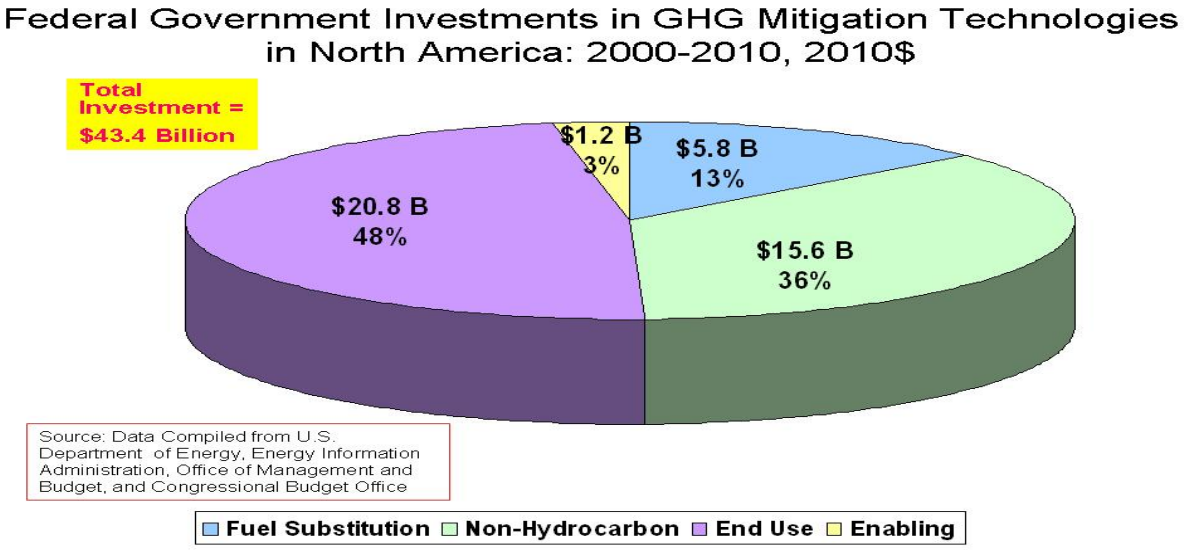
Figure 6 shows the investment pattern over the 2000-2010 period for other private industry. Significant new levels of investment occurred during 2009, especially in non-hydrocarbon measures such as wind energy, largely driven by various states Renewable Portfolio Standards (and favorable tax credits) and the Federal Renewable Fuel Standard. Fuel substitution technologies included a significant proportion in landfill gas recovery and in the later years significant investment in nuclear. Some of the investments were "matched" or otherwise encouraged by Federal expenditures under ARRA, further increasing activity by other private sector industries. In 2010 the investment level by other private industry fell off compared to 2009.

Figure 6



The Federal government (***Figure 7***) has been the most diversified investor, supporting all sixteen technologies considered in this report. Total estimated expenditure in the years 2000-2010 of $43.4 billion has been spread between fuel substitution, non-hydrocarbons (primarily ethanol, wind, and solar) and end-use (primarily cogeneration and lighting technologies). Federal support for the "enabling" category, especially basic research, is significant.

Figure 7



Forty-eight percent of the Federal government investment is estimated to be in end-use technology, including more energy efficient lighting, combined heat and power and similar efficiency improvements as seen in Figure 7. Thirty-six percent of the Federal government investment is in the nonhydrocarbon class (including wind, ethanol and biodiesel), 13 percent in the fuel substitution class (such as landfill gas), and 3 percent fell into the enabling technology class.

During 2009 and 2010 major investments were made by the Federal government in end use and non-hydrocarbons as part of American Recovery and Reinvestment Act (ARRA) expenditures, often paired with investments by private sector entities.

The estimates provided here cannot be compared directly to estimates[16] provided by the Administration and others of ARRA impacts, for a number of reasons. First, the technologies

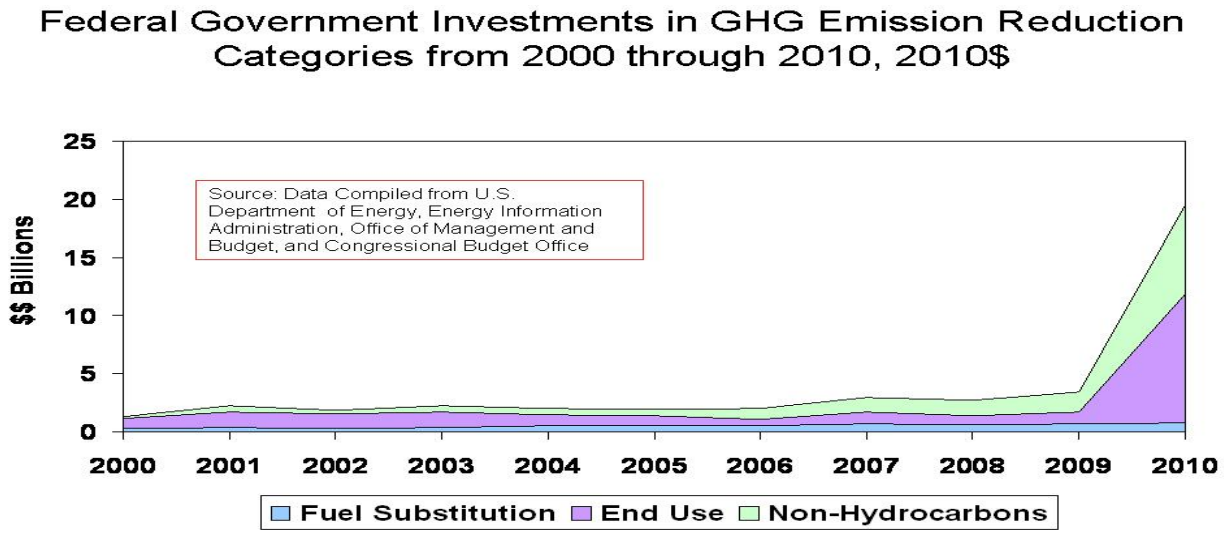
[16] See for example: http://apolloalliance.org/feature-articles/clean-energy-provisions-of-stimulus-are-consistent-with-apollo-economic-recovery-act/ , http://www.sustainablebusiness.com/index.cfm/go/news.display/id/21907 ,and http://www.whitehouse.gov/issues/energy-and-environment/

included differ. Second, the types of projects differ; this report does not include so-called green jobs training programs. Third, only expenditures made were included, not those authorized or appropriated. Finally, federal tax transfers in the form of credits and similar techniques and international assistance were not included.

Figure 8 shows the investment pattern over the 2000-2010 period for the Federal Government. Significant new levels of investment occurred during 2009 and 2010, especially in non-hydrocarbon measures and efficiency, mostly as a result of Department of Energy spending of ARRA appropriations. According to the Government Accountability Office, the Federal investments under ARRA were concentrated in energy efficiency and renewable technologies.[17]

Another feature of the change in the amount of Federal Government investments during 2009 and 2010, beyond the magnitude of federal spending, was the *nature* of federal spending. In earlier periods, federal spending was more heavily focused on early-stage development investments, particularly at the basic research stage. Now it includes later stage and commercial plants, such as the Section 1603 direct grants to wind energy facilities in lieu of tax credits.

Figure 8



[17] Frank Rusco, Director Natural Resources and Environment, United States Government Accountability Office, Testimony Before the Subcommittee on Oversight and Investigations, Committee on Energy and Commerce, House of Representatives, RECOVERY ACT Status of Department of Energy's Obligations and Spending, March 17, 2011

Finally, it is important to recognize that aggregate investment levels for each technology are, and should be, consistent with the development status and market potential of that technology. More mature technologies are likely to see higher levels of investment than technologies earlier in the development cycle. The technologies included here are at different stages in their development cycle and exhibit varying levels of market potential as indicated in part by relative expenditures. The distribution of investments can be expected to shift as different technologies mature or market conditions change.

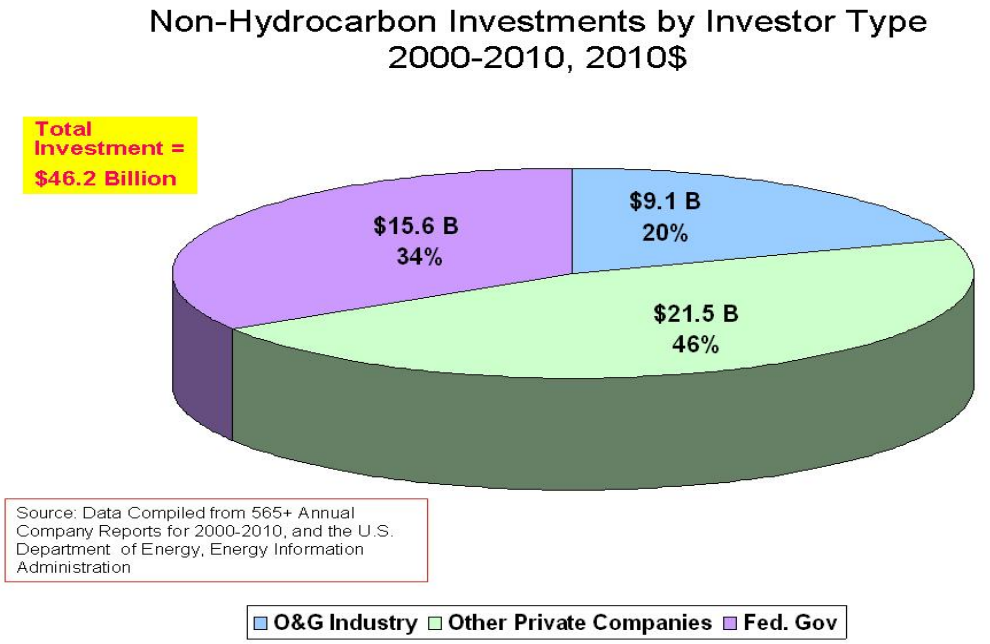
Technology Investments by Investor Types

Figures 9a-c show, for each technology category, the investment shares by investor type.

Non-Hydrocarbon (9a)

Other U.S.-based private industry invested roughly 46 percent of the $46.2 billion non-hydrocarbon category total from 2000 to 2010. This includes independent power producers investing in renewables like wind and solar, and agricultural interests investing in ethanol production. The U.S. based oil and gas industry invested approximately 20 percent of the category total, including investments in renewables like wind and solar, as well as ethanol. The Federal government invested approximately 34 percent, spread among the renewables, ethanol and other technologies, much of it in the last two years of the 2000-2010 period.

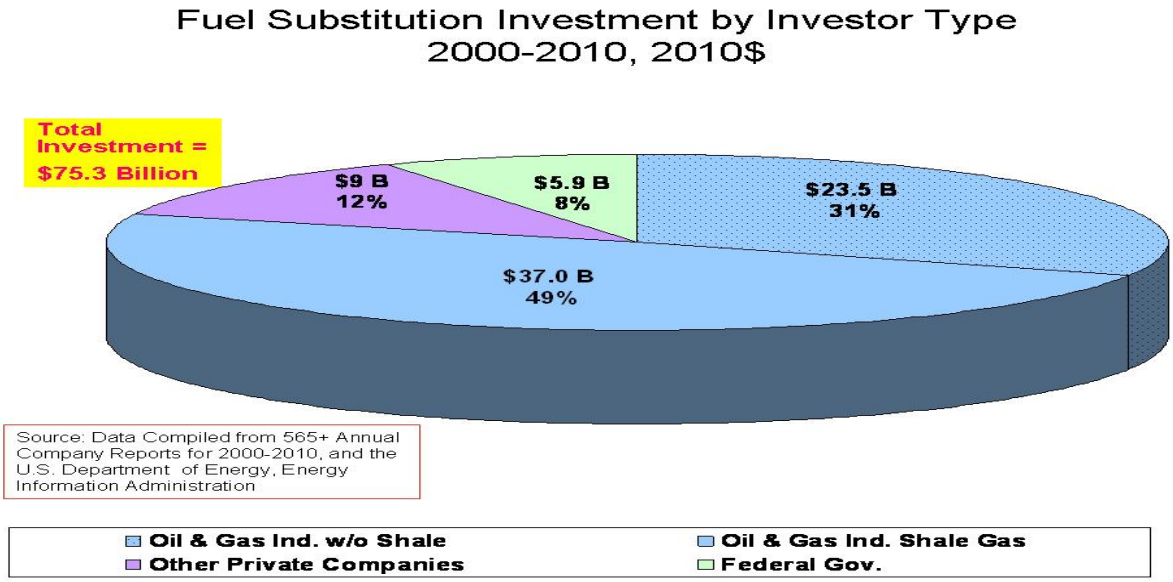
Figure 9a



Fuel Substitution (9b)

The U.S.-based oil and gas industry invested approximately 80 percent of the fuel substitution category (61% without shale gas), with significant investments in liquefied natural gas (LNG) in early years and shifting to and increasing, dramatically, investments in shale gas in the later years. Other private companies accounted for roughly 12 percent, with a significant proportion in landfill gas recovery and nuclear. The Federal government accounted for about 8 percent of this category, including investments in nuclear and landfill gas recovery.

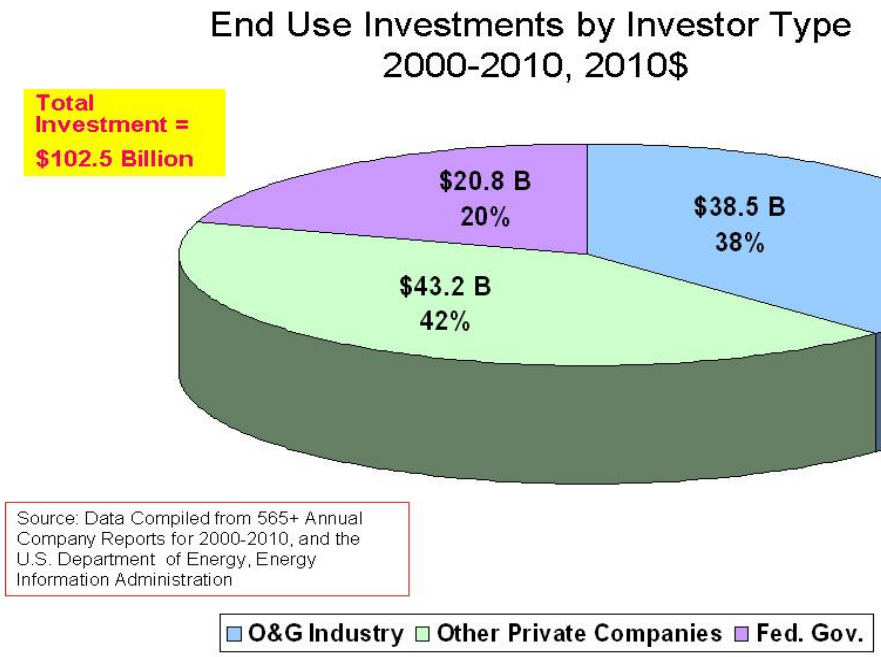
Figure 9b



End Use (9c)

Within the end-use category, other U.S. based industries invested an estimated 42 percent. This includes significant investments by automotive companies investing in advanced-technology vehicles, and coal companies investments in carbon capture and storage (CCS). U.S. based oil and gas industry invested approximately 38 percent of the $102.5 billion total investment in this technology category, principally in cogeneration, carbon capture and storage and advanced technology vehicles. Advanced batteries are an example of the advanced technology vehicle investments made by the U.S. based oil and gas industry. The Federal government invested approximately 20 percent in the end-use category, including investments in lighting technologies and advanced technology vehicles. In the case of advanced technology vehicles, Federal Government investments are “matched” with investments from both oil and gas companies and, more typically, other private sector companies like automobile and battery makers.

Figure 9c


End Use Investments by Investor Type
2000-2010, 2010$
Total Investment = $102.5 Billion
$20.8 B
20%
$38.5 B
38%
$43.2 B
42%
Source: Data Compiled from 565+ Annual Company Reports for 2000-2010, and the U.S. Department of Energy, Energy Information Administration
O&G Industry
Other Private Companies
Fed. Gov.

Chapter II: Emission Reductions Reported

This chapter provides a compilation of greenhouse gas (GHG) emission reduction estimates reported by the U.S. based oil and natural gas industry. The emission reduction estimates for 2007-2010 presented herein were compiled strictly from company reports including annual shareholder reports and corporate responsibility reports. The authors did not solicit, receive, or utilize any nonpublic information to develop these estimates. As discussed in the Methodology section below, there are indications that this summary of reported reductions is an underestimate of actual reductions.

Reported reductions fall into three major categories:

- *Fuel substitution*, such as increasing natural gas supply through capturing fugitive emissions, and replacing more carbon intensive fuels,
- *Non-hydrocarbon*, such as biofuels produced at biorefineries, and,
- *End-use*, including combined heat and power.

The more than $108.1 billion in GHG mitigation technology investments made by the U.S. based oil and natural gas industry over 2000 to 2010 clearly resulted in emission reductions. However, it needs to be recognized that other factors make it difficult to specifically link aggregate emission reductions and individual past investments. For example, while this report documents emission reductions between 2007 and 2010, investments made can often take time to complete with actual emission reductions, occurring with a lag. Some of the reductions in 2007-2010 are likely due to investments made in the early to middle years of the 2000-2010 period.

Reported emission reductions by the oil and gas industry in the North American market are shown in Table 2. These are reductions that occur from the various companies' operations, such as improved efficiency in energy use in their facilities and improved fugitive emission control.[18]

U.S. based oil and gas industry sources have reported direct emission reductions totaling 48.3 million metric tons CO_2 equivalent for 2008 compared to 2007. The reductions of 48.3 million

[18] Many reporting companies utilize the SANGEA™ model, which is maintained by API. In conjunction with API, the U.S. oil and natural gas industry has provided a suite of tools for consistently estimating emissions. It includes API's 2009 compendium of emissions estimation methodologies, the SANGEA software for emissions estimation and inventorying, and guidelines (created by the international petroleum organization IPIECA) to assist in the accounting and reporting of emissions. These tools are available at ghg.api.org

metric tons is equivalent to taking 9.7 million cars and light trucks off the road.[19] Comparable figures for 2009 are 52.8 million metric tons and 10.6 million cars. For 2010 the reported reduction of 55.9 million metric tons equates to 11.2 million cars. For comparison, there are 246 million cars and trucks in the U.S., according to the U.S. Department of Transportation.[20]

- Thirty-eight to forty-six percent of the emission reductions occur in the fuel substitution category, over the period 2008-2010. This includes projects such as the installation of improved plunger lift seals and lower emission well completion technology.
- Thirty-five to forty-five percent of the reductions are in the end use category, largely from investments in combined heat and power (also known as cogeneration) at refineries and other facilities, especially investments begun in the early years of the period.
- The remainder of the reductions, 17 to 19 percent occur in the non-hydrocarbon category, including electrical generation facility construction using wind and solar, as well as biofuels production.

Table 2
Reported Emission Reductions 2008 -2010 relative to Prior Year
Oil and Gas Industry in North America
Million Metric Tons CO2e and percent by Category

	Fuel Substitution	End Use	Nonhydrocarbon	Total
2008 Reductions MMT	22.218	16.905	9.177	48.3
Percent of 2008 Reductions	46%	35%	19%	
2009 Reductions MMT	22.176	21.648	8.976	52.8
Percent of 2009 Reductions	42%	41%	17%	
2010 Reductions MMT	21.242	25.155	9.503	55.9
Percent of 2010 Reductions	38%	45%	17%	

[19] Passenger vehicles estimate derived from http://www.epa.gov/otaq/climate/420f05004.htm, by dividing total reductions by average passenger vehicle emissions
[20] http://www.fhwa.dot.gov/policyinformation/statistics/2009

Emissions Reduction Methodology

This analysis reflects a straightforward compilation of reported emission reductions from company reports, including annual shareholder reports and "corporate responsibility reports."[21]

While this methodology is straightforward, there are indications that it could result in an underestimation of emission reductions.

- First, not all companies reported emission reductions, so the reductions compiled here are likely conservative.
- Second, methane emission reductions reported in EPA's Natural Gas STAR program are substantially greater than the total reported here. More specifically, the 22.1 million metric tons of CO2e reductions reported for the Fuel Substitution category includes but is not limited to methane emission reductions from improved exploration and production equipment and practices. However, EPA's Natural Gas STAR program[22] reports 2009 methane reductions from producing entities of 70 billion cubic feet or roughly 24 million metric tons of CO2e. This exceeds the total reductions reported here for the entire Fuel Substitution category.

Emission reductions reported were then categorized based on company descriptions of how the reductions were achieved, where such descriptions were provided. For example, reductions achieved through efficiency improvements were assigned to the end use category. Emission reductions that were reported by some companies on a global basis were prorated to the North American market using secondary sources. This was done only in the fuel substitution category, associated with emission reductions due to methane capture from fugitive emissions. In this case we used reported emission reductions from EPA's Natural Gas Star Program to prorate global emission reduction estimates to the North American market.

Some companies reported reductions (or intensity improvements) based upon their equity involvement in shared facilities (such as refinery complexes) while some reported the reductions for the entire facility, especially if they were/are the primary operator of that facility. We include reductions based on equity positions to avoid double counting. No specific nexus is suggested between a specific investment and emission reduction.

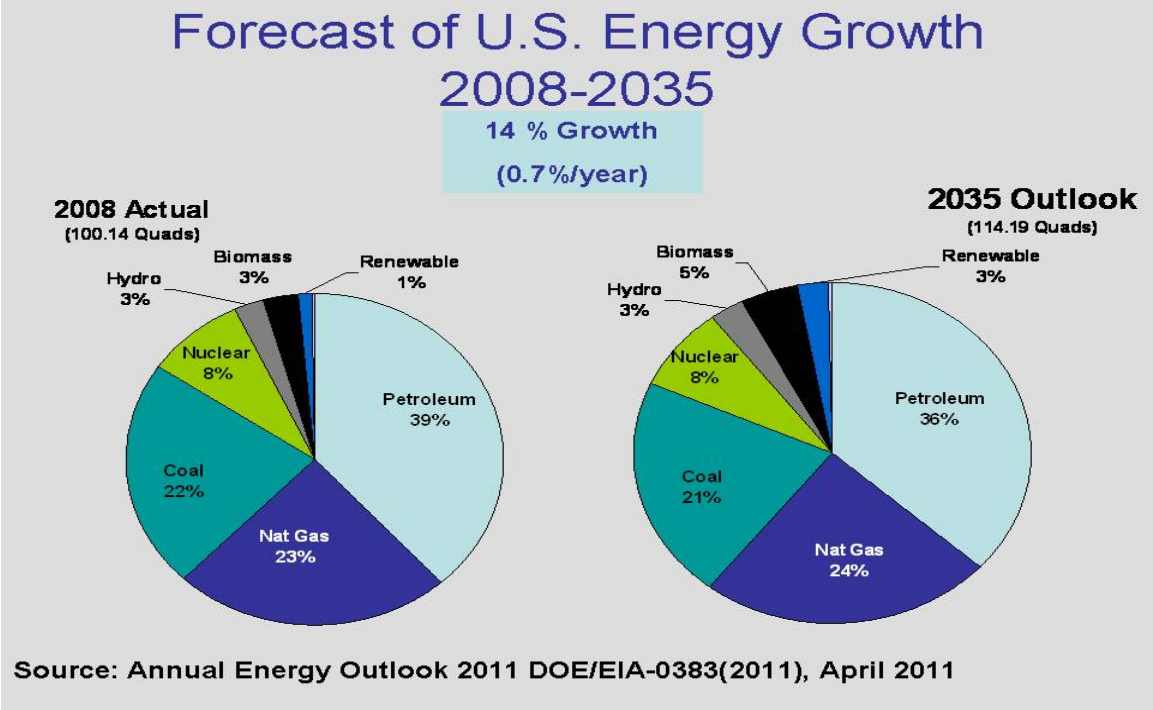
[21] Corporate responsibility reports go by a variety of names including "sustainability reports," "citizenship" and other similar names. We use "Corporate Responsibility" here in the generic sense to include all such reports.
[22] See http://www.epa.gov/gasstar/accomplishments/index.html#three

Chapter III: The Challenge of Emission Reductions

Energy consumption in the United States is forecast by the Energy Information Administration (EIA), an agency of the U.S. Department of Energy, to increase approximately 14 percent over the 2008 to 2035 period, or about 0.7 percent annually. (***Figure 10***) This increase is projected *after* accounting for a predicted improvement in energy intensity (energy usage per real dollar of GDP).[23]

To meet the increased demand for energy, the EIA projects that hydrocarbons (crude oil and natural gas and their derivatives) will remain the mainstay of the U.S. energy sector at least over the next several decades. The market share of oil, natural gas, and coal is projected to be approximately 82 percent in 2035, little changed from 85 percent in 2008.

Figure 10

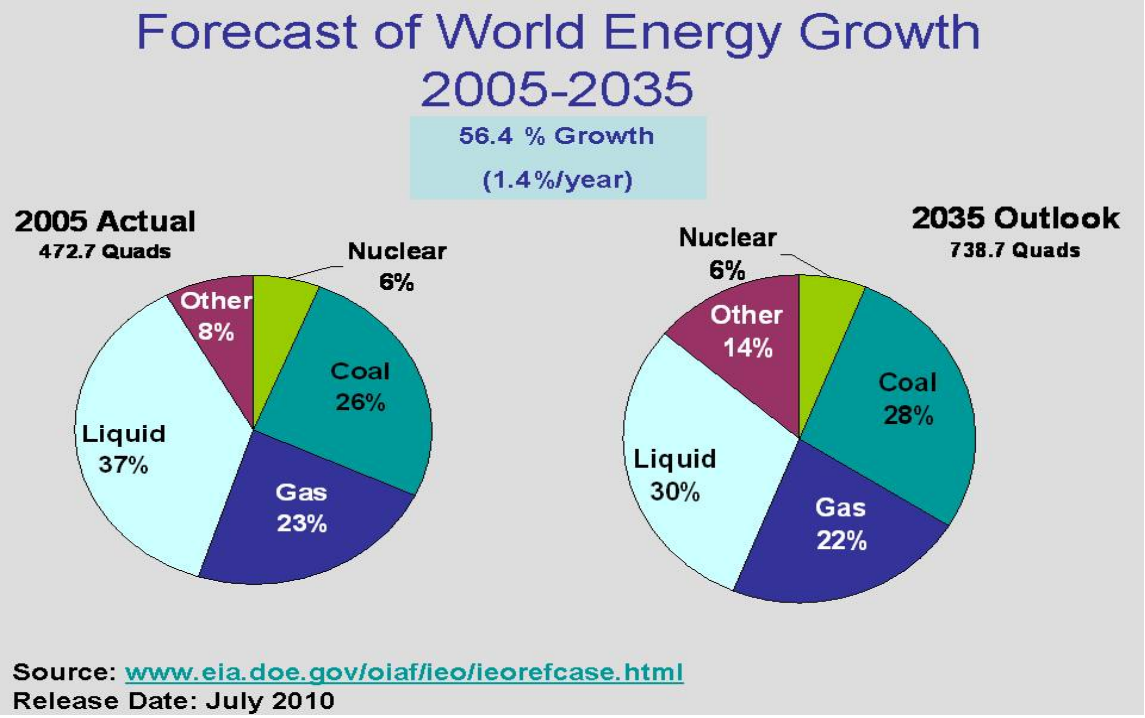


According to EIA, global energy consumption is projected to rise by approximately 56 percent over the 2005 to 2035 period, a roughly 1.4 percent annual increase, led by developing countries, many of which are expected to significantly increase energy consumption due to rising per capita incomes and population growth. (***Figure 11***) Similar to the forecast for the

[23] Noted trends and statistics in this section are from Energy Information Administration, *Annual Energy Outlook 2011*, April 2011

U.S., fossil fuels are estimated to fill roughly 80 percent of the projected global primary energy demand in 2035.

Figure 11



These projections of energy demand highlight the importance of continued economically viable investments leading to more efficient, and lower-GHG emitting technologies, as well as the development of efficient technology transfer programs to developing countries.

National Trends

There has been significant progress in mitigation of U.S. GHG emissions although significant challenges remain going forward.[24]

In 2010, energy-related carbon dioxide emissions in the United States increased by 213 million metric tons or 3.9 percent, compared to 2009. 2010 was preceded by declines in three out of the four previous years. Total U.S. anthropogenic (human-caused) greenhouse gas emissions in 2009 were 5.8 percent below the 2008 total. The decline in total emissions—from 6,983 million metric tons carbon dioxide equivalent (MMTCO2e) in 2008 to 6,576 MMTCO2e in 2009—was the largest since emissions have been tracked by EIA over the 1990-2009 time

[24] Noted trends and statistics in this section are from Energy Information Administration, *U.S. Energy-Related Carbon Dioxide Emissions, 2010,* Release Date: August 18, 2011

frame. It was largely the result of a 419 MMTCO2e drop in carbon dioxide (CO2) emissions (7.1 percent). There was a small increase of 7 MMTCO2e (0.9 percent) in methane (CH4) emissions, and an increase of 8 MMTCO2e (4.9 percent), in emissions of man-made gases with high global warming potentials (high-GWP gases). Emissions of nitrous oxide (N2O), on the other hand, fell by 4 MMTCO2e (1.7 percent). The decrease in U.S. CO2 emissions in 2009 resulted primarily from three factors: an economy in recession, a hard-hit energy-intensive manufacturing sector, and a large drop in the price of natural gas that caused fuel switching away from coal to natural gas in the electric power sector. In 2010, the increase in energy related emissions is largely attributed to a rebound in coal use compared to natural gas in electric power generation and industrial use, as well as a modest improvement in the overall economy.

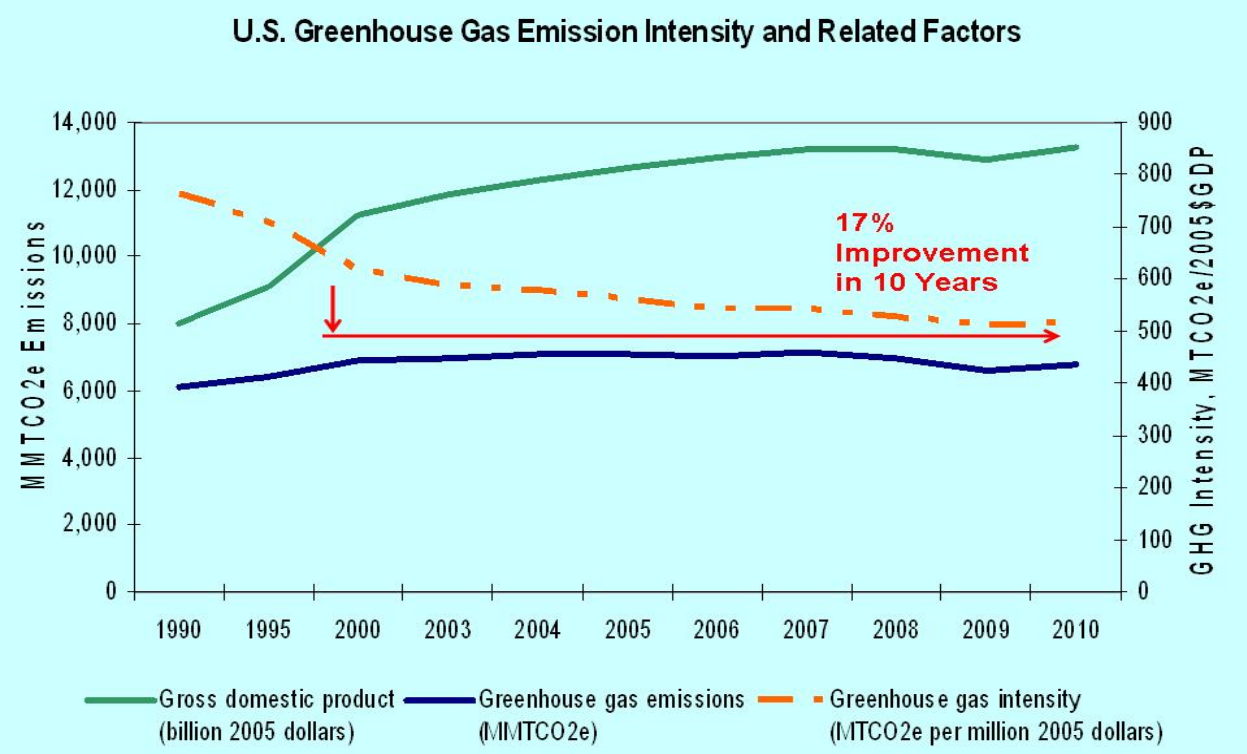
In 2009 the economy as measured by the real gross domestic product (GDP) fell by 3.5 percent compared to the previous year, but emissions fell by over 7 percent. In 2010 GDP grew by 3.0 percent, but emissions increased by 3.9 percent. While changes in emissions are highly correlated with economic activity, clearly there are additional factors that influence changes in emission levels. Since 1990, carbon dioxide emissions in the United States have grown much more slowly than GDP; in 2007 emissions reached a peak of about 20 percent greater than 1990, but even after the 2010 increase, carbon dioxide emissions are only about 12 percent greater. GDP has increased by 63 percent over that same time period.

While the U.S. economy declined by 2.6 percent in 2009, a 5.8-percent decrease in total greenhouse gas emissions meant that U.S. greenhouse gas intensity improved by 3.2 percent from 2008 to 2009. From 2009 to 2010, that was reversed slightly, with a 0.7% increase in intensity. Since about 2000 the energy intensity of the economy has improved by an average of 1.7 percent per year, as natural gas has increasingly substituted for coal, and other fuel substitutions and efficiency improvements continued to grow, although not in every single year.

The electric power sector saw growth in demand of 4.2 percent in 2010, while emissions rose by 5.2 percent. This indicates an increase in the carbon intensity of electric power generation of about 0.9 percent. In 2010, coal generation grew by 90 billion kWh or 56 percent of the increase in generation. And because coal is the most carbon-intensive of fuels, this increased the overall carbon intensity of the electric power sector. The overall share of coal in total generation increased slightly from 45.7 percent in 2009 to 46.1 percent in 2010. The natural gas share of total generation rose from 22.1 percent in 2009 to 22.6 percent in 2010.

From 2000 through 2010, the carbon dioxide intensity of the U.S. economy—measured as metric tons carbon dioxide equivalent ($MTCO_2e$) emitted per million dollars of gross domestic product (GDP) — improved by more than 17 percent or 1.7 percent per year, as shown in Figure 12. Oil and gas industry investments over the last decade in GHG mitigating technologies have contributed to this improving trend.

Figure 12



Source: Energy Information Administration, *U.S. Energy-Related Carbon Dioxide Emissions, 2010,* Release Date: August 18, 2011

U.S. energy-related CO2 emissions are projected to increase by an average of 0.2 percent per year from 2008 to 2035 in the *Annual Energy Outlook 2011*, while emissions from the non-OECD economies are expected to grow by 1.7 percent per year. Both rates are lower than previous projections largely as a result of the 2008-2009 global recession. Consequently, the U.S. share of world CO2 emissions is projected to fall to 15.8 percent (6,320 MMT out of a global total of 39,975 MMT) in 2035, from about 19.5% today.

China's share of global energy-related CO2 emissions is projected to grow from 21 percent in 2007 to 31 percent in 2035, and China accounts for 56 percent of the projected increase in

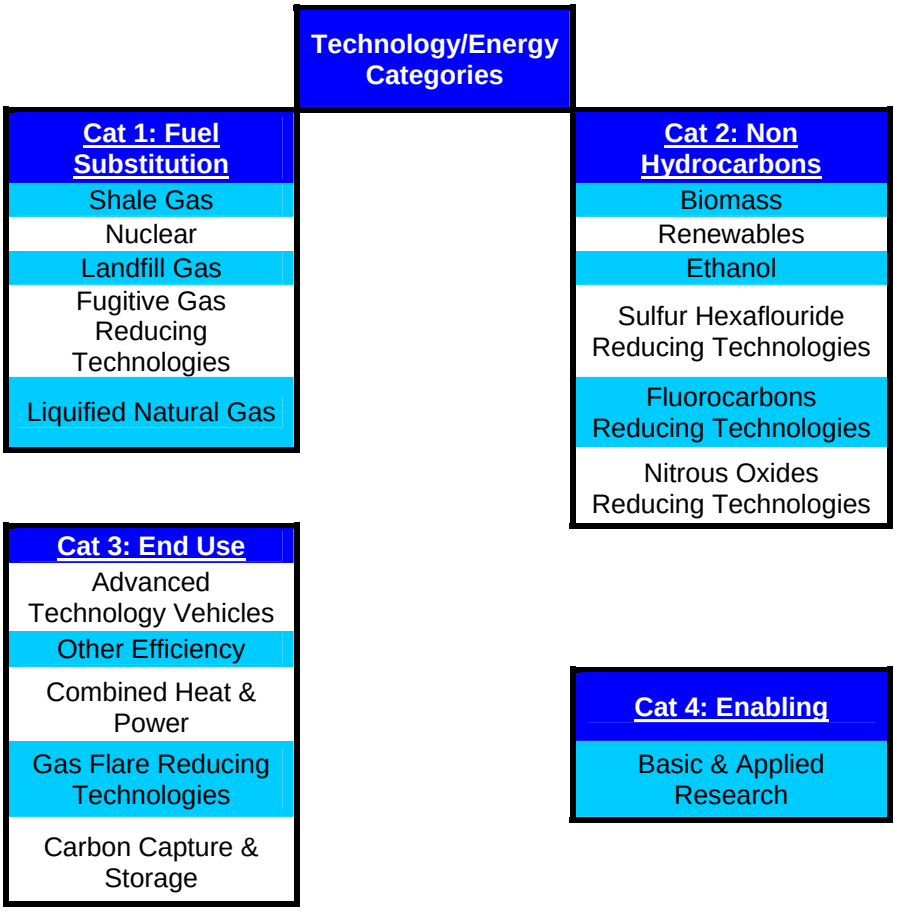
world emissions over the period. India accounts for the second-largest share of the projected increase, 7 percent.

Greenhouse Gas Emission Mitigation Technologies

A principal objective of this report is to identify key technologies and their associated investments that mitigate GHG emissions, or that have the potential to do so in the future. Sixteen major energy technologies have been identified in this study as actual or emerging/potential mitigation technologies. These technologies have been grouped into four categories (***Figure 13***): *fuel substitution*, (five technologies), *nonhydrocarbon* (six technologies), *end-use*[25] *(*five technologies*)*, and *enabling*. Biomass, within the non-hydrocarbon category, is further delineated into electricity and transportation applications, and ethanol is separated into corn and cellulosic ethanol. Sugar cane is not included here as it is not a major source in the North American market.

Figure 13

Categorization of GHG Mitigating Technologies[26]



[25] Carbon Capture and Storage has been moved from "enabling" in the May 2008 Report to "end-use" here.
[26] In previous editions of this Report, "Fugitive Gas Reducing Technologies" was placed in the End Use Category in this chart.

Category 1. "*Fuel substitution*" technologies include shale gas, liquefied natural gas (LNG), nuclear, landfill gas, and methane captured by fugitive gas reducing technologies.

- *Shale Gas* is an important source of expanded supply of natural gas in the U.S. As a greenhouse gas emission reduction technology, shale gas increases the supply of natural gas to the North American market that may substitute for coal, and to a lesser extent for petroleum-based liquid fuels. The potential for greenhouse gas mitigation is determined, however, by the amount of gas-on-gas substitution versus gas-on-coal. Several recent studies demonstrate the greenhouse gas emission reductions are associated with substituting shale gas for coal and other higher GHG intensity fuels. The Massachusetts Institute of Technology (MIT) Energy Initiative found:
  - "the environmental impacts of shale development are challenging but manageable."[27]
  - "Consequently, the role of natural gas is likely to continue to expand, and its relative importance is likely to increase even further when greenhouse gas emissions are constrained."[28]

  MIT further found that replacement of coal by natural gas in U.S. electric generation would involve the "substitution of coal units with an average efficiency of 30% to 35% with gas combined cycle plants with efficiencies in the range of 45% to 55%."[29]

  Similarly the International Energy Agency in their World Energy Outlook 2011 – Special Report – "Are We Entering a Golden Age of Gas?" concluded that "shale gas produced to proper standards of environmental responsibility has slightly higher 'well-to-burner' emissions than conventional gas, with the combustion of gas being the dominant source of emissions."[30] (emphasis added) The National Energy Technology Laboratory (NETL) provided relative lifecycle GHG emission factors[31]:
  - Average Coal: 2,453 lbs CO2e per MWh;
  - Average Conventional [natural] Gas; 1,041 CO2e per MWh;
  - Average Unconventional [natural] Gas: 1,139 CO2e per MWh.

- *Liquefied natural gas* (LNG) is natural gas that has been super-cooled to a liquid. This dramatically reduces the volume for cost-effective transport in ships (where transport via conventional natural gas pipelines is cost prohibitive or not feasible). LNG as a transport mode opens up natural gas to become a much more broadly traded international commodity and increases the supply available to the U.S. [32] As a greenhouse gas emission reduction technology, LNG imports increase the supply of natural gas to the North American market that may substitute for coal, and to a lessor extent for petroleum fuels. The potential for greenhouse gas mitigation is determined, however, by the amount of gas-on-gas substitution versus gas-on-coal.

---

[27] MIT Energy Initiative – Future of Natural Gas, Press Release 6/9/2011
[28] MIT Energy Initiative – Future of Natural Gas, Abstract, p. ix, June 2011
[29] MIT Energy Initiative – Future of Natural Gas, Appendix 1A; Life-Cycle Climate Impacts from Fossil Fuel Use, p. 2, June 2011
[30] International Energy Agency – World Energy Outlook 2011 – Special Report – Are We Entering a Golden Age of Gas?" p.7, 2011
[31] National Energy Technology Laboratory – *Life Cycle Greenhouse Gas Analysis of Natural Gas Extraction & Delivery in the United States*, Timothy J. Skone, May 12, 2011
[32] For more information on LNG, refer to the briefing papers and knowledge base incorporated in the CEE's online *Guide to LNG in North America*, www.beg.utexas.edu/lng.

- *Nuclear* is limited to the production of electricity and reduces the amount of coal or natural gas consumption for that purpose, and consequently the associated greenhouse gas emissions.

- *LFG* is landfill gas (methane) produced by the anaerobic digestion of waste material. Historically, that methane was emitted into the atmosphere, but more recently has been collected and used to produce electricity or in transportation applications. According to the Environmental Protection Agency, of the 2,300 or so currently operating or recently closed municipal solid waste landfills in the United States, more than 510 have LFG utilization projects.[33] The generation of electricity from LFG makes up about two–thirds of the currently operational projects in the United States, with the remainder in direct use (heat) and transportation application. LFG acts to reduce greenhouse gas emissions first by reducing the amount of methane released to the atmosphere, and secondarily by substituting for higher-carbon content fossil fuels such as coal and petroleum.

- *Fugitive Gas* Emissions can occur when methane, a potent greenhouse gas, is collected and transported, and certain amounts leak out to the atmosphere. Investments made to reduce fugitive emissions directly and indirectly reduce greenhouse gas emissions. Emissions may indirectly be reduced as lower carbon natural gas is added to the fuel supply.

Category 2. "Non-hydrocarbon" technologies include any energy form that is not a hydrocarbon energy source. This category includes: wind energy conversion, solar to electric, geothermal (electric and direct use for industrial application), biomass and biorefinery, biodiesel, and ethanol production. Ethanol and biodiesel production were included in this category rather than in the fuel substitution category where they could have also arguably been placed. This category also includes technologies that facilitate reductions in halogenated fluorocarbons (HFC), perfluorocarbons and sulfur hexafluoride (SF_6).

- *Ethanol* is currently produced by the fermentation of various sugars and starches, primarily from corn and sugar cane. Significant fossil fuel use is involved in corn-based ethanol production both for growing the corn and in producing the ethanol. Most ethanol for fuel is produced in Brazil or the United States. Technological advances may allow ethanol production from cellulosic materials in the longer term. Greenhouse gas emissions benefits associated with corn-based ethanol are likely to be marginal, and there is significant uncertainty surrounding greenhouse gas emissions benefits associated with cellulosic ethanol, although they are expected to be better than corn based ethanol.

  As part of revising the National Renewable Fuel Standard program (commonly known as the RFS program) as required by the Energy Independence and Security Act of 2007 (EISA), EPA has analyzed lifecycle greenhouse gas (GHG) emissions from increased renewable fuels use. In February 2010 EPA determined that ethanol produced from corn starch at a new natural gas, biomass, or biogas fired facility (or expanded capacity from such a facility) using advanced efficient technologies will achieve about 20% GHG emission reduction compared to the 2005 gasoline baseline.[34]

[33] http://www.epa.gov/lmop/faq/lfg.html
[34] http://www.epa.gov/otaq/renewablefuels/420f10006.htm

- *Biomass* projects also use plant or animal waste materials to produce energy either from direct combustion, through thermal gasification, or biologic treatment. Biomass gasification is included in biomass/biorefining, as a precursor to ultimate use, within the nonhydrocarbon group.

- *Bio-refineries* produce a broad slate of products from plant materials, including energy and fuels, plastics, pharmaceuticals and animal feeds. Biodiesel is produced by chemically altering oils (e.g., soybean oil) into diesel fuel substitutes. Also included are other bio-derivatives including those produced as refinery products, such as certain alcohols and alkanes. Another sub-category of biologically derived petroleum substitutes are called biobased products (or bioproducts).

- *Solar, wind and geothermal* are electricity generation technologies that substitute for fossil-based generation technologies. However, wind and solar can be intermittent in their output, they often require other power plants on a grid to operate in less efficient modes of operation—termed ramping—which can result in reduced or no reductions in fuel use and GHG emissions.

- *Sulfur hexafluoride (SF_6) and Halogenated Fluorocarbons/Perflurocarbons* are gases used in industrial applications and refrigeration. Various substitute gases have recently been developed to reduce those applications' greenhouse gas emissions, or their global warming potential. These gases substitute for other industrial and commercial gases, but are not "fuels" and not considered as fuel substitutes.

- *Nitrous Oxides* (N_2O) are produced by both natural and human sources. Primary human-related sources of N_2O are agricultural soil management, animal manure management, sewage treatment, adipic acid production, and nitric acid production. Nitrous oxide is also produced naturally from a wide variety of biological sources in soil and water, particularly microbial action in wet tropical forests. Control mechanisms for human sources include improved tillage practices and fertilization techniques, and improved efficiency in manufacture of adipic acid and combustion.

Category 3. "*End-use*" technologies include stationary fuel-cell applications[35], transportation applications (fuel cell, electric hybrid, and flex-fuel vehicles, high efficiency gasoline and diesel engines), and cogeneration—regardless of fuel source. The extent of greenhouse gas mitigation from flexible fuel vehicles depends on the consumers' actual use of different fuels, and may be negligible. This category also includes investments made to improve thermodynamic efficiency.

- *Advanced-Technology Vehicles* use both petroleum and non-petroleum based fuels (or mixtures), advanced batteries for hybrid vehicles or fuel-cell technologies. Automakers, engine manufacturers, and oil and gas companies are actively developing vehicle technologies and the advanced fuels of the future that will power them.

- *Cogeneration*, or *combined heat and power* (CHP) is the simultaneous production of both electricity and thermal energy (steam, hot water, hot air). CHP is an important efficiency improvement compared to separate production of electricity and heat. These facilities range from very small units in commercial buildings to large units at petroleum refineries, and are captured separately from other efficiency improvements.

[35] Note that fuel cells as a technology are not separately listed, as they depend on a variety of fuels and can be used in a variety of applications, including transportation and combined heat and power. They are subsumed in the various categories where applicable.

- *Efficiency* measures include a whole range of technologies, from improved combustion burners, to advanced lighting, and improved process efficiencies, but does not include, for purposes of this report, combined heat and power.

- *Gas Flaring* can occur when methane associated with crude oil production is combusted. In areas of the world lacking infrastructure and markets, this associated gas is usually flared (burned) or sometimes vented (emitted as un-burnt gas). Reducing this flared gas reduces greenhouse gas emissions of either CO_2 if the gas is burned, or of methane if the gas is vented. Safety issues may impact the flaring or venting decision.

- *Carbon Capture and Storage* is the capture and long-term storage of carbon dioxide emissions from combustion processes. Over 200 CCS projects were active or planned worldwide at the end of 2010, a net rise of 26 from 2009[36]. Of these, 77 are large-scale integrated projects at various stages of development. North America, Europe, and Australia are home to 87% of all projects, despite the largest global growth in energy usage— a major source of human-generated CO_2 release—expected outside these continents over the next few decades. This technology has moved beyond the basic research stage.

Category 4. "Enabling Technologies" includes various consortia that are researching and developing a wide variety of technologies that were not delineated by specific technology due to lack of data availability. This includes the university programs supported by the private sector companies and federal government.

Investment Estimates Methodology

This analysis was carried out in several steps. The first was an identification of major categories of emerging energy sources, and the associated emissions control/reduction technologies. Second, a database of investments was constructed by GHG mitigation technology category and by investor type. The database was compiled from a review of over 565 publicly available company annual reports, federal budget documents, and other public sources, beginning with the database constructed for the 2009 report, *Key Investments in Greenhouse Gas Mitigation Technologies by Energy Firms, Other Industry and the Federal Government: An Update,* June 2009. No confidential or non-public company investment information was sought, received, or utilized. If an investment amount for a relevant technology was specified in a source document it was included in the database. All investments were initially tabulated in nominal dollars. Because the investments covered in this report have occurred over an eleven-year period, it is appropriate to adjust the annual data for the inflation that has occurred over the study period. Given that most investments in greenhouse gas mitigation technology covered in this report are spread across many sectors of the economy, the deflator chosen to convert the annual data to

[36] *Carbon Capture and Storage: A Mixed Review,* Robin Beckwith, JPT/JPT Online, May 2011

2010 dollars was the U.S. Department of Commerce, Bureau of Economic Analysis chain-type deflator for "Gross Private Domestic Investment."[37]

Third, each investment was reviewed to determine if it should remain in the database, be prorated, or otherwise adjusted from a global level to the North American market. For example, we identified three major types of investments for LNG: liquefaction, regasification facilities, and ships. We have only included investments in North American LNG regasification facilities. The global LNG market also includes investments in ships, and liquefaction facilities in foreign locations. Investments in ships and liquefaction facilities were not included in the data base as they, to a large extent, fall outside the area of the North American market.

[37] Available at http://research.stlouisfed.org/fred2/series/GPDICTPI?cid=21

Appendix A
Figures Presented in Nominal Dollars

Figure A-1

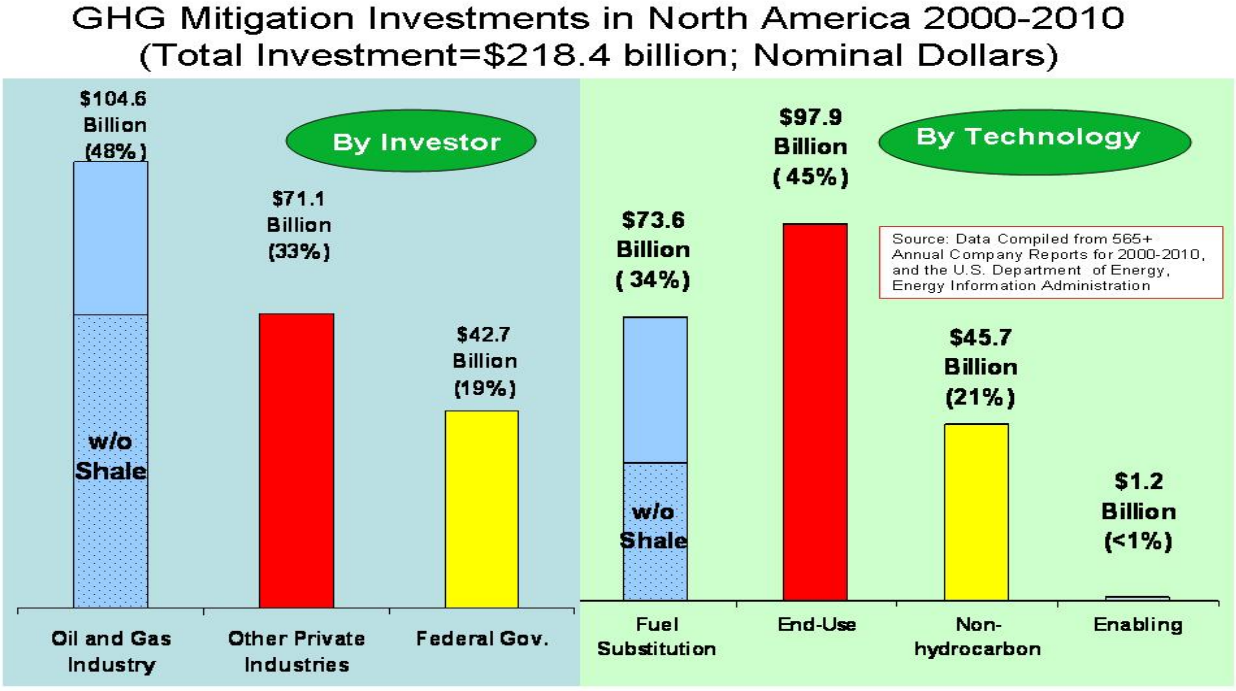


Figure A-2

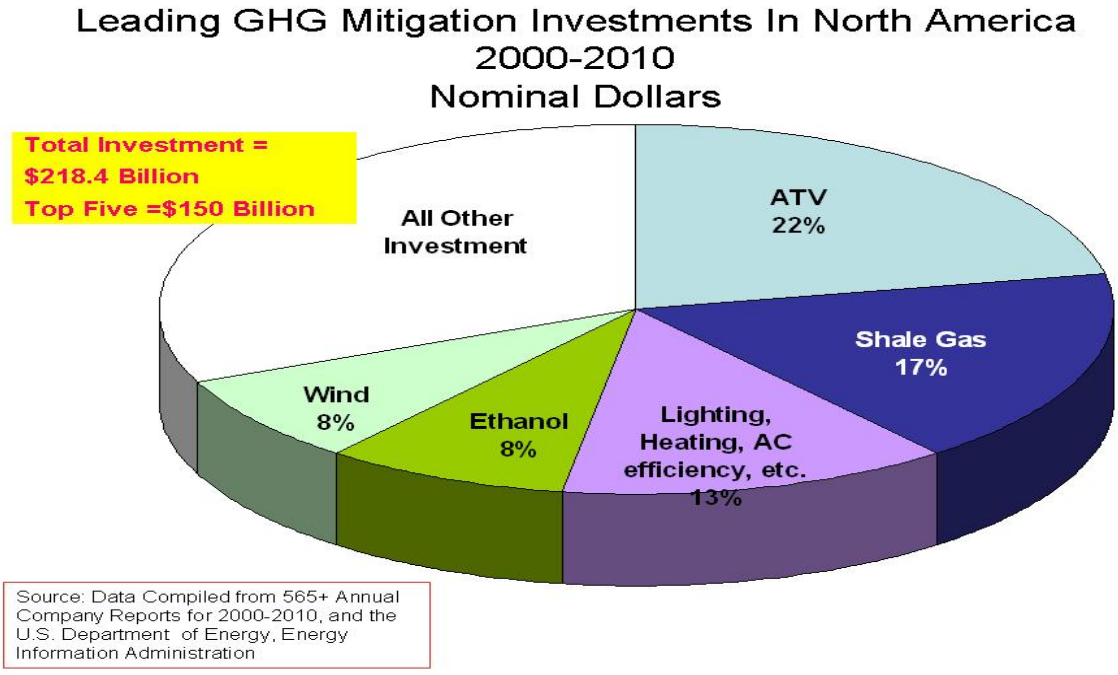


Figure A-3

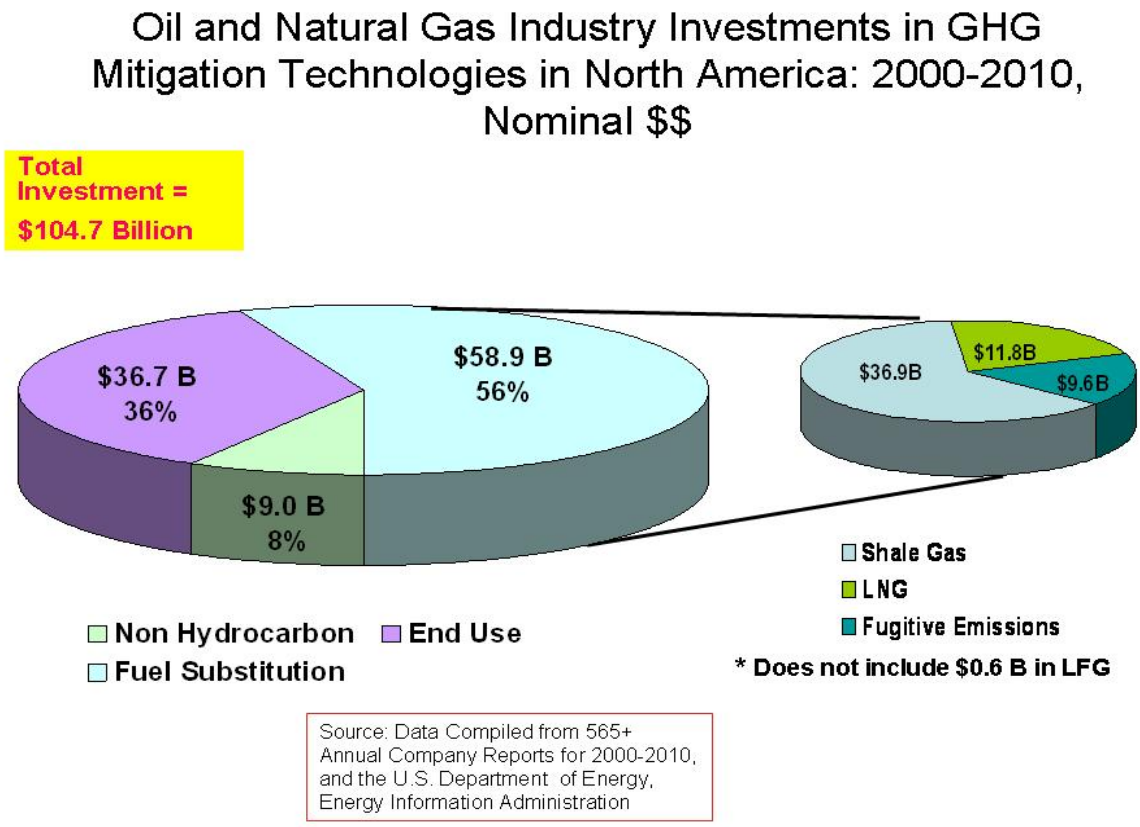


Figure A-4

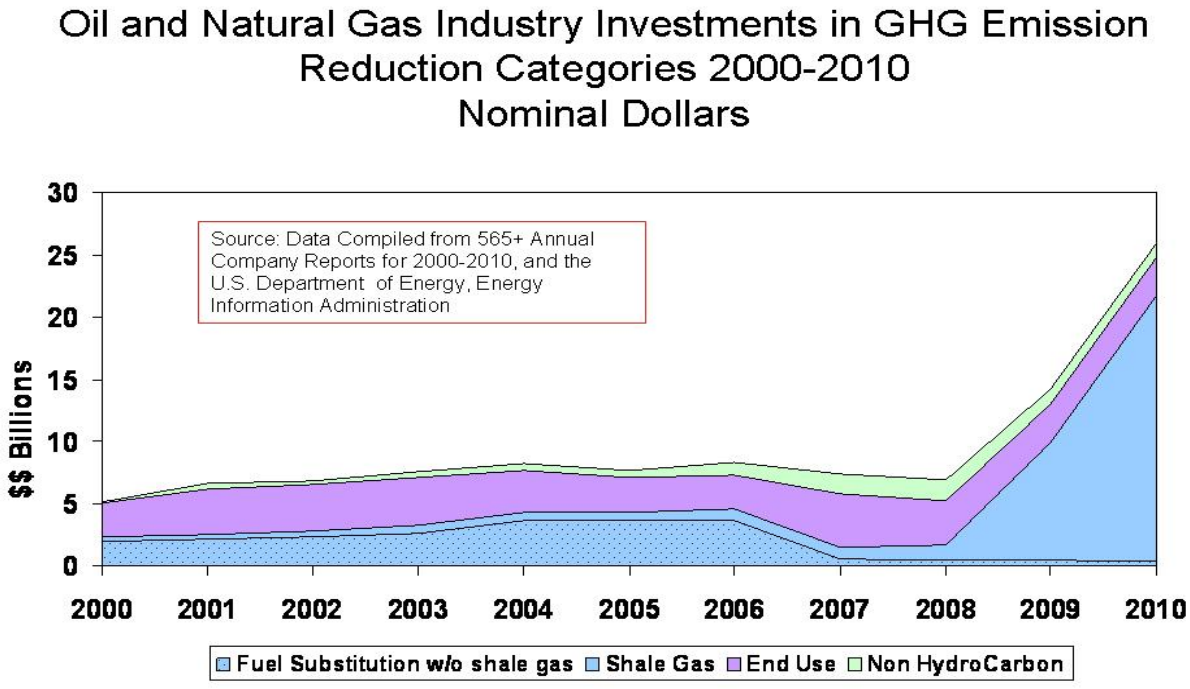


Figure A-5

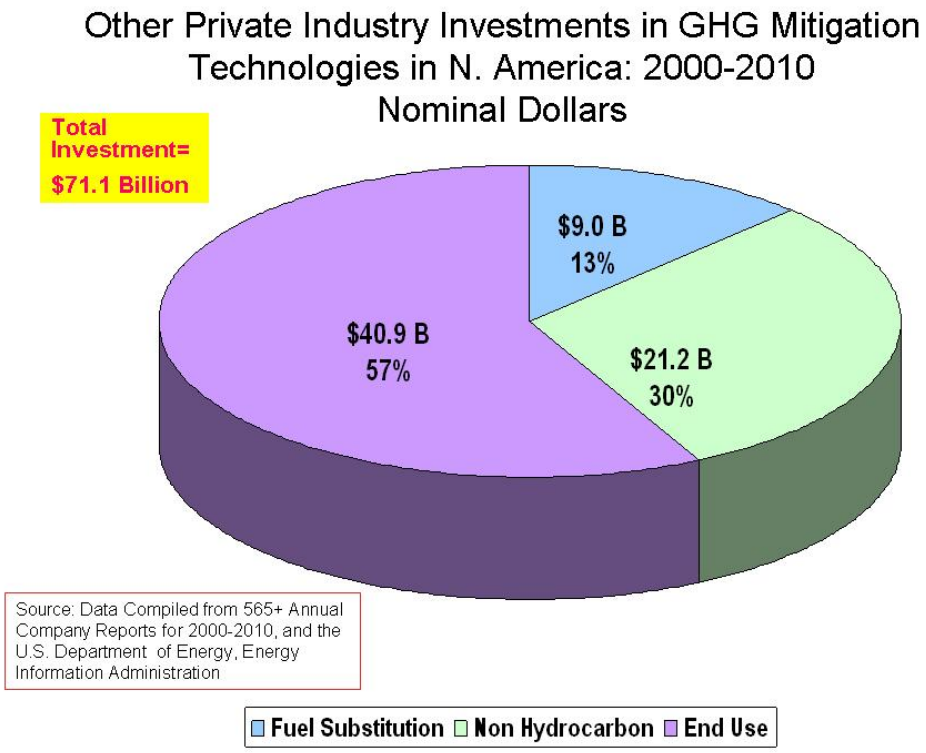


Figure A-6

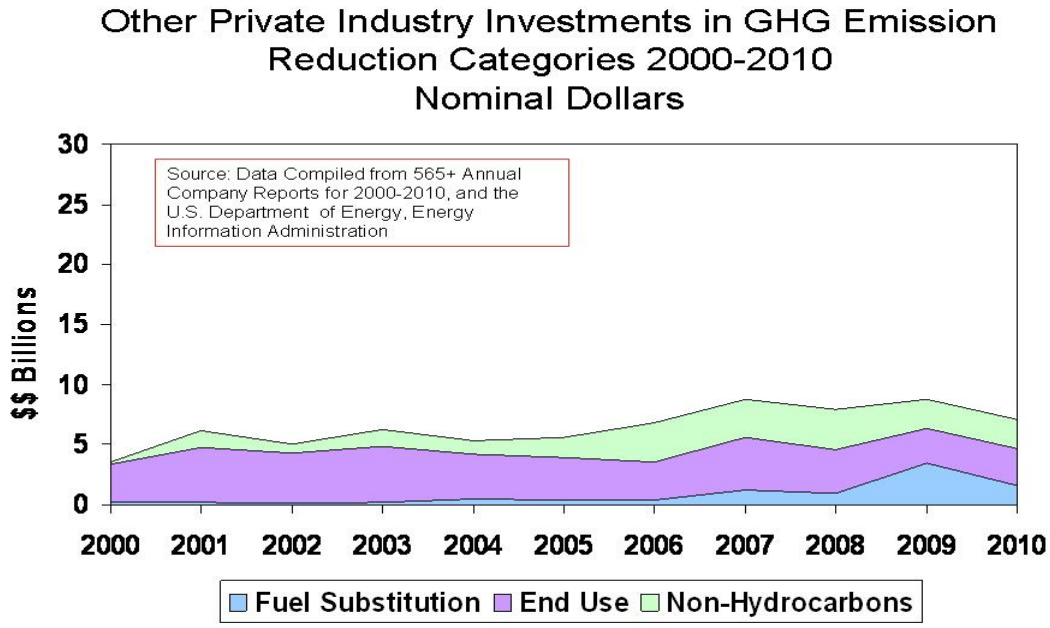


Figure A-7

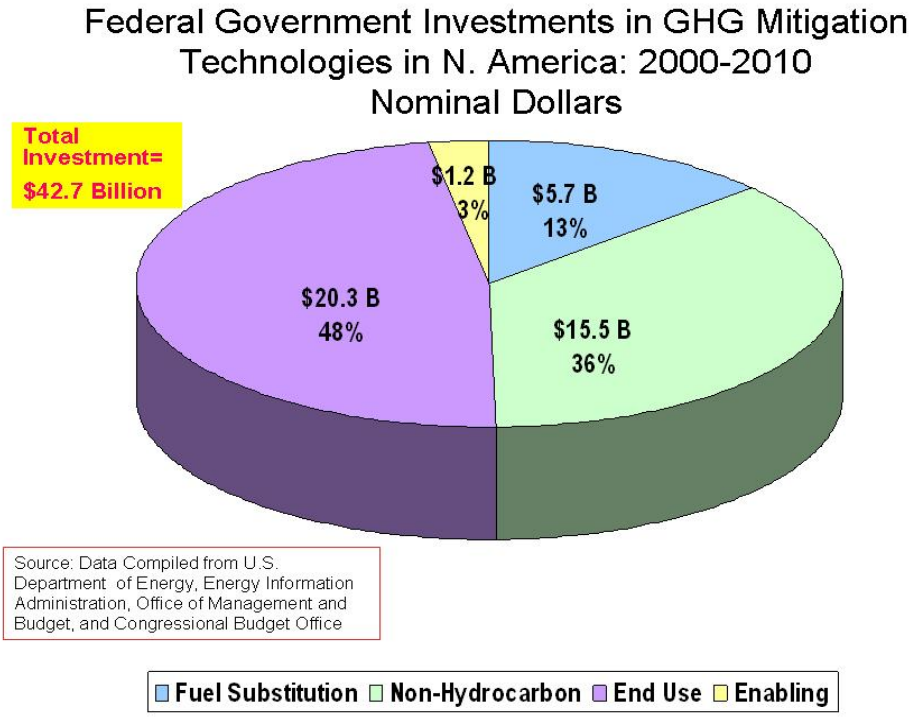


Figure A-8

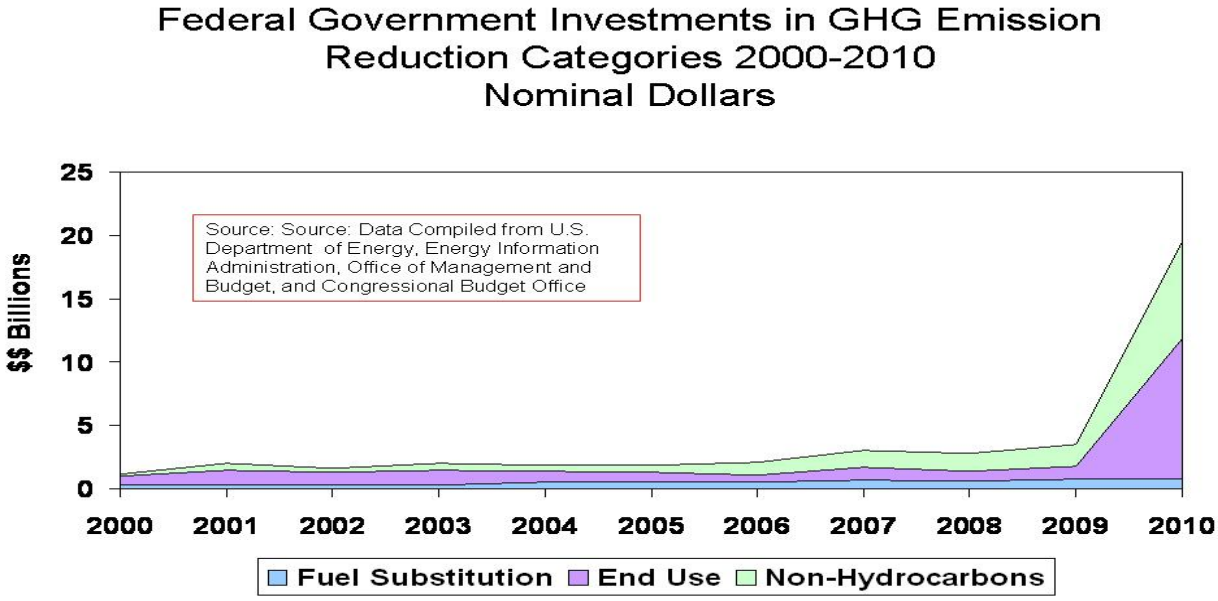


Figure A-9

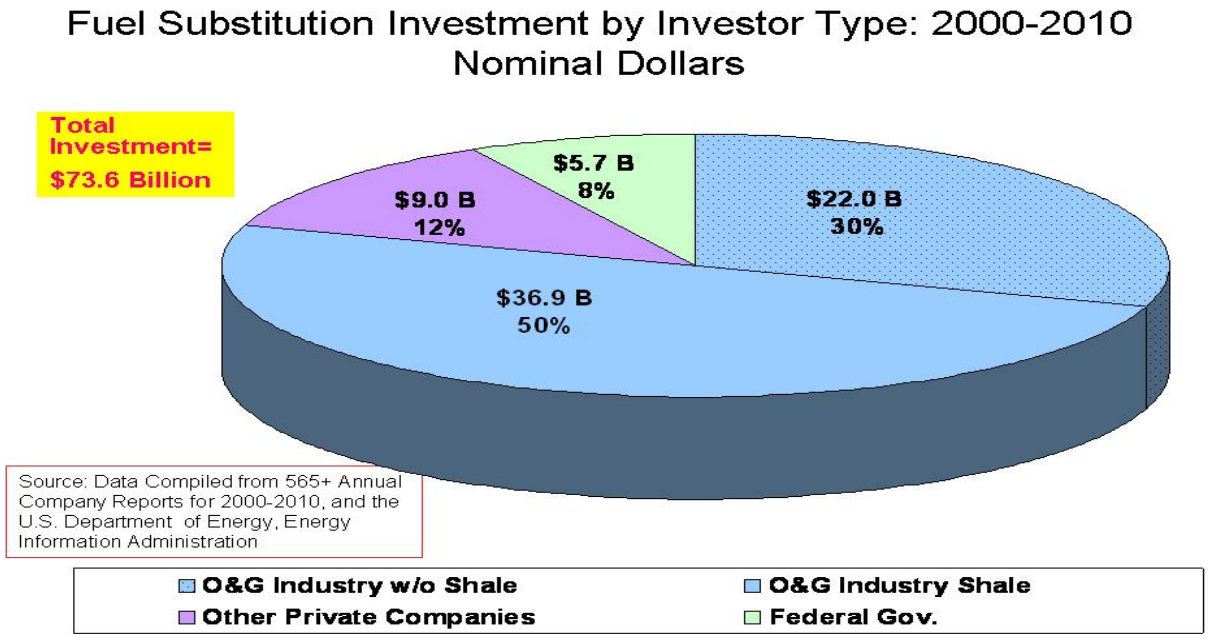


Figure A-10

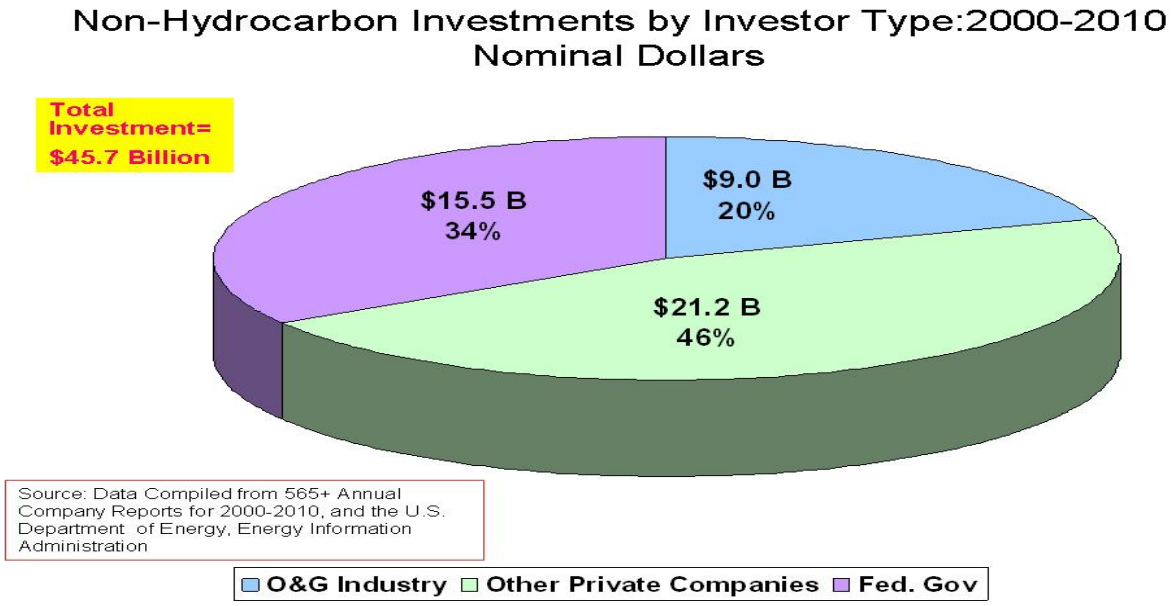
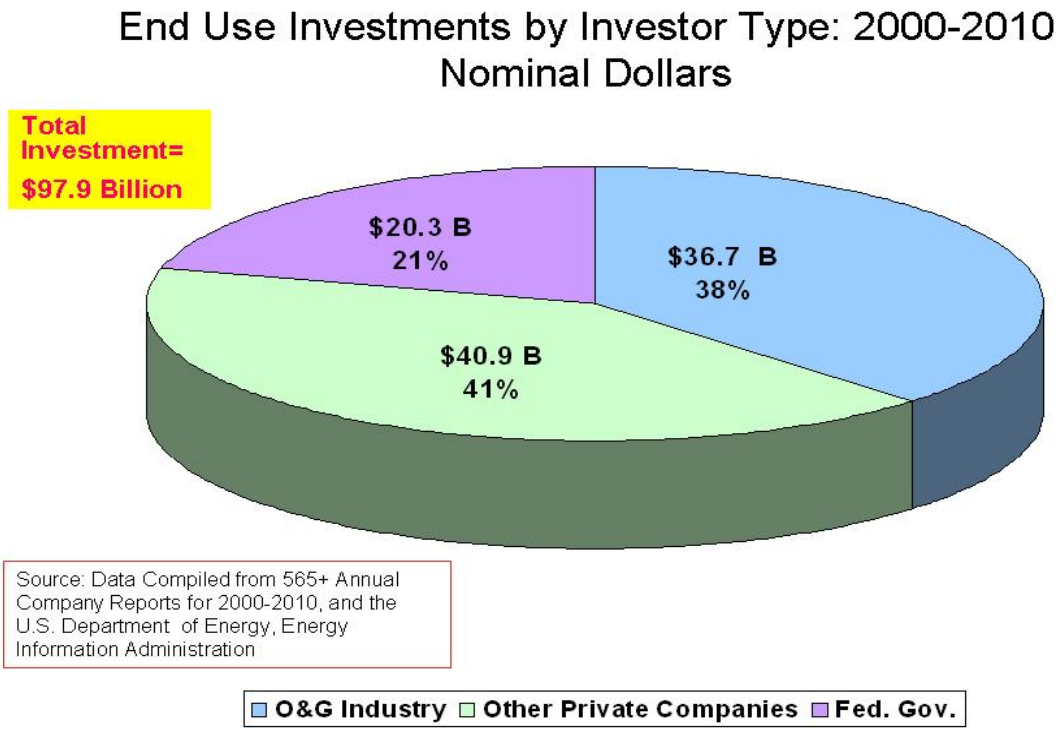


Figure A-11


End Use Investments by Investor Type: 2000-2010
Nominal Dollars
Total Investment= $97.9 Billion
$20.3 B 21%
$36.7 B 38%
$40.9 B 41%
Source: Data Compiled from 565+ Annual Company Reports for 2000-2010, and the U.S. Department of Energy, Energy Information Administration
O&G Industry
Other Private Companies
Fed. Gov.

Appendix B
Bibliography

Amerada Hess Corporation; Annual Report to Shareholders; 2000
Amerada Hess Corporation; *Annual Report to Shareholders*; 2001
Amerada Hess Corporation; *Annual Report to Shareholders*; 2002
Amerada Hess Corporation; *Annual Report to Shareholders*; 2003
Amerada Hess Corporation; *Annual Report to Shareholders*; 2004
Amerada Hess Corporation; *Annual Report to Shareholders*; 2005
American Wind Energy Association*; http://www.awea.org/projects/*
Anadarko Petroleum, Inc. *Annual Report to Shareholders*; 2000
Anadarko Petroleum, Inc. *Annual Report to Shareholders*; 2001
Anadarko Petroleum, Inc. *Annual Report to Shareholders*; 2002
Anadarko Petroleum, Inc. *Annual Report to Shareholders*; 2002
Anadarko Petroleum, Inc. *Annual Report to Shareholders*; 2004
Anadarko Petroleum, Inc. *Annual Report to Shareholders*; 2005
Anadarko Petroleum, Inc. *Annual Report to Shareholders*; 2006
Anadarko Petroleum, Inc. *Annual Report to Shareholders*; 2007
Anadarko Petroleum, Inc. *Annual Report to Shareholders*; 2008
Anadarko Petroleum, Inc. *Annual Report to Shareholders*; 2009
Anadarko Petroleum, Inc. *Annual Report to Shareholders*; 2010
Apache Corporation: GHG Emissions Quantification – 2007
Apache Corporation; *Annual Report to Shareholders*; 2000
Apache Corporation; *Annual Report to Shareholders*; 2001
Apache Corporation; *Annual Report to Shareholders*; 2002
Apache Corporation; *Annual Report to Shareholders*; 2003
Apache Corporation; *Annual Report to Shareholders*; 2004
Apache Corporation; *Annual Report to Shareholders*; 2005
Apache Corporation; *Annual Report to Shareholders*; 2006
Apache Corporation; *Annual Report to Shareholders*; 2007
Apache Corporation; *Annual Report to Shareholders*; 2008
Apache Corporation; *Annual Report to Shareholders*; 2009
BP America, Inc.; *Annual Report to Shareholders;* 2000
BP America, Inc.; *Annual Report to Shareholders;* 2001
BP America, Inc.; *Annual Report to Shareholders;* 2002
BP America, Inc.; *Annual Report to Shareholders;* 2003
BP America, Inc.; *Annual Report to Shareholders;* 2004
BP America, Inc.; *Annual Report to Shareholders;* 2005
BP America, Inc.; *Annual Report to Shareholders;* 2006
BP America, Inc.; *Annual Report to Shareholders;* 2007
BP America, Inc.; *Annual Report to Shareholders;* 2009
BP America, Inc.; *Annual Report to Shareholders;* 2010
BP, Sustainability Report 2007
BP, Sustainability Report 2008
BP, Sustainability Report 2009
BP, Sustainability Report 2010
Burlington Resources Inc. *Annual Report to Shareholders;* 2000
Burlington Resources Inc. *Annual Report to Shareholders;* 2001
Burlington Resources Inc. *Annual Report to Shareholders;* 2002
Burlington Resources Inc. *Annual Report to Shareholders;* 2003
Burlington Resources Inc. *Annual Report to Shareholders;* 2004
Burlington Resources Inc. *Annual Report to Shareholders;* 2005
Canadian Association of Petroleum Producers;
http://www.capp.ca/raw.asp?x=1&dt=NTV&e=PDF&dn=34093
Chesapeake Energy Corporation; *Report to Shareholders;* 2000
Chesapeake Energy Corporation; *Report to Shareholders;* 2001
Chesapeake Energy Corporation; *Report to Shareholders;* 2002
Chesapeake Energy Corporation; *Report to Shareholders;* 2003

Chesapeake Energy Corporation; *Report to Shareholders;* 2004
Chesapeake Energy Corporation; *Report to Shareholders;* 2005
Chesapeake Energy Corporation; *Report to Shareholders;* 2006
Chesapeake Energy Corporation; *Report to Shareholders;* 2007
Chesapeake Energy Corporation; *Report to Shareholders;* 2008
Chesapeake Energy Corporation; *Report to Shareholders;* 2009
Chevron Corporation; *Annual Report to Shareholders; 2000*
Chevron Corporation; *Annual Report to Shareholders; 2001*
Chevron Corporation; *Annual Report to Shareholders; 2002*
Chevron Corporation; *Annual Report to Shareholders; 2003*
Chevron Corporation; *Annual Report to Shareholders; 2004*
Chevron Corporation; *Annual Report to Shareholders; 2005*
Chevron Corporation; *Annual Report to Shareholders; 2006*
Chevron Corporation; *Annual Report to Shareholders; 2007*
Chevron Corporation; *Annual Report to Shareholders; 2008*
Chevron Corporation; *Annual Report to Shareholders; 2009*
Chevron Corporation; *Annual Report to Shareholders; 2010*
CITGO Petroleum Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2000*
CITGO Petroleum Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2001*
CITGO Petroleum Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2002*
CITGO Petroleum Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2003*
CITGO Petroleum Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2004*
CITGO Petroleum Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2005*
CITGO Petroleum Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2006*
CITGO Petroleum Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2007*
CITGO Petroleum Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2008*
CITGO Petroleum Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2008*
ConocoPhillips Petroleum Company *Annual Report to Shareholders, 2000*
ConocoPhillips Petroleum Company *Annual Report to Shareholders, 2001*
ConocoPhillips Petroleum Company *Annual Report to Shareholders, 2002*
ConocoPhillips Petroleum Company *Annual Report to Shareholders, 2003*
ConocoPhillips Petroleum Company *Annual Report to Shareholders, 2004*
ConocoPhillips Petroleum Company *Annual Report to Shareholders, 2005*
ConocoPhillips Petroleum Company *Annual Report to Shareholders, 2006*
ConocoPhillips Petroleum Company *Annual Report to Shareholders, 2007*
ConocoPhillips Petroleum Company *Annual Report to Shareholders, 2008*
ConocoPhillips Petroleum Company *Annual Report to Shareholders, 2009*
ConocoPhillips Petroleum Company *Annual Report to Shareholders, 2010*
ConocoPhillips Petroleum Company; *Sustainable Development Report – Baseline;* 2004
ConocoPhillips Petroleum Company; *Sustainable Development Report – 2006*
ConocoPhillips, 2008 Sustainable Development Review
ConocoPhillips; *Technology and Innovation Initiative, www.conocophillips.com/EN/tech/initiatives/Pages/index.aspx*
DaimlerChrysler Group; *Annual Report to Shareholders*; 2000
DaimlerChrysler Group; *Annual Report to Shareholders*; 2001
DaimlerChrysler Group; *Annual Report to Shareholders*; 2002
DaimlerChrysler Group; *Annual Report to Shareholders*; 2003
DaimlerChrysler Group; *Annual Report to Shareholders*; 2004
DaimlerChrysler Group; *Annual Report to Shareholders*; 2005
DaimlerChrysler Group; *Annual Report to Shareholders*; 2006

DaimlerChrysler Group; *Annual Report to Shareholders*; 2007
DaimlerChrysler Group; *Annual Report to Shareholders*; 2008
DaimlerChrysler Group; *Annual Report to Shareholders*; 2009
DaimlerChrysler Group; *Annual Report to Shareholders*; 2010
Devon Energy 2008/2009 Corporate Responsibility Report
Devon Energy Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2000*
Devon Energy Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2001*
Devon Energy Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2002*
Devon Energy Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2003*
Devon Energy Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2004*
Devon Energy Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2005*
Devon Energy Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2006*
Devon Energy Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2007*
Devon Energy Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2008*
Devon Energy Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2009*
Devon Energy Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2010*
Dominion Resources, *2008/2009 Corporate Responsibility Report*
Dominion Resources, Inc. *Annual Report to Shareholders;* 2003
El Paso Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2000*
El Paso Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2001*
El Paso Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2002*
El Paso Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2003*
El Paso Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2004*
El Paso Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2005*
El Paso Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2006*
El Paso Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2007*
El Paso Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2008*
El Paso Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2009*
El Paso Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2010*
El Paso Corporation, Corporate Sustainability Report, 2008
Energy Information Administration, *Annual Energy Outlook 2008*
Energy Information Administration, *Annual Energy Outlook 2009*
Energy Information Administration, *Annual Energy Outlook 2010*
Energy Information Administration, *Annual Energy Outlook 2011*
Energy Information Administration, Form EIA-886, "Annual Survey of Alternative Fueled Vehicles"
Energy Information Administration, *Emissions of Greenhouse Gases in the United States 2009*, March 2011
Energy Information Administration, *Emissions of Greenhouse Gases in the United States 2010*, August 2011

EOG Resources, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2000*
EOG Resources, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2001*
EOG Resources, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2002*
EOG Resources, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2003*
EOG Resources, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2004*
EOG Resources, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2005*
EOG Resources, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2006*
EOG Resources, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2007*
EOG Resources, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2008*
EOG Resources, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2009*
EOG Resources, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2010*
Equitable Resources, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For The Fiscal Year Ended December 31, 2000*
Equitable Resources, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For The Fiscal Year Ended December 31, 2001*
Equitable Resources, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For The Fiscal Year Ended December 31, 2002*
Equitable Resources, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For The Fiscal Year Ended December 31, 2003*
Equitable Resources, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For The Fiscal Year Ended December 31, 2004*
Equitable Resources, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For The Fiscal Year Ended December 31, 2005*
Equitable Resources, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For The Fiscal Year Ended December 31, 2006*
Equitable Resources, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For The Fiscal Year Ended December 31, 2007*
Equitable Resources, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For The Fiscal Year Ended December 31, 2008*
Equitable Resources, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For The Fiscal Year Ended December 31, 2009*
Equitable Resources, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For The Fiscal Year Ended December 31, 2010*
Exxon Mobil Corporation *Annual Report to Shareholders; 2000*
Exxon Mobil Corporation *Annual Report to Shareholders; 2001*
Exxon Mobil Corporation *Annual Report to Shareholders; 2002*
Exxon Mobil Corporation *Annual Report to Shareholders; 2003*
Exxon Mobil Corporation *Annual Report to Shareholders; 2004*
Exxon Mobil Corporation *Annual Report to Shareholders; 2005*
Exxon Mobil Corporation *Annual Report to Shareholders; 2006*
Exxon Mobil Corporation *Annual Report to Shareholders; 2007*
Exxon Mobil Corporation *Annual Report to Shareholders; 2008*
Exxon Mobil Corporation *Annual Report to Shareholders; 2009*
Exxon Mobil Corporation *Annual Report to Shareholders; 2010*
ExxonMobil Corporation, 2008 Corporate Citizenship Report
ExxonMobil Corporation, 2009 Corporate Citizenship Report
ExxonMobil Corporation, 2010 Corporate Citizenship Report
Frank Rusco, Director Natural Resources and Environment, United States Government Accountability Office, Testimony Before the Subcommittee on Oversight and Investigations, Committee on

Energy and Commerce, House of Representatives, RECOVERY ACT Status of Department of Energy's Obligations and Spending, March 17, 2011
Ford Motor Company; Annual Report; 2000
Ford Motor Company; Annual Report; 2001
Ford Motor Company; Annual Report; 2002
Ford Motor Company; Annual Report; 2003
Ford Motor Company; Annual Report; 2004
Ford Motor Company; Annual Report; 2005
Ford Motor Company; Annual Report; 2006
Ford Motor Company; Annual Report; 2007
Ford Motor Company; Annual Report; 2008
Ford Motor Company; Annual Report; 2009
Ford Motor Company; Annual Report; 2010
Frazier, Barnes and Associates; http://www.agecon.uga.edu/~caed/biodieselrpt.pdf; 2003
General Motors Corp.; *Annual Shareholders Report*; 2000
General Motors Corp.; *Annual Shareholders Report*; 2001
General Motors Corp.; *Annual Shareholders Report*; 2002
General Motors Corp.; *Annual Shareholders Report*; 2003
General Motors Corp.; *Annual Shareholders Report*; 2004
General Motors Corp.; *Annual Shareholders Report*; 2005
General Motors Corp.; *Annual Shareholders Report*; 2006
General Motors Corp.; *Annual Shareholders Report*; 2007
General Motors Corp.; *Annual Shareholders Report*; 2008
General Motors Corp.; *Annual Shareholders Report*; 2009
General Motors Corp.; *Annual Shareholders Report*; 2010
Hess Corporation, 2008 Corporate Sustainability Report
Hess Corporation; *Annual Report to Shareholders*; 2006
Hess Corporation; *Annual Report to Shareholders*; 2007
Hess Corporation; *Annual Report to Shareholders*; 2008
Hess Corporation; *Annual Report*; 2009
Hess Corporation; *Annual Report*; 2010
Honda Corporation, North America; *North American Environmental Report*, 2005
Honda Corporation, North America; *North American Environmental Report*, 2006
Honda Corporation, North America; *North American Environmental Report*, 2007
Honda Corporation, North America; *North American Environmental Report*, 2008
Honda Corporation, North America; *North American Environmental Report*, 2009
Honda Corporation, North America; *North American Environmental Report*, 2010
http://209.85.165.104/search?q=cache:8_EmYPfUutYJ:sec.edgar-online.com/2006/02/23/0000950129-06-001722/Section5.asp+elk+hills+shale+percent24+million+capex&hl=en&ct=clnk&cd=6&gl=us
http://209.85.165.104/search?q=cache:8_EmYPfUutYJ:sec.edgar-online.com/2006/02/23/0000950129-06-001722/Section5.asp+elk+hills+shale+percent24+million+capex&hl=en&ct=clnk&cd=6&gl=us
http://209.85.165.104/search?q=cache:8_EmYPfUutYJ:sec.edgar-online.com/2006/02/23/0000950129-06-001722/Section5.asp+elk+hills+shale+%24+million+capex&hl=en&ct=clnk&cd=6&gl=us
http://209.85.165.104/search?q=cache:8_EmYPfUutYJ:sec.edgar-online.com/2006/02/23/0000950129-06-001722/Section5.asp+elk+hills+shale+%24+million+capex&hl=en&ct=clnk&cd=6&gl=us
http://209.85.215.104/search?q=cache:uB3-1gBvOJ0J:www.secinfo.com/d19YC9.u3Fe.htm+Coshoctan+Ethanol+percent24+million&hl=en&ct=clnk&cd=11&gl=us
http://blog.syracuse.com/news/2007/09/spitzer_visits_northeast_biofu.html
http://downloads.pennnet.com/pnet/surveys/lng/0710lng_construction.pdf
http://findarticles.com/p/articles/mi_m0EIN/is_2006_Nov_9/ai_n27047072
http://findarticles.com/p/articles/mi_m0EIN/is_2006_Nov_9/ai_n27047072
http://findarticles.com/p/articles/mi_m0EIN/is_2007_Oct_11/ai_n27404255
http://findarticles.com/p/articles/mi_m0EIN/is_2007_Oct_11/ai_n27404255
http://fossil.energy.gov/news/techlines/2006/06050-DOE_Awards_EOR_Project.html
http://fossil.energy.gov/news/techlines/2006/06050-DOE_Awards_EOR_Project.html
http://fossil.energy.gov/news/techlines/2006/06050-DOE_Awards_EOR_Project.html
http://gcep.standford.edu/about/facts.html

http://gcep.standford.edu/about/facts.html
http://goliath.ecnext.com/coms2/gi_0199-45692/NLNG-Awards-Train-6-Contract.html
http://goliath.ecnext.com/coms2/gi_0199-5534450/Exceeding-expectations-Alpine-expansion-
and.html
http://goliath.ecnext.com/coms2/gi_0199-5534450/Exceeding-expectations-Alpine-expansion-and.html
http://goliath.ecnext.com/coms2/summary_0199-6188227_ITM
http://goliath.ecnext.com/coms2/summary_0199-6188227_ITM
http://governor.nd.gov/media/news-releases/2007/08/070814.html
http://hesreport.sunocoinc.com/fw/main/Global-Climate-Change-866.html
http://investor.chevron.com/phoenix.zhtml?c=130102&p=irol-newsArticle&ID=693376&highlight=
http://investor.chevron.com/phoenix.zhtml?c=130102&p=irol-newsArticle&ID=693376&highlight=
http://library.corporate-ir.net/library/19/196/196066/items/287687/SandRidge_2007_Annual_10K.pdf
http://library.corporate-ir.net/library/19/196/196066/items/287687/SandRidge_2007_Annual_10K.pdf
http://mpua.org/Communications/April2002advantageForPDF.pdf
http://nei.org/resourcesandstats/documentlibrary/newplants/graphicsandcharts/newnuclearplantstatus/
http://nei.org/resourcesandstats/documentlibrary/reliableandaffordableenergy/graphicsandcharts/usnuclearplantsales
http://petroleum.berkeley.edu/patzek/Harmful/Materials/nyt_12_21_2006.htm
http://phx.corporate-ir.net/phoenix.zhtml?c=196219&p=irol-sec
http://phx.corporate-ir.net/phoenix.zhtml?c=196219&p=irol-sec
http://phx.corporate-ir.net/phoenix.zhtml?c=196219&p=irol-sec
http://sec.edgar-online.com/2008/01/04/0000950129-08-000077/Section3.asp
http://sec.edgar-online.com/2008/01/04/0000950129-08-000077/Section3.asp
http://stlouis.bizjournals.com/stlouis/gen/company.html?gcode=1C432B8B168B4CCAB4D2FAB4D
AAA1211
http://webstar.postbulletin.com/agrinews/144923469760839.bsp
http://westernplainsenergy.biz/wpe.html
http://whiting.bp.com/go/doc/1550/165362/
http://wichita.bizjournals.com/wichita/stories/2006/02/13/daily3.html
http://wistechnology.com/articles/3811/
http://www.aberdeenenergy.com/press_2-10-06.htm
http://www.accessmylibrary.com/coms2/summary_0286-15674368_ITM
http://www.accessmylibrary.com/coms2/summary_0286-15782189_ITM
http://www.accessmylibrary.com/coms2/summary_0286-15782189_ITM
http://www.accessmylibrary.com/coms2/summary_0286-16667386_ITM
http://www.accessmylibrary.com/coms2/summary_0286-32474146_ITM
http://www.allbusiness.com/operations/shipping/161168-1.html
http://www.ameren.com/EnvReport/ADC_FullEnvReport.pdf
http://www.ameren.com/EnvReport/ADC_FullEnvReport.pdf
http://www.anadarko.com/Responsibility/Pages/ClimateChange.aspx
http://www.asalliances.com/ethanol.htm
http://www.asalliances.com/ethanol.htm
http://www.asalliances.com/ethanol.htm
http://www.aventinerei.com/facilities.htm
http://www.aventinerei.com/facilities.htm
http://www.aventinerei.com/facilities.htm
http://www.aventinerei.com/facilities.htm
http://www.babcockbrown.com/media/187092/bnb percent20investor percent20presentations.pdf
http://www.berr.gov.uk/files/file45788.pdf
http://www.bfenergy.com/news/nebraska_construction.html
http://www.bioenergyllc.com/projects.htm
http://www.biofuelsjournal.com/info/bf_articles.html?type=ar&ID=29034
http://www.bp.com/genericarticle.do?categoryId=2012968&contentId=7038865
http://www.canopetro.com/files/companyprofile/Cano2007AnnualReport.pdf
http://www.canopetro.com/files/companyprofile/Cano2007AnnualReport.pdf
http://www.cardinalethanol.com/Upload/Documents/Annual_Meeting_Powerpoint2.pdf
http://www.centralvalleybusinesstimes.com/stories/001/?ID=6491
http://www.chadbourne.com/newsevents/NewsDetail.aspx?news=682
http://www.chemie.de/news/e/53973/
http://www.cheniere.com/LNG_terminals/freeport_lng.shtml
http://www.cheniere.com/LNG_terminals/freeport_lng.shtml

http://www.chevron.com/documents/pdf/Chevron2007AnnualReportSupplement.pdf
http://www.chevron.com/documents/pdf/Chevron2007AnnualReportSupplement.pdf
http://www.chevron.com/globalissues/climatechange/
http://www.chevron.com/news/press/Release/?id=2006-10-26
http://www.chevron.com/products/sitelets/pascagoula/refineryprofile/
http://www.chron.com/disp/story.mpl/ap/business/5875017.html
http://www.conocophillips.com/newsroom/news_releases/2007news/12-07-2007.htm
http://www.conocophillips.com/newsroom/news_releases/2007news/12-07-2007.htm
http://www.contractorsunlimited.co.uk/news/050112-BG-Group.shtml
http://www.denverpost.com/ci_4530946
http://www.dom.com/investors/annual.jsp
http://www.dom.com/investors/annual.jsp
http://www.dom.com/investors/annual.jsp
http://www.dom.com/investors/annual.jsp
http://www.dot.state.oh.us/OHIORAIL/Project percent20Briefings/July percent202007/greater percent20ohio percent20ethanol.pdf
http://www.downstreamtoday.com/News/Articles/200806/Chile_LNG_Project_Secures_Financing_11508.aspx?AspxAutoDetectCookieSupport=1
http://www.edaofstclaircounty.com/docs/pdf/PressRelease/Marysville percent20Ethanol percent202 percent20Press percent20Release.pdf
http://www.eenergyadams.com/investor_proxy.htm
http://www.eia.doe.gov/oiaf/servicerpt/subsidy2/pdf/execsum.pdf
http://www.eia.doe.gov/oiaf/servicerpt/subsidy2/pdf/execsum.pdf
http://www.eia.doe.gov/oiaf/servicerpt/subsidy2/pdf/execsum.pdf
http://www.eia.doe.gov/oiaf/servicerpt/subsidy2/pdf/execsum.pdf
http://www.ekaellc.com/history.html
http://www.energyme.com/energy/2005/en_05_0246.htm
http://www.enhancedoilres.com/financials/MD&A_Annual.pdf
http://www.enhancedoilres.com/financials/MD&A_Annual.pdf
http://www.enhancedoilres.com/news/EOR-nr-Jan312008.pdf
http://www.enhancedoilres.com/shareholders/ShareholderUpdate-EOR-Aug-07.pdf
http://www.enhancedoilres.com/news/EOR-nr-Jan312008.pdf
http://www.enhancedoilres.com/shareholders/ShareholderUpdate-EOR-Aug-07.pdf
http://www.entergy.com/content/investor_relations/pdfs/2007_Annual_rpt.pdf
http://www.entergy.com/content/investor_relations/pdfs/2007_Annual_rpt.pdf
http://www.entergy.com/content/investor_relations/pdfs/2007_Annual_rpt.pdf
http://www.epa.gov/gasstar/documents/ll_dimcompstat.pdf
http://www.epa.gov/gasstar/documents/ll_dimcompstat.pdf
http://www.epa.gov/gasstar/documents/ll_pipeline.pdf
http://www.epa.gov/gasstar/documents/ll_pipeline.pdf
http://www.epa.gov/lmop/proj/index.htm#1
http://www.epa.gov/lmop/proj/index.htm#1
http://www.evolutionpetroleum.com/assets_enhanced.html
http://www.evolutionpetroleum.com/assets_enhanced.html
http://www.forbes.com/markets/feeds/afx/2007/08/08/afx3999270.html
http://www.forbes.com/markets/feeds/afx/2007/08/08/afx3999270.html
http://www.fossil.energy.gov/programs/reserves/npr/Secure_Fuels_from_Domestic_Resources_-_P.pdf
http://www.fplgroup.com/reports/pdf/2007_annual.pdf
http://www.fplgroup.com/reports/pdf/2007_annual.pdf
http://www.gastool.methanetomarkets.org/m2mtool/files/docs/eliminateunnecessaryequipmentandorsystems.pdf
http://www.gastool.methanetomarkets.org/m2mtool/files/docs/ReducingEmissionsfromCompressorSeals.ppt
http://www.ghgworks.com/4b-bluelake.html
http://www.ghgworks.com/4b-bluelake.html
http://www.grainnet.com/info/articles.html?type=bn&ID=32674
http://www.granitefallsenergy.com/
http://www.greatplainsethanol.com/
http://www.greencarcongress.com/2007/10/aep-to-sell-cap.html
http://www.greencarcongress.com/2007/10/aep-to-sell-cap.html
http://www.highbeam.com/doc/1G1-142338612.html

http://www.hks.harvard.edu/hepg/Papers/Fertel_Handout.pdf
http://www.hks.harvard.edu/hepg/Papers/Fertel_Handout.pdf
http://www.iadg.com/Hawkeye-Renewables.aspx
http://www.ibecethanol.com/
http://www.ilcorn.org/news/html/11-19-04.html
http://www.imperialoil.ca/Canada-English/Files/Kearl_May06.pdf
http://www.indusbusinessjournal.com/ME2/dirmod.asp?sid=&nm=&type=Publishing&mod=Publications percent3A
percent3AArticle&mid=8F3A7027421841978F18BE895F87F791&tier=4&id=EB1470A942E745B796BD2E8EB26DA1AD
http://www.insideindianabusiness.com/newsitem.asp?ID=19189
http://www.kindermorgan.com/investor/kmp_2007_annual_report_overview.pdf
http://www.kindermorgan.com/investor/kmp_2007_annual_report_overview.pdf
http://www.kindermorgan.com/investor/presentations/2007_Analysts_Conf_03_CO2.pdf
http://www.kindermorgan.com/investor/presentations/2007_Analysts_Conf_03_CO2.pdf
http://www.klprocess.com/Press percent20Releases/RCJ_010608.html
http://www.littlesiouxcornprocessors.com/
http://www.littlesiouxcornprocessors.com/
http://www.mairetecnimont.it/business-unit/oil-gas/oil-gasprojects/fos-cavaou-lng-project
http://www.marathon.com/content/includes/2007ar/page3.asp
http://www.marathon.com/Search/?search2=heavy+oil+investment
http://www.marketwatch.com/news/story/10-q-nedak-ethanol-llc/story.aspx?guid=
percent7B9FEF4E86-BB4A-41D1-A4F2-2F0464AF5E89 percent7D
http://www.marketwire.com/press-release/Industrial-Info-Resources-872128.html
http://www.marketwire.com/press-release/King-and-Spalding-820291.html
http://www.marketwire.com/press-release/King-and-Spalding-820291.html
http://www.marubeni.com/news/2007/070525e.html
http://www.megawestenergy.com/projects/deerfield.html
http://www.megawestenergy.com/projects/montana.html
http://www.megawestenergy.com/projects/trinity.html
http://www.mitsui.co.jp/en/release/2004/1174939_1205.html
http://www.mocorn.org/news/2003/MediaAdvisory09-26-03.htm
http://www.mywire.com/pubs/PRNewswire/2007/12/11/5157879?extID=10051
http://www.mywire.com/pubs/PRNewswire/2007/12/11/5157879?extID=10051
http://www.nationalgrid.com/uk/GrainLNG/Expansion/
http://www.ne.doe.gov/np2010/neScorecard/pdfFiles/scorecard_suppl_2008_03_03.pdf
http://www.netl.doe.gov/publications/factsheets/project/Proj441.pdf
http://www.netl.doe.gov/technologies/carbon_seq/core_rd/RegionalPartnership/42588.html
http://www.netl.doe.gov/publications/factsheets/project/Proj441.pdf
http://www.netl.doe.gov/technologies/carbon_seq/core_rd/RegionalPartnership/42588.html
http://www.netl.doe.gov/technologies/carbon_seq/core_rd/RegionalPartnership/42587.html
http://www.netl.doe.gov/technologies/carbon_seq/core_rd/RegionalPartnership/42589.html
http://www.netl.doe.gov/technologies/carbon_seq/core_rd/RegionalPartnership/42587.html
http://www.netl.doe.gov/technologies/carbon_seq/core_rd/RegionalPartnership/42589.html
http://www.netl.doe.gov/technologies/carbon_seq/core_rd/RegionalPartnership/42592.html
http://www.netl.doe.gov/technologies/carbon_seq/core_rd/RegionalPartnership/42590.html
http://www.netl.doe.gov/technologies/carbon_seq/core_rd/RegionalPartnership/42591.html
http://www.netl.doe.gov/technologies/carbon_seq/core_rd/RegionalPartnership/42593.html
http://www.news-banner.com/index/news-app/story.3955/menu./sec./home.
http://www.northernlightsethanol.com/smac.asp
http://www.nrc.gov/reading-rm/doc-collections/commission/secys/2007/secy2007-0081/enclosure3.pdf
http://www.oregontrailethanol.com/
http://www.ottertailethanol.com/documents/Jan_31_2006_Press_Release.pdf
http://www.pearleandp.com/s/SanMiguel.asp?ReportID=143129
http://www.pennwest.com/operations/crude_pembina.html
http://www.pennwest.com/operations/crude_pembina.html
http://www.projectdubai.com/ta_news.php?news_id=2199&section=real
http://www.ptac.org/co2/dl/co2f0602p03.pdf http://www.arcresources.com/en-ca/news/
http://www.ptac.org/co2/dl/co2f0602p03.pdf http://www.arcresources.com/en-ca/news/

http://www.qp.com.qa/qp.nsf/8c264276b952633c432571290026c60e/c8a5483e9a32793b432571440021a4d4?OpenDocument
http://www.akersolutions.com/Internet/MediaCentre/PressReleases/Group/2005/AKPressRelease_992834.htm
http://www.reuters.com/article/pressRelease/idUS111767+14-Apr-2008+BW20080414
http://www.reuters.com/article/pressRelease/idUS111767+14-Apr-2008+BW20080414
http://www.rigzone.com/news/article.asp?a_id=47926
http://www.rigzone.com/news/article.asp?a_id=47926
http://www.riotechnical.com/files/LHCE.pdf
http://www.rockymountainnews.com/drmn/energy/article/0,2777,DRMN_23914_5726152,00.html
http://www.rockymountainnews.com/drmn/energy/article/0,2777,DRMN_23914_5726152,00.html
http://www.rockymountainnews.com/drmn/energy/article/0,2777,DRMN_23914_5726152,00.html
http://www.rrc.state.tx.us/commissioners/carrillo/mexico/2007/presentations/CREIngSalazar.pdf
http://www.scandoil.com/moxie-bm2/gas/lng_gas/bp-migas-announces-tanggu.shtml
http://www.sec.gov/Archives/edgar/data/1287900/000114420407053675/v089753_10k-a.htm
http://www.sec.gov/Archives/edgar/data/1287900/000114420407053675/v089753_10k-a.htm
http://www.sempralng.com/Files/pdf/CameronBrochure_May06.pdf
http://www.sempralng.com/Files/pdf/CameronBrochure_May06.pdf
http://www.shell.ca/home/content/ca-en/about_shell/what_we_do/oil_sands/aosp/sustainable_dev/hssd_resources.html
http://www.shell.ca/home/content/ca-en/about_shell/what_we_do/oil_sands/aosp/sustainable_dev/hssd_resources.html
http://www.shell.ca/home/content/ca-en/news_and_library/press_releases/2006/unindex/april21_new_engine_oil.html?LN=/news_and_library/press_releases/2006
http://www.shell.com/static//ca-en/downloads/about_shell/what_we_do/aosp_sd_report.pdf
http://www.shipbuildinghistory.com/world/highvalueships/lngactivefleet.htm
http://www.stpns.net/view_article.html?articleId=31849783182153932
http://www.syncrude.ca/users/folder.asp?FolderID=5726
http://www.syncrude.ca/users/folder.asp?FolderID=5726
http://www.syncrude.ca/users/folder.asp?FolderID=5726
http://www.tallcornethanol.com/
http://www.uwgp.com/
http://www.washingtonpost.com/wp-dyn/content/article/2006/03/25/AR2006032500033.html
http://www.washingtonpost.com/wp-dyn/content/article/2006/03/25/AR2006032500033.html
http://www.windaction.org/news/8571
http://www.woodside.com.au/NR/rdonlyres/1B6BA1C2-9028-4639-9EE4-802D28FBB839/0/Plutofactsheetapril2008lores.pdf
http://www.xtoenergy.com/en/Carbon_Disclosure_Estimations.html
http://www.zwire.com/site/news.cfm?dept_id=474107&newsid=18776169
http://www.zwire.com/site/news.cfm?dept_id=474107&newsid=18776169
http://www.zwire.com/site/news.cfm?newsid=18175190&BRD=2020&PAG=461&dept_id=231738&rfi=6
https://portal.perulng.com/irj/go/km/docs/documents/PLNG%20Website/index.htm
Kerr-McGee Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2000*
Kerr-McGee Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2001*
Kerr-McGee Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2002*
Kerr-McGee Corporation *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2003*
Lyondell-CITGO Refining, L.P. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2001*
Lyondell-CITGO Refining, L.P. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2002*
Lyondell-CITGO Refining, L.P. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2003*
Lyondell-CITGO Refining, L.P. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2004*
Marathon Oil Corporation *Annual Report to Shareholders; 2000*

Marathon Oil Corporation *Annual Report to Shareholders; 2001*
Marathon Oil Corporation *Annual Report to Shareholders; 2002*
Marathon Oil Corporation *Annual Report to Shareholders; 2003*
Marathon Oil Corporation *Annual Report to Shareholders; 2004*
Marathon Oil Corporation *Annual Report to Shareholders; 2005*
Marathon Oil Corporation *Annual Report to Shareholders; 2006*
Marathon Oil Corporation *Annual Report to Shareholders; 2007*
Marathon Oil Corporation *Annual Report to Shareholders; 2008*
Marathon Oil Corporation *Annual Report to Shareholders; 2009*
Marathon Oil Corporation *Annual Report to Shareholders; 2010*
Marathon Oil Corporation, 2005 "Report Card"
Marathon Oil Corporation, 2006 Corporate Social Responsibility Report
Marathon Oil Corporation, 2007 Corporate Social Responsibility Report
Marathon Oil Corporation, 2008 Corporate Social Responsibility Report
Marathon Oil Corporation, 2009 Corporate Social Responsibility Report
Motiva Enterprises, L.L.C. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2000*
Motiva Enterprises, L.L.C. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2001*
Motiva Enterprises, L.L.C. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2002*
Motiva Enterprises, L.L.C. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2003*
Motiva Enterprises, L.L.C. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2004*
Motiva Enterprises, L.L.C. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2005*
National Biodiesel Board; http://www.biodiesel.org/
National Science Foundation; *2001 Survey of Industrial Research and Development*; 2003
Occidental Petroleum Corporation *Annual Report to Shareholders; 2000*
Occidental Petroleum Corporation *Annual Report to Shareholders; 2001*
Occidental Petroleum Corporation *Annual Report to Shareholders; 2002*
Occidental Petroleum Corporation *Annual Report to Shareholders; 2003*
Occidental Petroleum Corporation *Annual Report to Shareholders; 2004*
Occidental Petroleum Corporation *Annual Report to Shareholders; 2005*
Occidental Petroleum Corporation *Annual Report to Shareholders; 2006*
Occidental Petroleum Corporation *Annual Report to Shareholders; 2007*
Occidental Petroleum Corporation *Annual Report to Shareholders; 2008*
Occidental Petroleum Corporation *Annual Report to Shareholders; 2009*
Occidental Petroleum Corporation *Annual Report to Shareholders; 2010*
Occidental Petroleum Corporation 2008 Social Responsibility Report
Occidental Petroleum Corporation 2009 Social Responsibility Report
Occidental Petroleum Corporation 2010 Social Responsibility Report
Pennsylvania State University: College of Earth and Mineral Sciences: Department of Energy and Mineral Engineering, The Economic Impacts of the Pennsylvania Marcellus Shale Natural Gas Play: An Update Timothy J. Considine, Robert Watson, Seth Blumsack, May 24, 2010
Premcor, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2000*
Premcor, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2001*
Premcor, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2002*
Premcor, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2003*
Premcor, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2004*
Premcor, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2005*
REN21 Renewable Energy Policy Network. 2005. *Renewables 2005 Global Status Report.* Washington, DC: Worldwatch Institute.

Shell Oil Company *Annual Report to Shareholders;* 2000
Shell Oil Company *Annual Report to Shareholders;* 2001
Shell Oil Company *Annual Report to Shareholders;* 2002
Shell Oil Company *Annual Report to Shareholders;* 2003
Shell Oil Company *Annual Report to Shareholders;* 2004
Shell Oil Company *Annual Report to Shareholders;* 2005
Shell Oil Company *Annual Report to Shareholders;* 2006
Shell Oil Company *Annual Report to Shareholders;* 2007
Shell Oil Company *Annual Report to Shareholders;* 2008
Shell Oil Company *Annual Report to Shareholders;* 2009
Shell Oil Company *Annual Report to Shareholders;* 2010
Shell Oil Company; http://eng.volkswagen-media-services.com/medias_publish/m...lose_ethanol_in_germany.standard.gid-oeffentlichkeit.html
Shell Oil Company; Shell Sustainability Report 2006
Shell Oil Company; Shell Sustainability Report 2007
Shell Oil Company; Shell Sustainability Report 2008
Shell Oil Company; Shell Sustainability Report 2009
Shell Oil Company; Shell Sustainability Report 2010
Shell Technology webcast – February 21, 2007
sites.nppd.com/IO/spring06.pdf
Sunoco, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2000*
Sunoco, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2001*
Sunoco, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2002*
Sunoco, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2003*
Sunoco, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2004*
Sunoco, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2005*
Sunoco, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2006*
Sunoco, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2007*
Sunoco, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2008*
Sunoco, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2009*
Sunoco, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2010*
T^2 and Associates, *Key Investments in Greenhouse Gas Mitigation Technologies by Energy Firms, Other Industry and the Federal Government: An Update*, June 2009, and embedded 400+ annual company reports
Tesoro Petroleum Corporation *Annual Report to Shareholders*, 2004
Tesoro Petroleum Corporation *Annual Report to Shareholders*, 2005
Tesoro Petroleum Corporation *Annual Report to Shareholders*, 2006
Tesoro Petroleum Corporation *Annual Report to Shareholders*, 2007
Tesoro Petroleum Corporation *Annual Report to Shareholders*, 2008
Tesoro Petroleum Corporation *Annual Report to Shareholders*, 2009
Tesoro Petroleum Corporation *Annual Report to Shareholders*, 2010
The Williams Companies, Inc. *Annual Report to Shareholders*, 2003
The Williams Companies, Inc. *Annual Report to Shareholders*, 2004
The Williams Companies, Inc. *Annual Report to Shareholders*, 2005
The Williams Companies, Inc. *Annual Report to Shareholders*, 2006
The Williams Companies, Inc. *Annual Report to Shareholders*, 2007
The Williams Companies, Inc. *Annual Report to Shareholders*, 2008
The Williams Companies, Inc. *Annual Report to Shareholders*, 2009

The Williams Companies, Inc. *Annual Report to Shareholders,* 2010
The Williams Companies, Inc., 2007 Corporate Responsibility Report
The Williams Companies, Inc., 2008 Corporate Responsibility Report
The Williams Companies, Inc., 2009 Corporate Responsibility Report
Total Fina Elf Holdings USA, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2000*
Total Fina Elf Holdings USA, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2001*
Total Fina Elf Holdings USA, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2002*
Total Fina Elf Holdings USA, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2003*
Total Fina Elf Holdings USA, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2004*
Total Fina Elf Holdings USA, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2005*
Total Fina Elf Holdings USA, Inc. *Annual Report Pursuant To Section 13 Or 15(D) Of The Securities Exchange Act Of 1934; (10-K) For the Fiscal Year Ended December 31, 2007*
U.S Department of Energy, General Services Administration; *Federal Automotive Statistical Tool*
U.S. Department of Energy, Energy Information Administration,; Form EIA-860, *Annual Electric Generator Report.*
U.S. Department of Energy, Energy Information Administration; Form EIA-886, "Annual Survey of Alternative Fuel Vehicles Suppliers and Users"
U.S. Department of Energy, Energy Information Administration;
http://www.iea.org/Textbase/stats/rd.asp
U.S. Department of Energy*; s:/xlsfiles/history tables/BA history by approp 98-06 energy programs*
U.S. Energy Information Administration *Emissions of Greenhouse Gases in the United States 2008,* Dec 2009
Unocal Corporation *Annual Report to Shareholders;* 2000
Unocal Corporation *Annual Report to Shareholders;* 2001
Unocal Corporation *Annual Report to Shareholders;* 2002
Unocal Corporation *Annual Report to Shareholders;* 2003
Unocal Corporation *Annual Report to Shareholders;* 2004
Unocal Corporation *Annual Report to Shareholders;* 2005
Valero Energy Corporation *Annual Report to Shareholders, 2002*
Valero Energy Corporation *Annual Report to Shareholders, 2003*
Valero Energy Corporation *Annual Report to Shareholders,2004*
Valero Energy Corporation *Annual Report to Shareholders, 2005*
Valero Energy Corporation *Annual Report to Shareholders, 2006*
Valero Energy Corporation *Annual Report to Shareholders, 2007*
Valero Energy Corporation *Annual Report to Shareholders, 2008*
Valero Energy Corporation *Annual Report to Shareholders, 2009*
Valero Energy Corporation *Annual Report to Shareholders, 2010*
Valero Energy Corporation *Social Responsibility Report, 2010*
XTO Energy, Inc. *Annual Report*; 2000
XTO Energy, Inc. *Annual Report*; 2001
XTO Energy, Inc. *Annual Report*; 2002
XTO Energy, Inc. *Annual Report*; 2003
XTO Energy, Inc. *Annual Report*; 2004
XTO Energy, Inc. *Annual Report*; 2005
XTO Energy, Inc. *Annual Report*; 2006
XTO Energy, Inc. *Annual Report*; 2007
XTO Energy, Inc. *Annual Report*; 2008
XTO Energy, Inc. *Annual Report*; 2009