Energy, Economics, and the Environment: Effects on African Americans

An Analysis Prepared for the American Association of Blacks in Energy (AABE) by Redefining Progress.

February, 2004
Oakland,CA

Executive Summary

The economy is highly dependent on the abundance of commercial energy. Affordable energy supplies provide innumerable benefits to modern society: they help to heat and light hospitals and schools, to produce essential goods and services, and to transport people to work and home again. However, the detrimental effects of the current dependence on large-scale energy use are also far-reaching. Many households lack the financial resources to purchase enough energy to meet basic needs, while an even greater number of households are vulnerable to the negative health effects stemming from the current fuel mix. Likewise, energy prices, and oil prices in particular, appear to have undue influence on the general state of the economy and employment, such that a large proportion of the population is vulnerable to economic downturns triggered by fluctuations in the global energy market.

In no population is the mixed blessing of the modern energy system as evident as in the African American population. This report examines the effects of energy use on African Americans and determines that, as a group, African Americans are significantly more vulnerable than the general population to several factors including:

Higher Vulnerability to Energy Prices
African Americans are more than twice as likely to live in poverty as non-African Americans. As such the amount of money spent on fuel and electricity purchases represents a significant household expenditure. More importantly, African Americans spend a significantly higher fraction of their expenditures on direct energy purchases than non-African Americans across every income decile. In other words, poor African Americans spend more money on energy than poor non-African Americans. As a consequence of these two factors, African Americans dedicate a much higher share of their expenditures toward energy purchases. Increases in the price of energy are likely to negatively affect African Americans more significantly than the general population.

Higher Vulnerability to Macroeconomic Effects
Global oil prices currently have a unique role in affecting the timing and magnitude of business cycles. Nine of the last ten recessions have been preceded by periods of rising oil prices. During such periods of economic downturn African Americans are more negatively affected in terms of employment and wages than non-African Americans. These broader-scale economic effects are many times larger than those predicted from changes in the national energy bill.

Higher Vulnerability to Health Effects
African Americans have a significantly higher exposure to air pollution. Approximately, 71 percent of African Americans live in counties in violation of federal air pollution standards, and 78 percent of African Americans are located within 30 miles of a coal-fired power plant. As a partial consequence of this inequality, the African American community has a rate of incidence of asthma and other illnesses roughly three times that of the general population. Despite higher exposure, African Americans have more limited resources to combat these effects. The percentage of African Americans lacking medical insurance is 150% that of the

general population. Similarly, African Americans are likely to be more significantly affected by some of the detrimental health effects of global climate change such as the increased incidence of heat-related deaths or possibly some communicable diseases.

As a consequence of this higher vulnerability, African Americans ought to have greater concerns with energy policy than the general population. Moreover, African Americans should arguably be less concerned about maintaining the status quo insofar as African American ownership of energy businesses and African American employment in the energy sector are disproportionately small. Along these lines, Sections 2.2 and 2.3 outline some of the major energy policy initiatives that may affect African Americans, for the better or worse, and provide guidance on the likely effects of each.

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Key Findings by Section

Section 1.1 – Energy Consumption

- U.S. per capita annual commercial energy consumption is approximately 338 million Btus, or roughly five times greater than the global average. Similarly, the energy intensity of the U.S. economy is high relative to most developed countries.

- Roughly half of per capita consumption of energy is direct expenditure (residential and transportation). The remaining half of per capita expenditures are indirect expenditures (commercial and industrial), embedded in products purchased.

- African Americans spend a significantly higher fraction of total expenditures on energy use than non-African Americans in America for almost all income deciles.

- Particularly in the lower half of income deciles, Black Americans spend a substantially larger percentage of total outlays on energy purchases. In particular, electricity and home heating expenditures are significantly higher for African Americans than for non-African Americans in the same income decile.

- Electricity expenditures are higher for African Americans than non-African Americans in almost every income decile, converging only at the highest income levels.

- Home heating ("other energy") expenditures are similarly higher for African Americans than non-African Americans in almost every income decile.

- Gasoline and motor oil expenditures are *lower* for African Americans than non-African Americans in every decile.

- In general, the poor spend a significantly higher fraction of expenditures on energy purchases than the middle-class and the wealthy: 13% of expenditures in the poorest decile as opposed to just 5% of expenditures in the top decile. The higher percentage of African Americans living in lower income deciles exacerbates the vulnerability of African Americans to higher energy prices.

Section 1.2 and 1.3 – Energy Supply and Energy Projections

- Over the period 1990 to 2002 there has been a 26% increase in electrical generation in the U.S. In 2002, coal represented 50% of generation, nuclear 20%, natural gas 18%, hydroelectric 7%, and petroleum 2.3%.

- Average electricity retail prices over the period 1990 to 2002 decreased in real terms for all sectors. Average electricity prices decreased 14.4% over this period.

- Overall residential energy consumption is predicted to increase to 26.1 quadrillion Btu/year in 2025. Most of this increase will be in natural gas and electricity use. Commercial energy use will increase to 25.9 quadrillion Btu/year in 2025, most of this increase also occurring with increased use of electricity and natural gas. Industrial energy use is expected to increase to 43.1 quadrillion Btu/year. Industrial use of electricity and natural gas will both increase by approximately 37%.

Section 1.4 – Vulnerability of African Americans

- African Americans spend a significantly higher fraction of total expenditures on direct purchases of energy than non-African Americans. This trend is true across all but the highest income deciles.
    - As discussed in Section 1.1.2, African Americans have higher expenditures on electricity and home heating, which are only partially offset by lower expenditures on motor oil and gasoline.
    - A partial explanation may lie in both lower average education levels and lower levels of home ownership among African Americans.

- In addition to the economic burden of high prices, to the extent that the poor (and poor African Americans in particular) choose to forgo energy use (e.g. heating) or trade-off energy use with other products such as food and health care, high energy prices can represent a significant health hazard to the fuel poor.

- African Americans appear to be more vulnerable to the negative effects of general economic downturns triggered by oil price shocks.

- With respect to specific populations, low-income African Americans and African American farmers are among the most vulnerable populations in society.

- As of the mid-1990s, African Americans had a disproportionately small ownership share in U.S. businesses.
    - In 1997, blacks owned approximately 3.95% of all firms in the United States.
    - Black-owned firms were only responsible for 0.384% of total sales and receipts.

- The energy intensity of black-owned firms appears to be roughly equivalent to the energy intensity of all firms.
    - In 1997, Black Americans owned 4.24% of U.S. firms in industries with greater than average energy intensities (in contrast to 3.95% average ownership).
    - However, black-owned firms in sectors with greater than average energy intensities were only responsible for 0.374% of sales and receipts (in contrast to 0.384% average sales and receipts).

Section 1.5 – Health and Well-Being

- African Americans have a significantly higher exposure to air pollution
    - 71 percent of African Americans live in counties in violation of federal air pollution standards.

    - 78 percent of African Americans are located within 30 miles of a coal-fired power plant.

- The African American community has a rate of incidence of asthma, respiratory distress syndrome, and sudden infant death syndrome roughly three times that of the general population.

- Despite higher exposure, African Americans have more limited resources to combat pollution. The percentage of African Americans lacking medical insurance is 150% that of the general population.

- Climate change impacts such as ozone formation, increased heat-deaths, and higher disease incidence are also likely to disproportionately affect African Americans.

Section 1.6 – Employment in the Energy Sector

- For the eleven industries examined, over the past two decades the fraction of employees who are black has *risen* from 6% to 8%.

- However, there has been a 28% *decrease* in overall energy sector employment during this period.

- As a result, the total number of African Americans employed in the energy industry has *fallen* over the past two decades, from a high of 215,000 in 1989 to approximately 176,000 in 2002.

- Nearly two-thirds of blacks employed in the energy sector live in the South, due in large to the higher African American population there.

- The total percentage of black Americans who are employed in the U.S. energy sector has fallen from around 1.8% in 1983, to 1.1% today.

- African Americans have consistently represented a lower fraction of employees in the energy sector than they have in the economy overall, in services, or in manufacturing jobs.

Section 1.7 – Renewable Energy

- A shift toward renewable energy is likely to increase African American employment levels per unit of energy produced, but will have uncertain effects on overall energy sector employment.

- Shifting to renewable energy would require an estimated doubling of the federal energy research and development budget as well as numerous regulatory and economic incentives.

- Any reduction in the dependence on the volatile global oil market can reduce the vulnerability of the U.S. economy and African Americans in particular to the macroeconomic effects of oil shocks.

- On a broader scale, African Americans comprise roughly 8.5% of employees in industrial categories that include renewable industries. This share is equivalent to African American employment in energy in general.

- In contrast to African American employment in the general energy sector, employment in the renewable sector is on the rise.

- A shift to renewable energy would likely increase overall employment levels in the energy sector per unit of energy produced.

- Government studies have indicated that the pursuit of renewables would require a substantial increase in spending on federal energy research and development. The DOE's Interlaboratory Working Group recommended a doubling of energy R&D to pursue a low-carbon future.

- In addition to enhanced research programs, significant regulatory programs such as CAFÉ standards or carbon trading systems are required to encourage the transition.

- Both the DOE's Five Laboratory Study (1997) and the Scenarios for a Clean Energy Future (2000) estimated that the overall costs of pursuing a renewable and energy efficiency strategy would be offset by the benefits.

- Employment effects from switching to renewable energy systems are likely to be positive overall, though there is no reason to believe that they will disproportionately go to African Americans.

- Economic effects from rising energy prices will be disproportionately felt by African Americans. However;
    - Reduced energy demand may offset the harms.
    - Reduced vulnerability to oil shocks will disproportionately benefit the poor and African Americans.

Section 2.1 – LIHEAP and WAP

- African Americans are disproportionately benefited by LIHEAP and other energy assistance programs.

- African Americans comprise 12.7% of the overall population. Based on an eligibility model and self-reporting, blacks are estimated to receive an estimated 23-25% of LIHEAP funds.

- In 2003, 23% of the $1.8 billion in LIHEAP appropriations amounted to roughly $400 million in home energy assistance for African Americans.

- In the few states for which data is available, blacks receive an even greater proportion of LIHEAP funds than suggested by their percentage of eligible recipients.

- Updating the antiquated state block grant allocation formula would increase the percentage of African American households eligible to receive LIHEAP funds.

- In constant dollar terms (annually adjusted by the CPI), LIHEAP funding has approximately been halved over the past two decades.

- Variable funding poses a significant obstacle to improving LIHEAP services.

- The number of African American households helped in FY 2000 is estimated to be between 830,000 and 1,150,000.

Section 2.2 and 2.3 – Energy Policies and Market Mechanisms

- A wide range of existing and potential policies affect energy supply and demand in the United States. These policies and their effects are summarized in Sections 2.2 and 2.3. In general is found that:
    - Those policies that reduce air pollution, decrease dependence on global oil markets, or increase energy efficiency are likely to disproportionately benefit African Americans.
    - Those policies that increase energy prices, reduce air quality controls, or increase dependence on fossil fuels are likely to disproportionately negatively impact African Americans.

Section 2.4 – U.S. Energy Policy and Africa

- From 1997 through 2002, the U.S. ExIm Bank provided a total of $106 million in loans and $1,054 million in guarantees for investment in the power and oil and gas sectors in Africa.

- OPIC currently provides political insurance coverage for the power and oil and gas industry in Africa summing to $350 million of maximum contingent liability (MCL).

- A recent review by the World Bank indicates that investment in extractive industries in developing countries is often detrimental to the general population in those countries.

- In 2002, approximately 13.4% of U.S. crude oil and petroleum product imports originated in Africa.

- The fraction of U.S. oil imports from Africa has fallen slightly over the past five years from a high of 18% in 1997. This fall is due to the fact that U.S. demand has risen while African exports have remained relatively constant.

- West African oil production and U.S. imports may rise significantly in the near future.

1.1 – U.S. Energy Supply and Demand for Commercial Energy

1.1.1 – U.S. per capita consumption

Background
The United States is the world's largest consumer of commercial energy. In terms of per capita consumption, Americans trail only behind Canada, Norway, and Luxembourg in the OECD. Consumption is split into four categories: residential, transportation, commercial and industrial. With regards to individual consumption, residential and transportation expenditures on energy tend to be direct expenditures, while commercial and industrial expenditures are typically indirect expenditures which are embedded in products purchased.

Key Findings

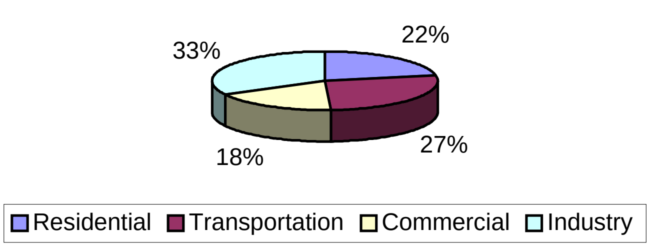
- From October 2002 through September 2003 (the most recent 12 months for which energy statistics are available), U.S. per capita commercial energy consumption was 337.7 million Btus.

- U.S. per capita commercial energy consumption is five times greater than the global average (65.7 million Btus in 2001).

- The energy intensity of the U.S. economy (10,700 Btus of primary energy consumed per dollar of GDP in 2001) is high relative to most developed countries, but lower than most developing nations.

- Consumption is generally broken down into four categories: Residential, Transportation, Commercial, and Industrial. Of these:
    - Residential consumption accounted for 21.8% (73.7 million Btus)
    - Transportation consumption accounted for 27.3% (92.3 million Btus)
    - Commercial consumption accounted for 18.0% (60.6 million Btus)
    - Industrial consumption accounted for 32.9% (111.1 million Btus)

Figure 1.1 - U.S. Commercial Energy Consumption by Sector



- Roughly half of per capita consumption of energy is direct expenditure (residential and transportation). The remaining half of per capita expenditures are indirect expenditures (commercial and industrial), embedded in products purchased.

Data: Appendix 1.1.1 and – State Energy Consumption, by sector (2000), Appendix 1.1.2 - World Per Capita Energy Consumption, 1991-2001, and Appendix 1.1.3 – Energy Intensity of GDP of Selected Nations in 2001.

Table 1.1.1: National Energy Use (last 12 months for which data is available)

Year	**Residential Total Energy Consumption (trillion Btu)**	**Commercial Total Energy Consumption (trillion Btu)**	**Industrial Total Energy Consumption (trillion Btu)**	**Transportation Total Energy Consumption (trillion Btu)**	**Electric Power Sector Primary Energy Consumption (trillion Btu)**	**Energy Consumption Balancing Adjustment (trillion Btu)**	**Total Energy Consumption (trillion Btu)**
2002 October	1426.862	1382.713	2757.575	2236.534	3036.286	-1.504	7802.18
2002 November	1656.777	1423.663	2728.644	2207.693	2930.605	-2.772	8014.005
2002 December	2214.055	1602.185	2666.057	2347.573	3187.762	-1.874	8827.996
2003 January	2580.181	1726.615	2781.028	2149.857	3353.535	0.315	9237.997
2003 February	2274.835	1549.346	2628.75	1996.271	2949.706	-3.523	8445.678
2003 March	1975.659	1516.912	2707.086	2196.097	3012.69	-3.211	8392.542
2003 April	1512.723	1340.682	2668.655	2135.055	2812.004	-3.809	7653.306
2003 May	1395.662	1352.377	2627.02	2269.791	3052.892	-0.343	7644.508
2003 June	1422.153	1361.63	2567.002	2245.249	3244.353	1.697	7597.73
2003 July	1719.603	1495.909	2703.091	2344.928	3708.874	5.869	8269.401
2003 August	1735.172	1509.749	2733.047	2397.176	3756.008	7.135	8382.28
2003 September	1478.602	1325.52	2649.783	2248.222	3221.855	2.397	7704.524
12 month total	**21392.284**	**17587.301**	**32217.738**	**26774.446**	**38266.57**	**0.377**	**97972.147**

Population: April, 2003:	**290,100,000**
Per capita energy use (million Btus):	
Residential	73.741
Transportation	92.294
Commercial	60.625
Industry	111.057
Total	**337.719**

Sources: **EIA** - http://tonto.eia.doe.gov/merquery/mer_data.asp?table=T02.01;
Census - http://eire.census.gov/popest/data/national/tables/NA-EST2003-01.php.

1.1.2 – African Americans

Background

Information on the use of energy by demographic group in the United States is limited. One major obstacle is that whereas section 1.1.1 described per capita energy consumption in all categories (industrial, transportation, commercial, and residential) it is difficult to determine how commercial and industrial energy use ought to be parsed out to different groups (e.g. ownership, employment, purchases, etc.). Barring a full-scale input-output analysis of industrial, commercial, and governmental energy use and the concomitant energy use embedded in consumer purchases, an analysis of energy use by race is best confined to direct energy expenditures.

For the purposes of this analysis, the best available information on energy expenditure by race in the United States comes from the Consumer Expenditure Survey (CEX); a Bureau of the Census' effort to characterize U.S. consumer purchases. RP has analyzed CEX data, and broken the information set down by race and by income levels to determine the fraction of expenditures that African Americans spend on energy products, and how that fraction compares to non-African Americans in America.[1] As a consequence, figures provided in Section 1.1.1 and 1.1.2 are not directly comparable: Section 1.1.1 includes direct and indirect energy use for all Americans in Btus, Section 1.1.2 only includes direct expenditures in dollar terms.

Key Findings

- African Americans spend a significantly higher fraction of total expenditures on energy use than non-African Americans in America for almost all income deciles.

- Particularly in the lower half of income deciles, Black Americans spend a substantially larger percentage of total outlays on energy purchases. In particular, electricity and home heating expenditures are significantly higher for African Americans than for non-African Americans in the same income decile.

- Electricity expenditures are higher for African Americans than non-African Americans in almost every income decile, converging only at the highest income levels.

- Home heating ("other energy") expenditures are similarly higher for African Americans than non-African Americans in almost every income decile.

- Gasoline and motor oil expenditures are lower for African Americans than non-African Americans in every decile.

[1] The distinction between expenditures as a fraction of income and as a fraction of total expenditures needs to be clarified. The data with respect to expenditures as a fraction of income is much less clear due to numerous factors such as unreported income, savings and wealth, borrowing, and life-cycle income. In contrast, information on expenditures as a fraction of expenditures is more telling as it represents a more accurate depiction of long-term expenditures.

- In general, the poor spend a significantly higher fraction of expenditures on energy purchases than the middle-class and the wealthy: 13% of expenditures in the poorest decile as opposed to just 5% of expenditures in the top decile. The higher percentage of African Americans living in lower income deciles exacerbates the vulnerability of African Americans to high energy prices.

Data and Analysis

The following series of figures graphically demonstrate energy expenditures as a share of all expenditures for black and non-black households. The graphs are divided into total expenditure deciles. Figure 1.1.2.1 clearly indicates that race is comparably influential to overall expenditure levels in determining expenditure share, and that black energy expenditure is *higher* than non-black energy expenditure in every expenditure decile, and particularly in the lower deciles. This is a highly notable finding, indicating that race is a highly statistically significant factor in determining overall energy use.

Figures 1.1.2.2, 1.1.2.3, and 1.1.2.4 show energy expenditures by race for energy types: electricity, "other energy" (primarily home heating fuels), and gasoline and motor oil. The information demonstrates that African Americans have relatively higher expenditures on electricity and other energy sources (i.e. home heating), while have lower overall expenditures on gasoline and motor oil presumably owing in part to a lower rate of automobile ownership.

Reasons for the relatively high energy consumption by African Americans will be further explored in Section 1.4.

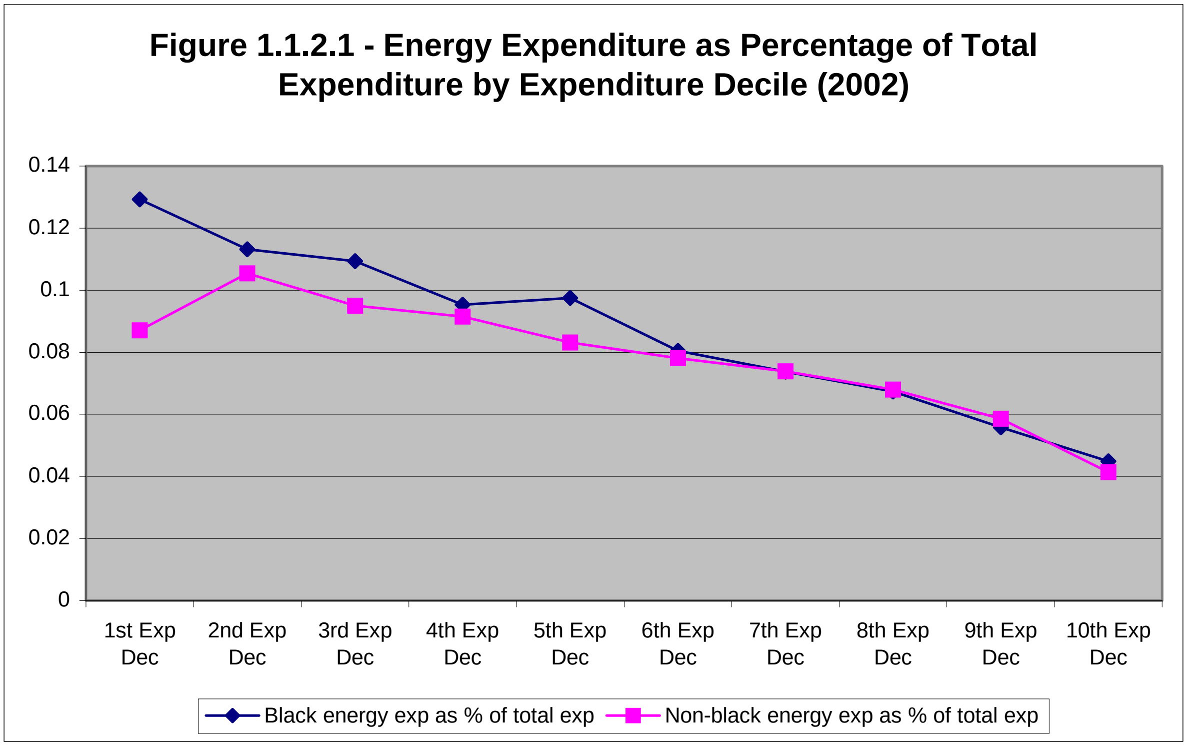


Figure 1.1.2.1 - Energy Expenditure as Percentage of Total Expenditure by Expenditure Decile (2002)
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
1st Exp Dec
2nd Exp Dec
3rd Exp Dec
4th Exp Dec
5th Exp Dec
6th Exp Dec
7th Exp Dec
8th Exp Dec
9th Exp Dec
10th Exp Dec
Black energy exp as % of total exp
Non-black energy exp as % of total exp

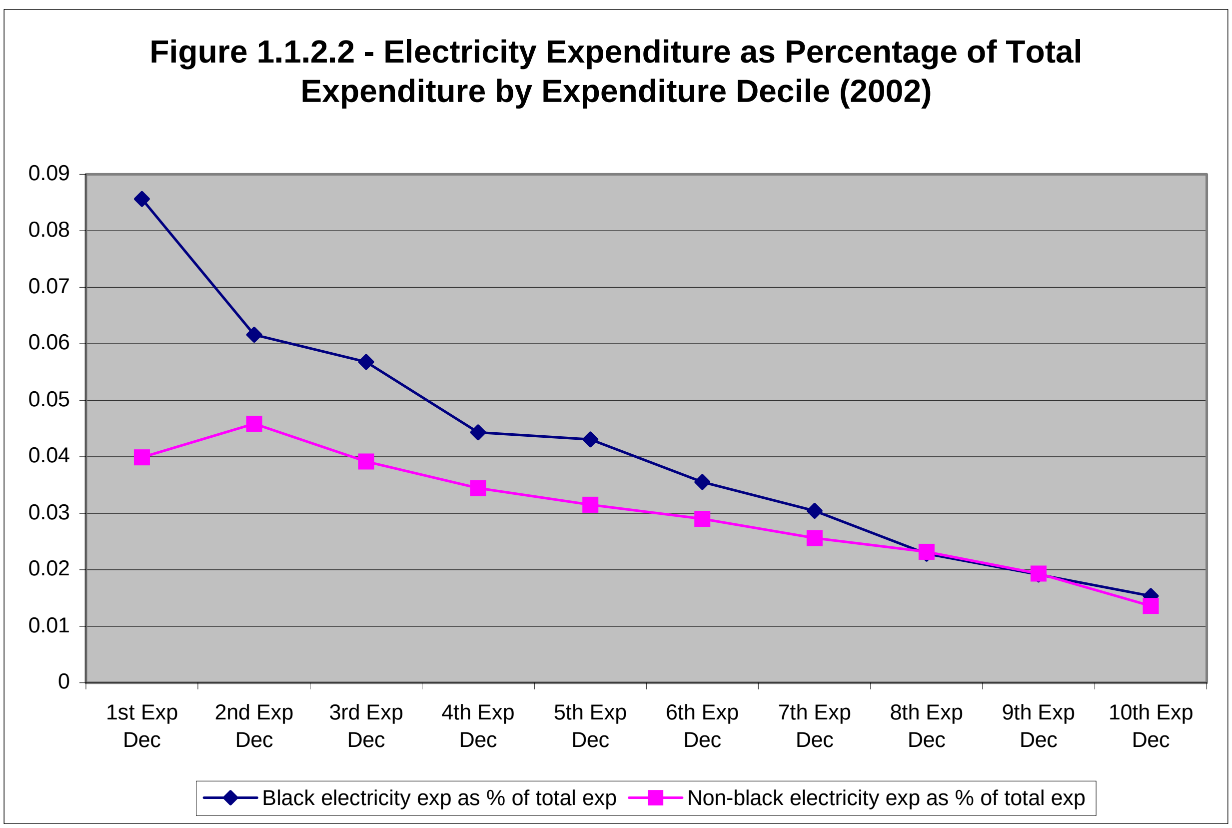


Figure 1.1.2.2 - Electricity Expenditure as Percentage of Total Expenditure by Expenditure Decile (2002)
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
1st Exp Dec
2nd Exp Dec
3rd Exp Dec
4th Exp Dec
5th Exp Dec
6th Exp Dec
7th Exp Dec
8th Exp Dec
9th Exp Dec
10th Exp Dec
Black electricity exp as % of total exp
Non-black electricity exp as % of total exp

Figure 1.1.2.3 - "Other Energy" Expenditure as Percentage of Total Expenditure by Expenditure Decile (2002)

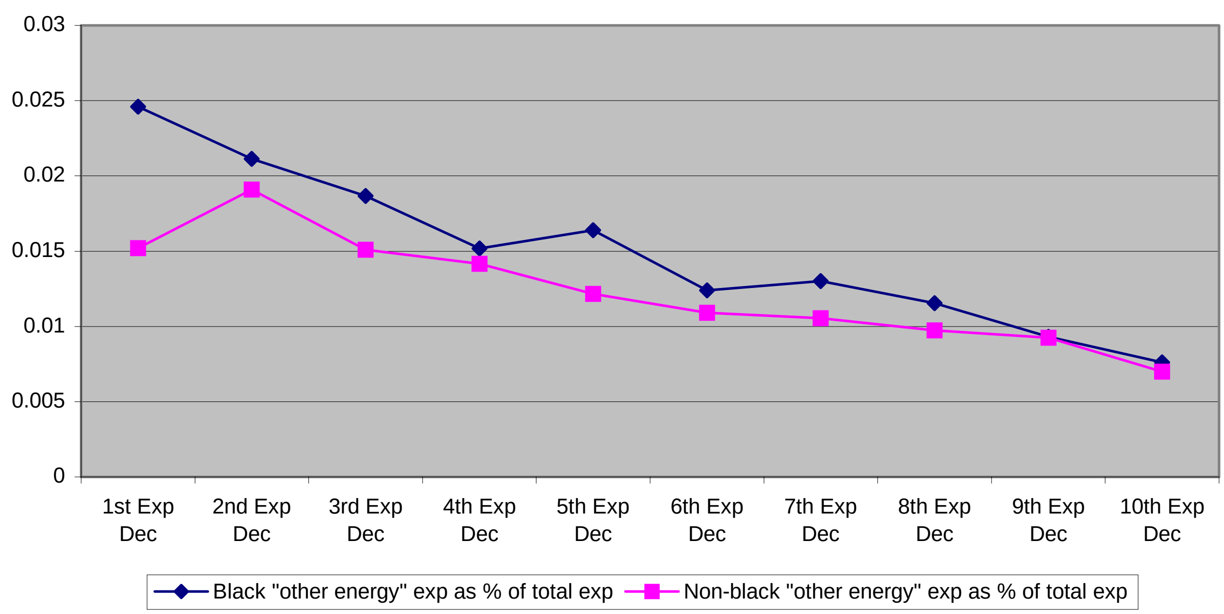
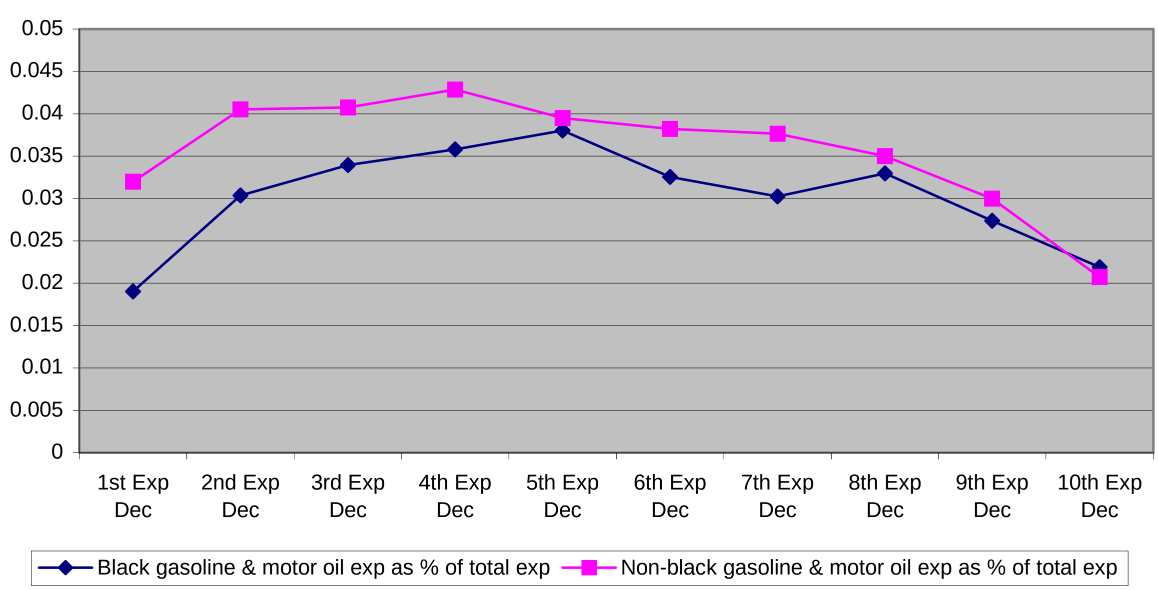


Figure 1.1.2.4 - Gasoline & Motor Oil Expenditure as Percentage of Total Expenditure by Expenditure Decile (2002)



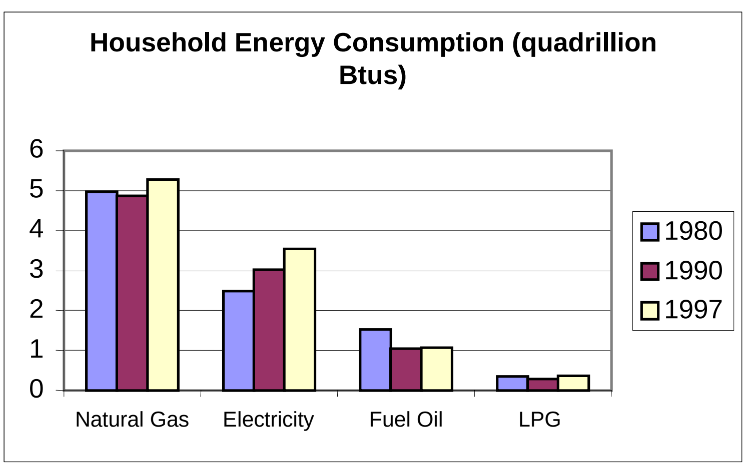
1.2 – Supply and Demand Trends: 1990-2003

Introduction
The commercial supply and demand for energy form the fundamental backdrop for any discussion of the importance and effects of energy use and race in the United States. This section provides basic information on the dynamic nature of American energy use over the past decade.

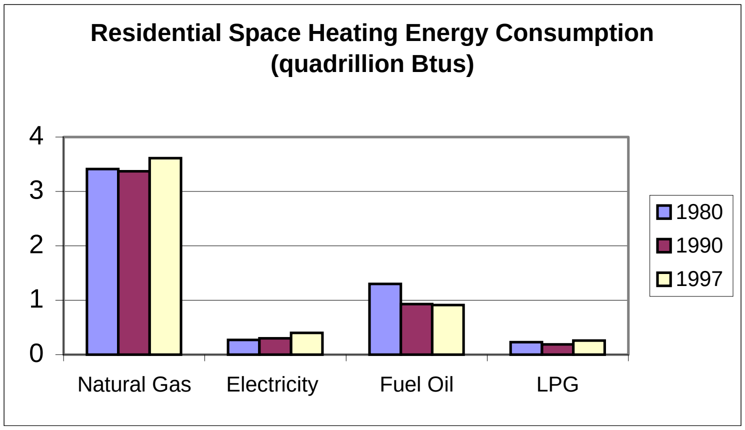
1.2.1 - Trends in Consumer Choice in the Energy Mix

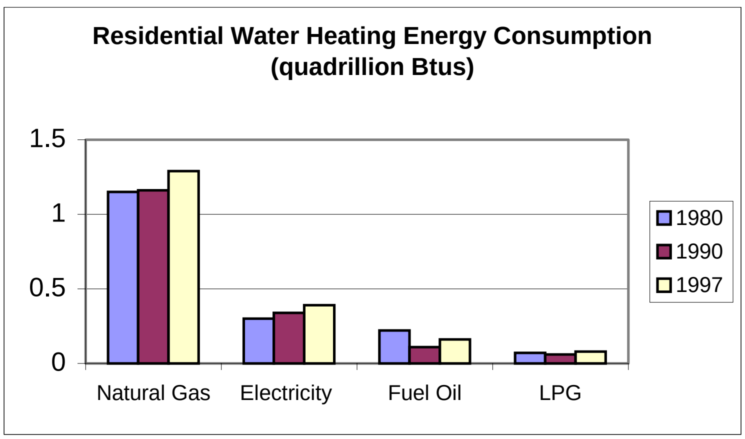
Distribution of Residential Energy Use by Fuel Type
As a percentage of total residential energy use, the twelve-year period from 1990 to 2002 saw a slight decrease in fossil fuel and renewable energy use, and an increase in electrical use, as measured in Btus. Fossil fuel use decreased from 34.4% to 31.5% and renewable use dropped from 3.8% to 2.0%. Most of this drop in renewables can be attributed to the drop in wood use from 3.4% to 1.7% of total residential energy use. Electricity retail sales increased slightly from 18.7% to 20.7%. (See Appendix 1.2.1)

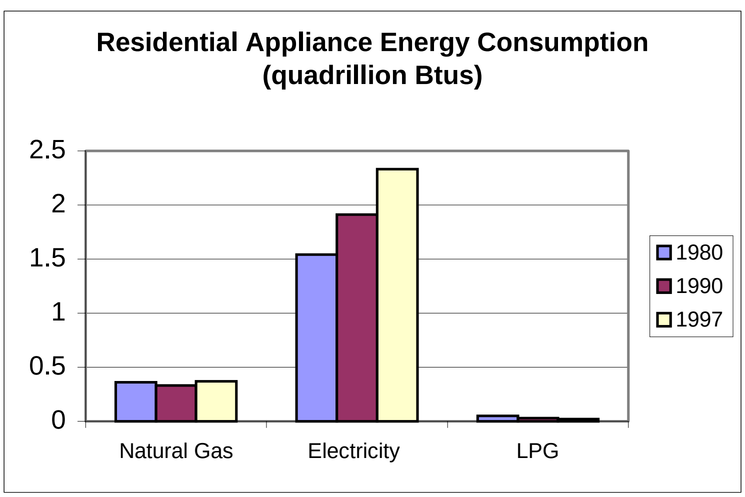
Household Energy Consumption and Expenditures by End Use and Energy Source
If we consider a longer period, 1980 to 1997, there is a much more dramatic increase in residential electrical use. Total household electrical use increased 42.7% as measured in Btus. Natural gas and LPG increased 6.2% and 2.9% respectively and petroleum use decreased 29.6%.



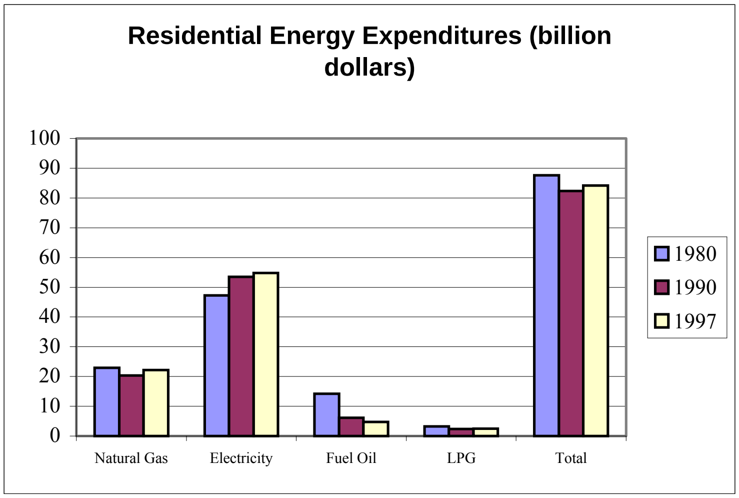
For space heating and water heating, the use of electricity, natural gas, and LPG all increased while the use of fuel oil decreased. Over the period 1980 to 2001, the percent of houses that use electricity for their primary heating need increased from 12% to 30% of households. Houses using fuel oil decreased 7% to just 8% of all households. Houses using natural gas remained unchanged at 55% of households. For appliances, the use of electricity increased over 50%, the use of natural gas increased slightly, and the use of LPG dropped 60%. (See Appendix 1.2.2) Appendix 1.2.3 lists the changes in various appliance use from 1980 to 2001.





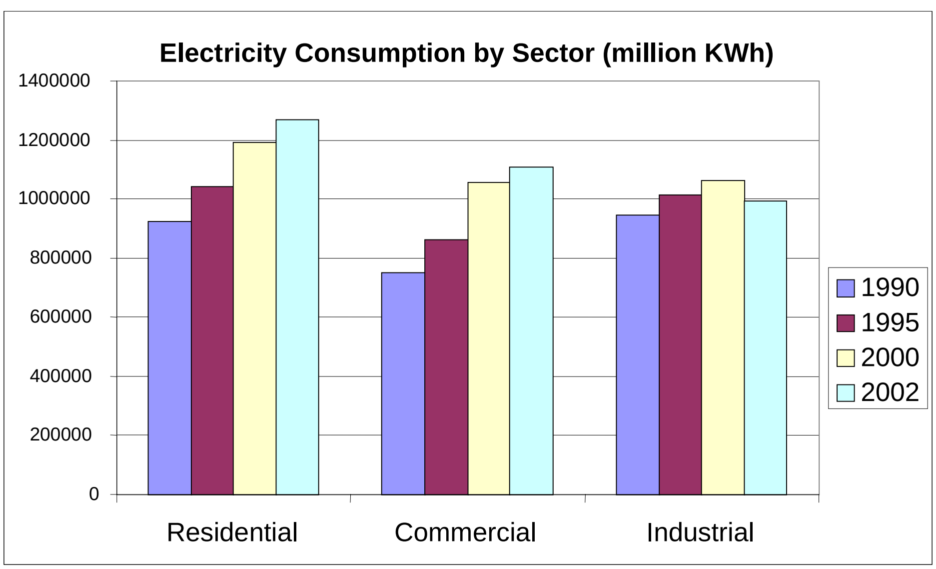


In terms of total expenditures in real terms, residential electricity expenditure increased 15.8% from 1980 to 1997. Expenditures for natural gas decreased by 3.1%, for LPG decreased 22.8%, and for fuel oil dropped 66.7%. Total residential energy expenditures dropped 3.9% from 1080 to 1997.



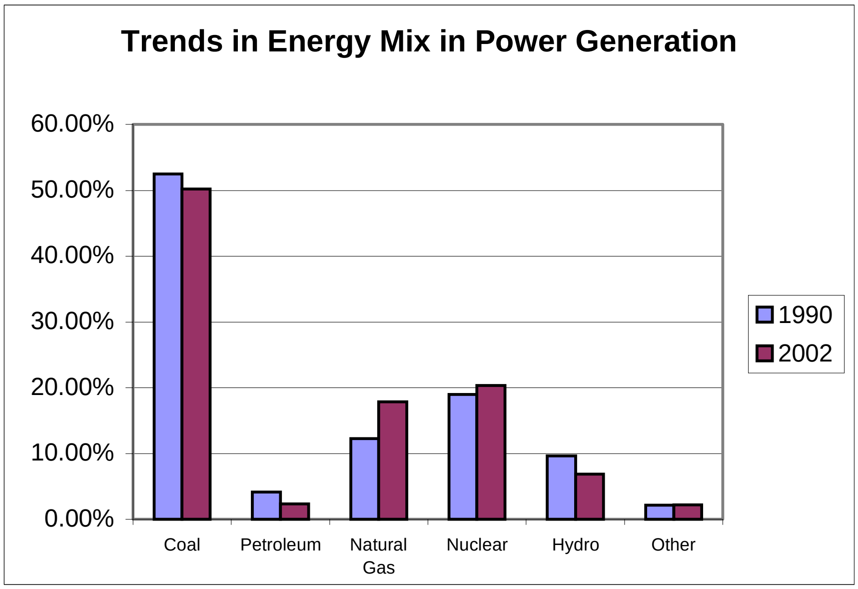
Electricity Consumption by Sector

From 1990 to 2002, all sectors have seen an increase in electrical consumption, the largest increase in commercial and residential and a small increase in industrial electrical use. Commercial electrical energy use increased 48% to 1,108,072 KWh in 2002. Residential electrical energy use increased 37% to 1,268,172 KWh in 2002. Industrial electrical energy use increased 5% to 993800 KWh. (See Appendix 1.2.4)



1.2.2 - Trends in Energy Mix in Power Generation

Over the period 1990 to 2002 there has been a 26% increase in electrical generation in the U.S. The percent of generation from coal, petroleum, and conventional hydroelectric power all dropped somewhat. Coal dropped from 52.5% of total generation in 1990 to 50.2% in 2002, petroleum dropped from 4.2% in 1990 to 2.3% in 2002, and hydroelectric dropped from 9.6% to 6.9%. Over this same period, the greatest percentage increase was seen for generation using natural gas, which went from 12.3% to 17.9%. Nuclear and renewables generation also increased: from 19.0% to 20.3% for nuclear and from 2.1% to 2.2% for renewables. (Appendices 1.2.6 and 1.2.7)

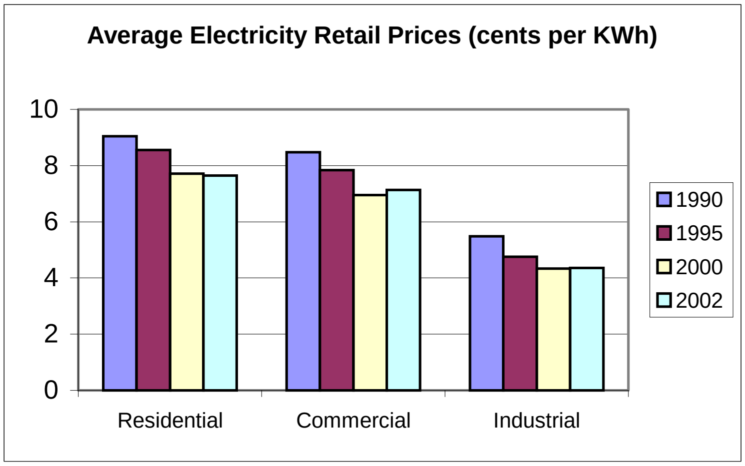


Hydro represents conventional hydroelectric. Other is comprised of other renewables, which includes wind, waste, solar, wood, and geothermal. This does not include hydroelectric pumped storage.

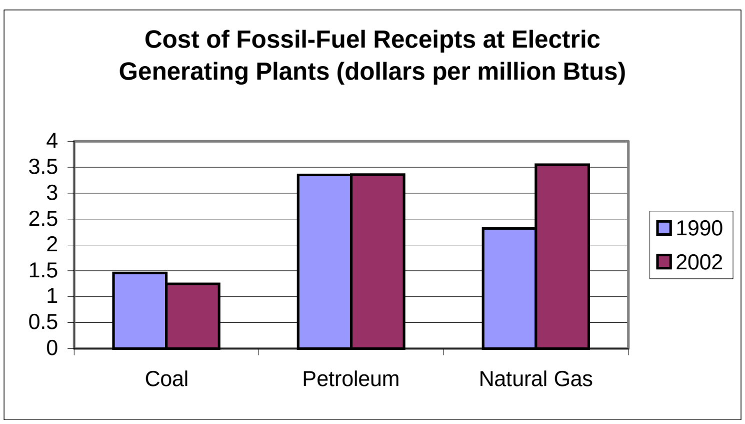
1.2.3 – Trends in costs of producing electricity by fuel

Electrical Prices by Sector

Average electricity retail prices over the period 1990 to 2002 decreased in real terms for all sectors. Prices went from 9.05, 8.48 and 5.48 cents per KWh in 1990 to 7.64, 7.13, and 4.36 in 2002 for residential, commercial and industrial users respectively. Average electricity prices decreased 14.4% over this period. (Appendix 1.2.5)



Cost of Fossil-Fuel Receipts at Generating Plants
The price generating plants paid for fossil fuels from 1990 to 2002 increased approximately 9%. However, most of this increase can be attributed to natural gas. The price of natural gas in dollars per million Btu increased from 2.32 to 3.54, or almost 53% over this twelve-year period. The price of coal decreased from 1.46 dollars per million Btu to 1.25 dollars per million Btu. And the price of petroleum remained roughly the same, changing from 3.35 to 3.36 (Appendix 1.2.8)

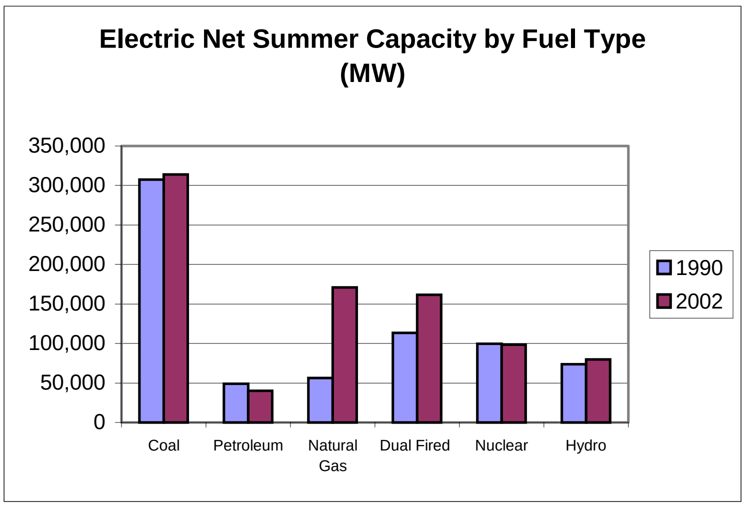


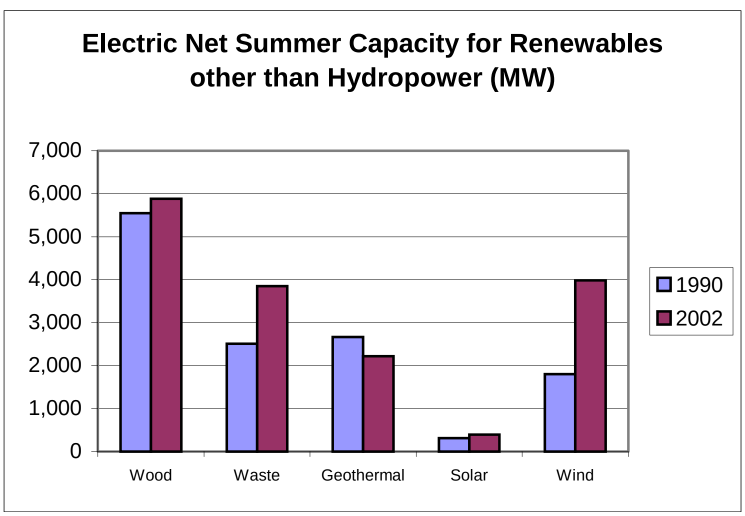
1.2.4 - Trends in peak loads in power generation

Trends in Non-coincidental Peak Load in Power Production
Over the period 1990 to 2002, summer non-coincidental peak loads increased from 546,794 MW to 710,050MW, almost 30%. Summer capacity margin decreased from 21.6% to 18.8%. (See footnote on Appendix 1.2.9). For winter, non-coincidental peak loads increased from 484,844 to 605,690 MW, or almost 25%. (Appendix 1.2.9)

Net Summer Capacity by Fuel Type

Total net summer capacity increased 23% from 1990 to 2002. The largest increase in summer capacity during this period was for natural gas plants, which increased 204.4%. Duel fired plant (petroleum and natural gas) capacity increased 42.3% and coal plant capacity increased 2.1%. Petroleum plant capacity decreased 18.1% during this period. Conventional hydroelectric power (not including hydroelectric pumped storage) capacity increased 8% over this period and total other renewable capacity increased 27.1%. The largest increase in capacity for renewables was for wind with an increase of 121.3%. There were also increases of 53.2% for waste, 24.7% for solar and 6.1% for wood. Geothermal capacity decreased 16.9% over this period (See Appendices 1.2.10 and 1.2.11).





Air Emissions

The electric power industry estimates that total emissions of SO_2 and NO_x both decreased approximately 32% from 1990 to 2002. Emission of CO_2 increased almost 25% during this same period. (See Appendix 1.2.12)

Electric Power Industry Estimated Total U.S. Air Emissions 1990- 2002 (million short tons)

Year	SO_2	NOx	CO_2
1990	16.291	7.591	2,043.657
1995	12.642	6.513	2,188.266
2000	11.770	5.722	2,566.034
2002	10.958	5.159	2,549.969
1990 –2002	-32.73%	-32.04%	24.77%

Sources: EIA-767, EIA-759, EIA-867, EIA-860B, EIA-906, FERC-423. EIA Electric Power Annual 2002

1.3 - Supply and Demand Projections to 2025

Background

Section 1.3 provides current projections of U.S. commercial energy supply and demand into the foreseeable future. The material in this section is derived largely from the report EIA's Annual Energy Outlook 2004 with projections to 2025 (http://www.eia.doe.gov/oiaf/aeo/index.html).

Analysis

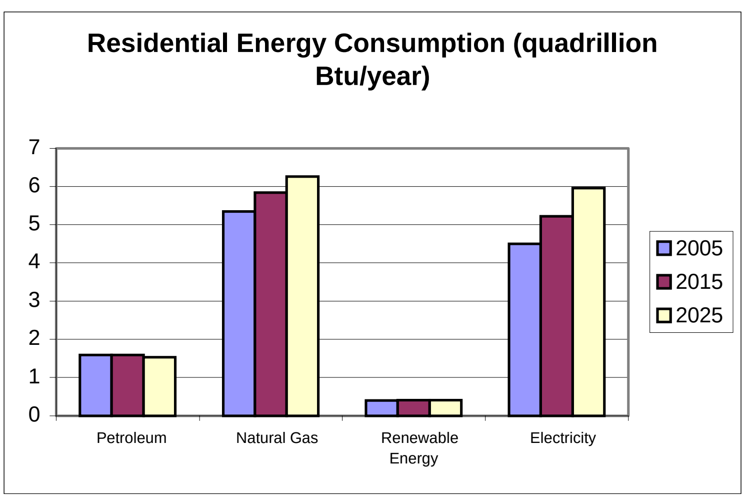
1.3.1 - Energy Consumption by Sector and Source

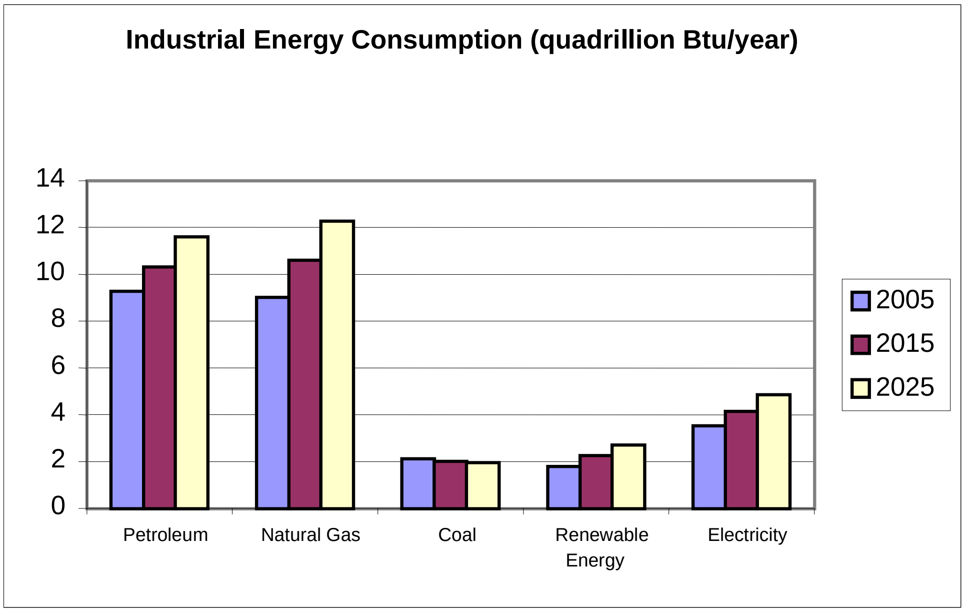
Overall residential energy consumption is predicted to increase to 26.1 quadrillion Btu/year in 2025. Most of this increase will be in natural gas and electricity use. Commercial energy use will increase to 25.9 quadrillion Btu/year in 2025, most of this increase also occurring with increased use of electricity and natural gas. Industrial energy use is expected to increase to 43.1 quadrillion Btu/year. Industrial use of renewables are expected to increase by more than 50%, while industrial use of electricity and natural gas will both increase by approximately 37%. (See Appendices 1.3.1 and 1.3.2)

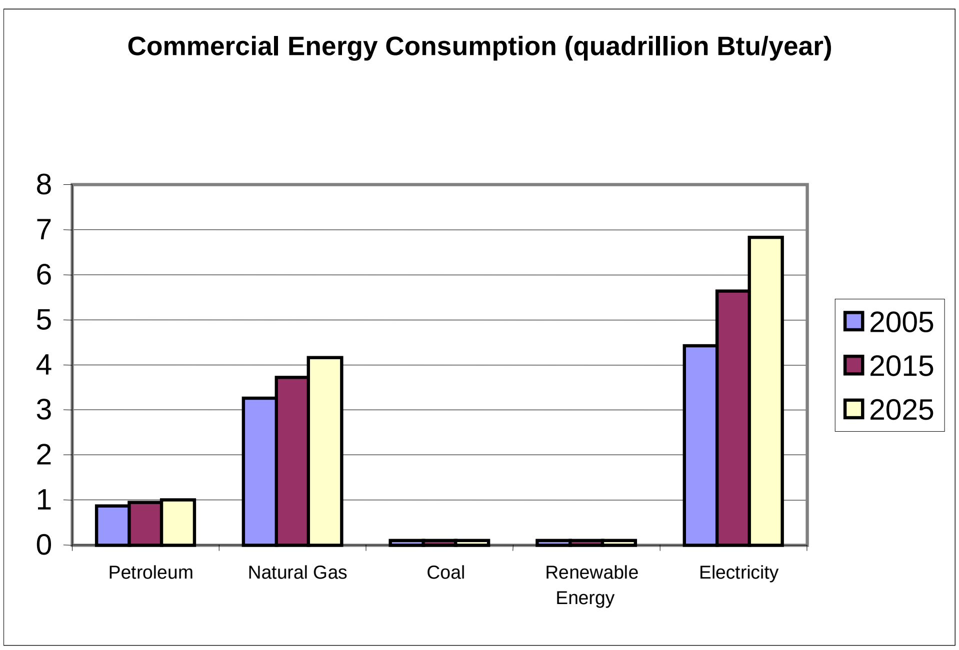
Predicted Percent Change in Energy Consumption from 2004 to 2025

	Residential	Commercial	Industrial	Transportation
Petroleum	-3.1%	17.5%	30.2%	46.8%
Natural Gas	17.6%	30.0%	39.8%	38.6%
Electricity	34.1%	59.8%	41.7%	50.9%

Source: EIA Annual Energy Outlook 2004 with projections to 2025; Table 10
http://www.eia.doe.gov/oiaf/aeo/supplement/index.html 2/2/04

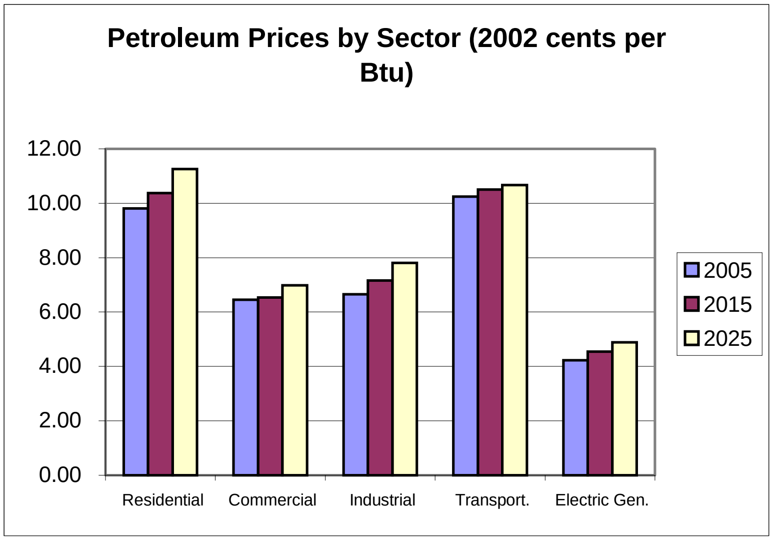


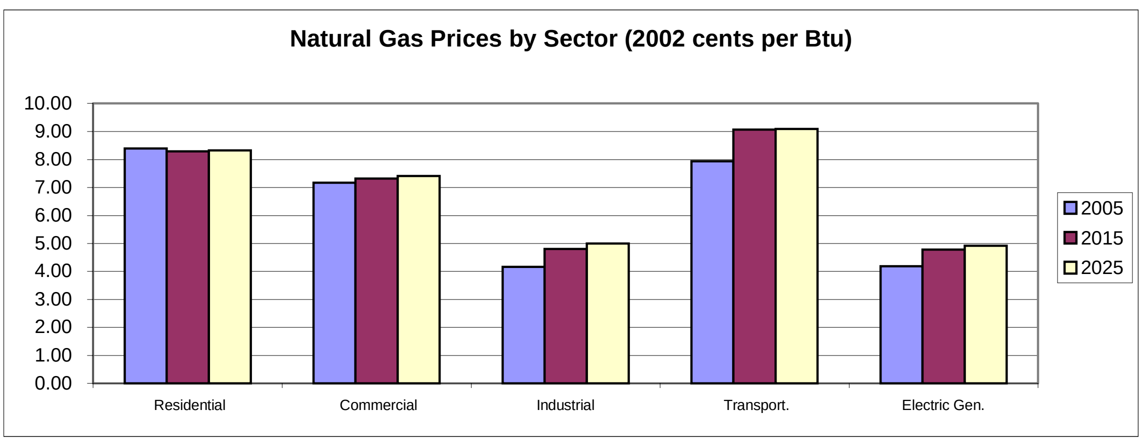

Industrial Energy Consumption (quadrillion Btu/year)
14
12
10
8
6
4
2
0
Petroleum
Natural Gas
Coal
Renewable Energy
Electricity
2005
2015
2025


Commercial Energy Consumption (quadrillion Btu/year)
8
7
6
5
4
3
2
1
0
Petroleum
Natural Gas
Coal
Renewable Energy
Electricity
2005
2015
2025

1.3.2 Energy Prices

Appendix 1.3.3 gives petroleum and natural gas prices by sector. No dramatic price increases are expected, although many unknown factors could alter the true future prices from the predicted levels.

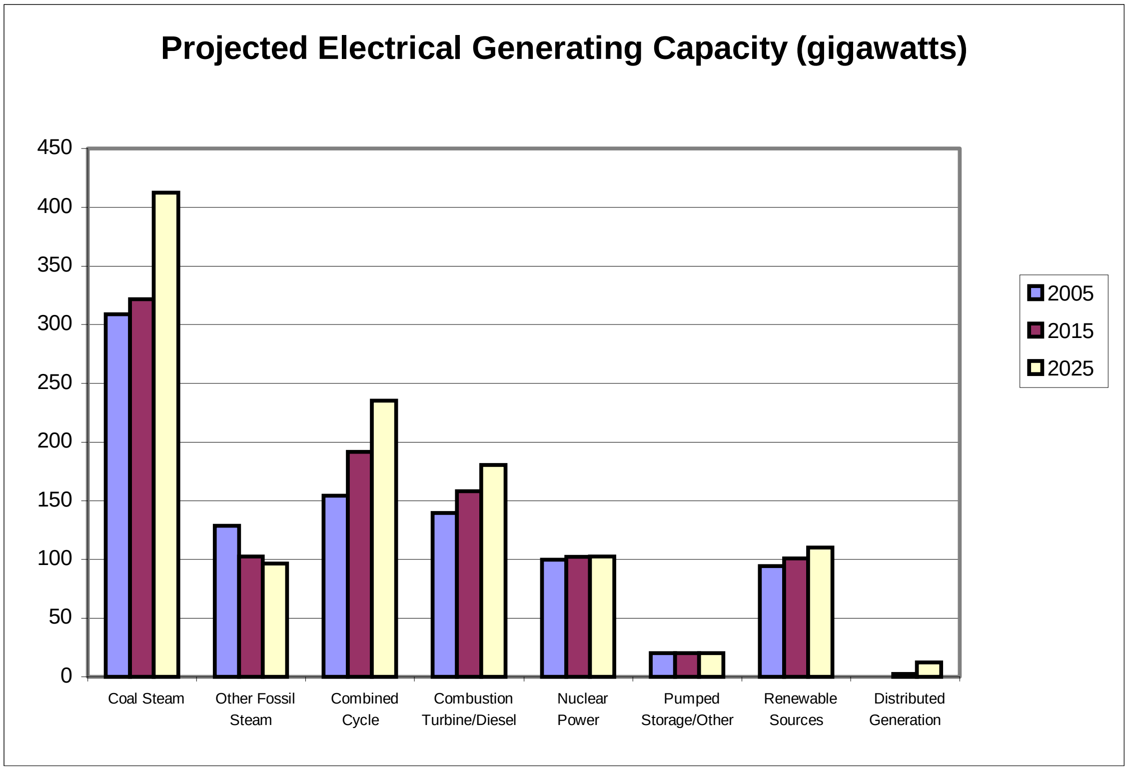




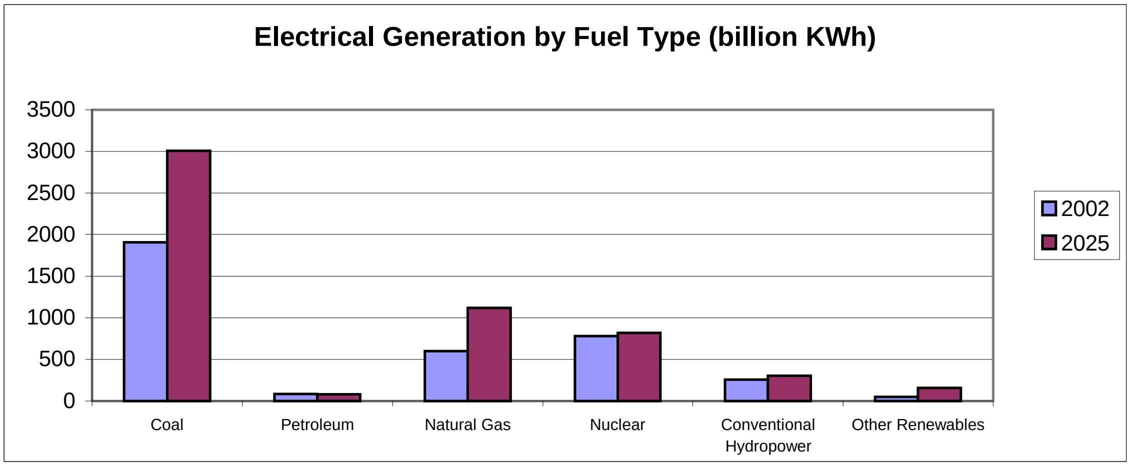
1.3.3 – Electricity Generation

Projected Electrical Generating Capacity in Gigawatts

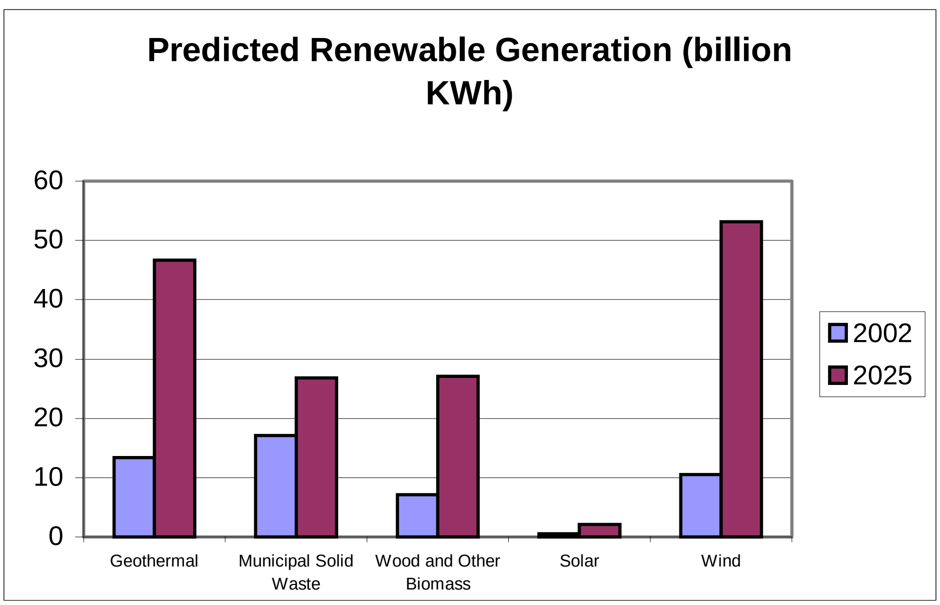
Projected generating capacity will increase for most generation types. In addition to the generating types shown in the chart below, fuel cells are expected to add .5 gigawatts of capacity by 2025. (See Appendix 1.3.4)



Total Electric Generation
The EIA predicts that total electrical generation, (which includes combined heat and power (CHP) plants whose primary business is to sell electricity, or electricity and heat, to the public) will increase to 5277 billion KWh by 2025. Much of this increase will come from coal which will account for 3008 billion KWh of generation in 2025, an increase of 57.7% over 2002. Natural gas use is predicted to increase 86.6% over its 2002 level to 1,117 billion KWh. Petroleum use will decline slightly to 80 billion KWh and nuclear power will increase slightly to 816 billion KWh. Conventional hydroelectric power is also expected to moderately increase to 305 billion KWh.



Electrical generation using renewables other than conventional hydroelectric power are generally expected to increase considerably. Wind generation is expected to increase four-fold. Solar, wood and other biomass, and geothermal are expected to increase 294%, 278% and 249% respectively. Generation with municipal solid waste is expected to increase by 56%. (See Appendices 1.3.5 and 1.3.6)

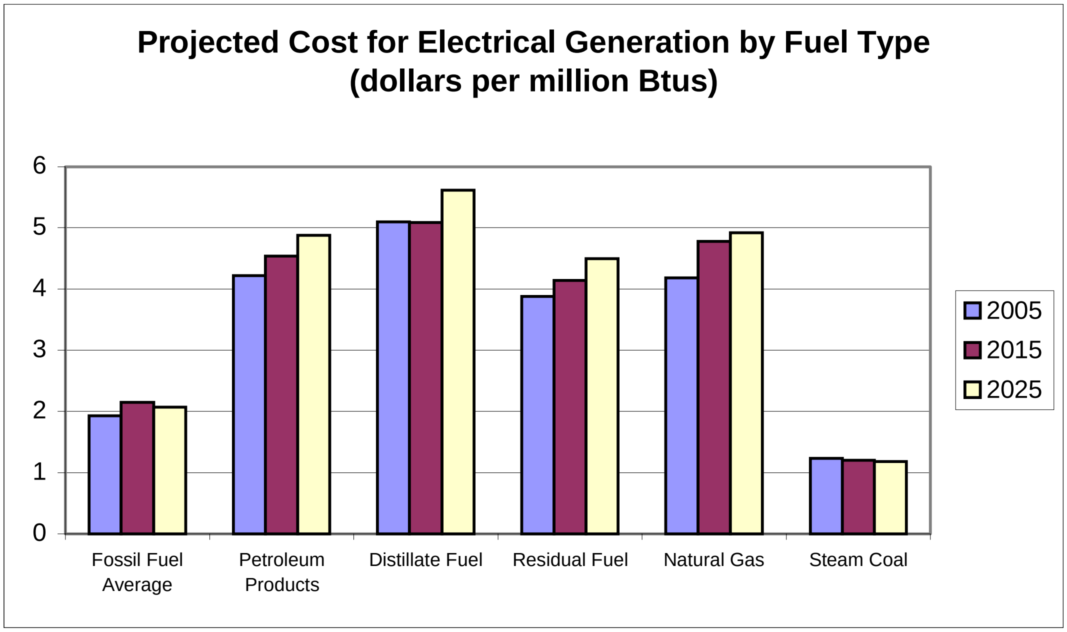


Regional Generation by Fuel Type

Appendix 1.3.3 gives the predicted changes in fuel type for generation by electricity market module region. The largest total increases in electrical generation are expected in the Florida region, California and the Northwest. (See Appendix 1.3 7)

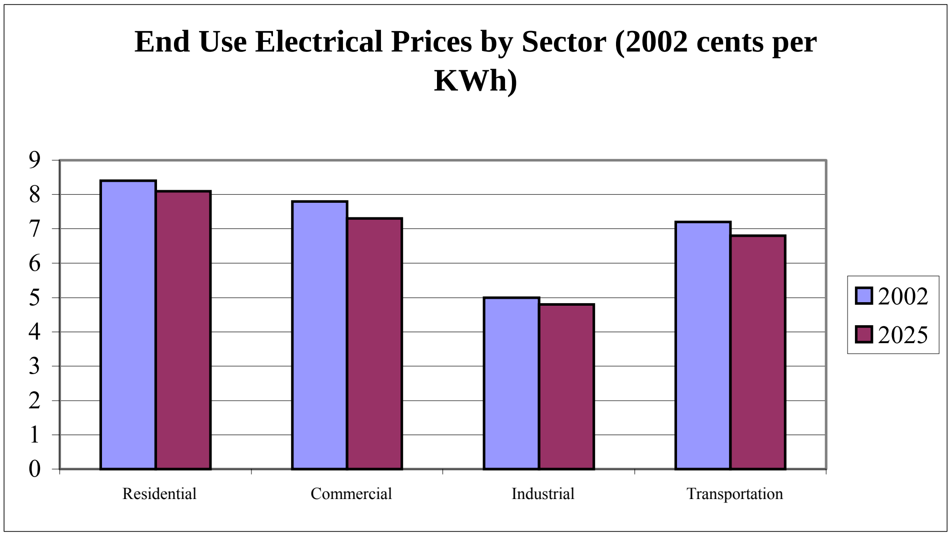
Cost of Producing Electricity by Fuel Type

The cost of producing electricity from all fuel types is expected to increase from 2002 to 2025 except for steam coal, which will decline slightly. The largest price increase is for natural gas, which is expected to increase from 3.77 dollars per Btu in 2002 to 4.92 dollars per Btu in 2025. (See Appendix 1.3.8)



End Use Electrical Prices

End use electrical prices per sector are predicted to decrease for all sectors. The largest decrease will be for the commercial sector with a 6.4% decrease in price. The smallest decrease will be for the residential sector with a 3.6% price reduction (See Appendix 1.3.9).



Predicted Change in Residential Sector Equipment Stock
The following table shows how residential equipment stock is expected to change by the year 2025. The most notable increase will be in the use of natural gas equipment.

Predicted change in residential sector equipment stock from 2002-2025

Equipment Stock (million units)

Main Space Heaters	
Electric Heat Pumps	1.9%
Electric Other	0.4%
Natural Gas Heat Pumps	17.0%
Natural Gas Other	1.1%
Distillate	0.1%
Liquefied Petroleum Gas	0.7%
Kerosene	-0.8%
Wood Stoves	-0.5%
Geothermal Heat Pumps	9.1%
Total	0.9%
Space Cooling	
Electric Heat Pumps	1.9%
Natural Gas Heat Pumps	17.0%
Geothermal Heat Pumps	9.1%
Central Air Conditioners	2.0%
Room Air Conditioners	-0.3%
Total	1.3%
Water Heaters	
Electric	0.5%
Natural Gas	1.3%
Distillate	-0.5%
Liquefied Petroleum Gas	1.2%
Solar Thermal	1.6%
Total	0.9%
Cooking Equipment 1/	
Electric	0.9%
Natural Gas	1.0%
Liquefied Petroleum Gas	0.5%
Total	0.9%
Clothes Dryers	
Electric	1.2%
Natural Gas	2.2%
Total	1.5%
Other Appliances	
Refrigerators	0.9%
Freezers	0.9%

Source: EIA Annual Energy Outlook 2004 with projections to 2025 Table 21
http://www.eia.doe.gov/oiaf/aeo/supplement/index.html 2/5/04

1.4 – Energy Prices and their Impacts.

Background

Energy prices have significant effects on consumers, both directly and indirectly. Directly, consumers purchase a variety of direct energy products such as electricity, gasoline, and heating fuels. These expenditures generally make up anything from 5-15% of total expenditures depending on factors like total expenditure and race. In addition, the remaining share of expenditures is spent on a wide range of products each of which employs some amount of energy in the production and distribution process. As a consequence, changing energy prices can indirectly affect the prices of almost all goods or services that consumers can purchase.

In addition to direct expenditures and the prices of non-energy goods and services, energy prices can have larger macroeconomic effects on the economy. Price shocks are capable of increasing inflation rates and even triggering economic downturns, all of which particularly affect African Americans.

Key Findings

- African Americans spend a significantly higher fraction of total expenditures on direct purchases on energy than non-African Americans. This trend is true across all but the highest income deciles.
    - As discussed in Section 1.1.2, African Americans have higher expenditures on electricity and home heating, which are only partially offset by lower expenditures on motor oil and gasoline.
    - A partial explanation may lie in both lower average education levels and lower levels of home ownership among African Americans.

- In addition to the economic burden of high prices, to the extent that the poor (and poor African Americans in particular) choose to forgo energy use (e.g. heating) or trade-off energy use with other products such as food and health care, high energy prices can represent a significant health hazard to the fuel poor.

- No information is available at present about the share of expenditures dedicated to energy embedded in purchases of other goods and services.

- African Americans appear to be more vulnerable to the negative effects of general economic downturns triggered by oil price shocks.

- With respect to specific populations, low-income African Americans and African American farmers are among the most vulnerable populations in society.

Analysis

Direct Expenditures
With regard to the fraction of energy directly purchased by African Americans versus non-African Americans, the graphs and analysis are presented in Section 1.1.2. To summarize the previous findings, African Americans spend a significantly higher fraction of total expenditures on energy use than non-African Americans in America for almost all income deciles. Particularly in the lower half of income deciles, Black Americans spend a substantially larger percentage of total outlays on energy purchases. Notably, electricity and home heating expenditures are significantly higher for African Americans than for non-African Americans in the same income decile. In contrast, gasoline and motor oil expenditures are lower for African Americans than non-African Americans in every decile.

While this analysis indicates that African American households use significantly more energy than non-African American households in the same income decile, the reasons are not entirely clear. The analysis appears to indicate that African American households are relatively less energy efficient than other household. As speculation, there are at least two reasons why this may be the case. The first potential explanation is that investment in energy efficiency (weatherization, energy efficient appliances, etc.) is largely limited to those who own homes. However, data from the Current Population Survey indicates that the percentage of African Americans who rent rather than own homes is over 50%, compared to just 25% of non-African Americans (Table 1.4.1).

Table 1.4.1 - Home Ownership by Race (Data: CPS, 2004)

	Own	% Owning		Rent	% Renting
Total	199488392	70.72%		78813098	29.28%
Non-African Americans	182315737	74.61%		62034005	25.39%
White	170554416	74.72%		54797122	25.28%
Asian	7170697	62.74%		4117027	37.26%
Other	3341912	59.74%		2141858	40.26%
American Indian	1248713	54.73%		977997	45.27%
Black	17172655	49.75%		16779093	50.25%

A second potential explanation in lower energy efficiency lies in the lower level of education among African Americans. Investment in energy efficiency may be correlated with the degree to which individuals are well informed, or energy literate. In general, African Americans have had less formal education than non-African Americans which may contribute to a lesser awareness about the alternatives and options available (Table 1.4.2).

Table 1.4.2 - Maximum Level of Education by Race (Data: CPS, 2004)						
	Total	**White**	**Black**	**Native American**	**Asian**	**Other**
Less than a high school diploma	20.50%	19.65%	26.32%	32.33%	17.39%	23.91%
High school graduate, no college	30.39%	30.55%	34.15%	31.74%	17.79%	27.20%
Some college or associate degree	25.29%	25.33%	25.19%	25.43%	21.87%	32.75%
Bachelor's degree or higher	23.83%	24.47%	14.34%	10.50%	42.94%	16.13%

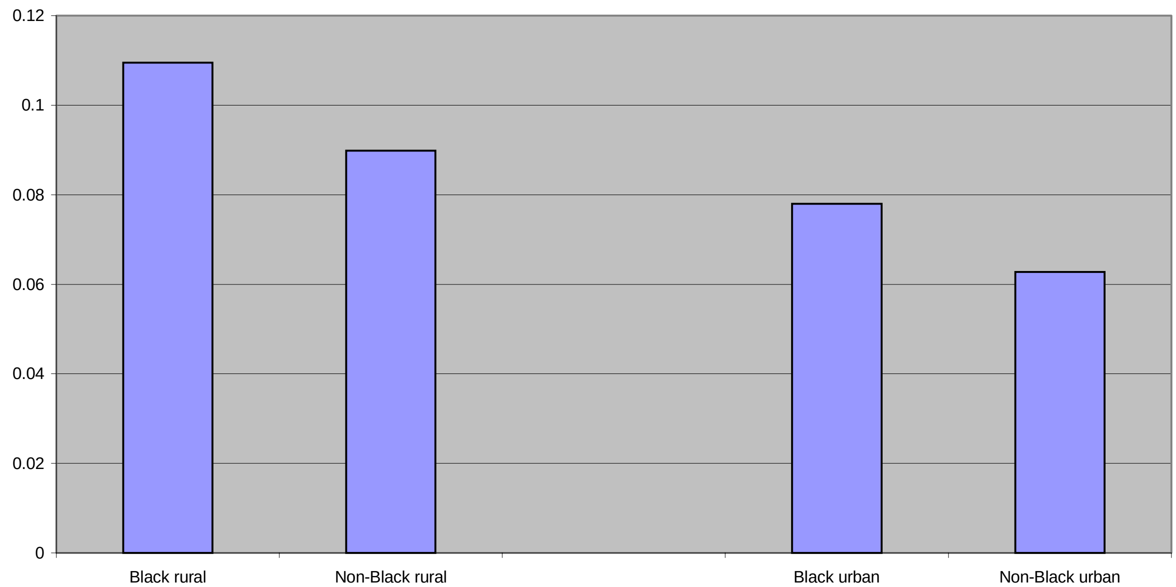
Regardless of the reason, African Americans clearly dedicate a higher fraction of direct expenditures to energy use, regardless of income level, and moreover are more likely to have lower levels of income, where the burden is most heavy. Unfortunately, no data is currently available regarding the fraction of expenditures dedicated to indirect energy use. To some extent, Section 1.4.4 addresses this question by examining the relative energy intensity of industries. Similarly, Section 1.6 examines the role of energy industries in employing African Americans.

More generally, as Section 2.2.5 also explores, African Americans are more vulnerable to recessions caused by global energy price shocks. The exact mechanism by which energy price increases cause economic downturns is debatable. Possible causes include reduced consumer demand as a result of having fewer dollars to spend on non-fuel goods, changes in the terms of trade as the U.S. is a major fuel importer, reduced production efficiency caused by running machinery and processes optimized for low energy prices at higher energy prices, and increased uncertainty about prices and costs (Balke, Brown & Yücel, 1999; Brown, 2000; Hamilton, 2000; IMF, 2000). It is well known that the Black population is disproportionately vulnerable to economic downturns. In particular, during downturns the unemployment rate of African Americans increases by a larger percentage than the unemployment rate of non-African Americans, and mean income follows a similar pattern (Bradbury 2000a, Bradbury 2000b; Eaton and Kisor, 1996).

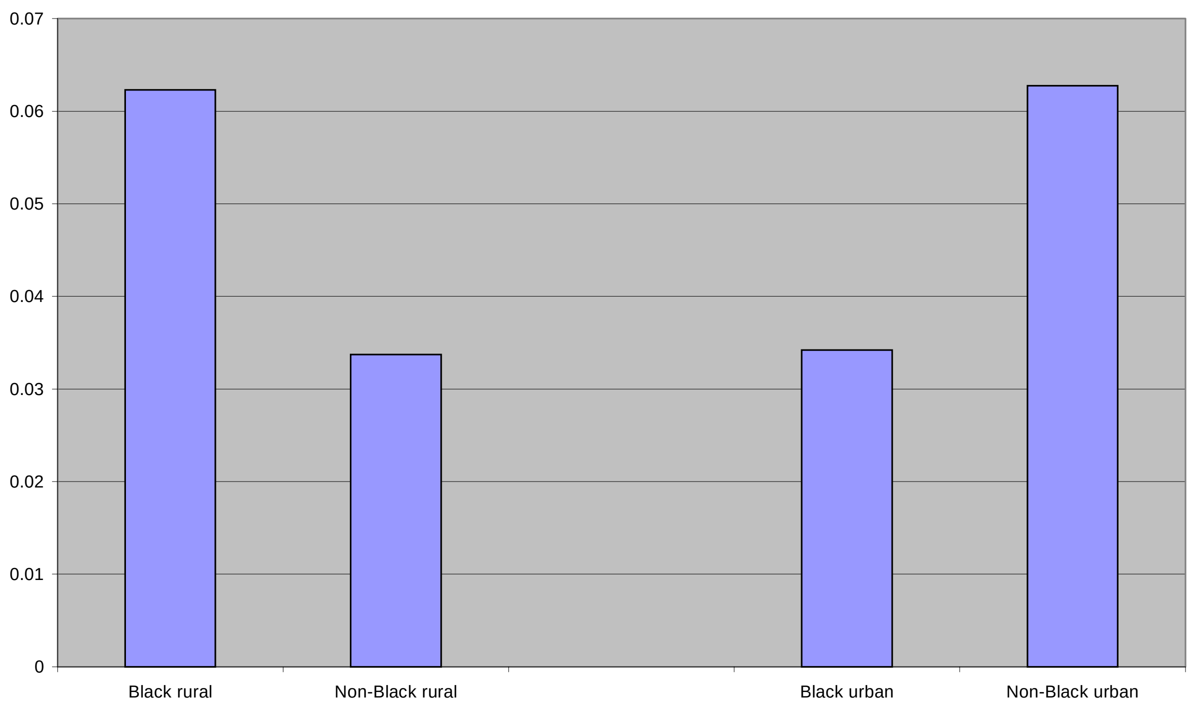
1.4.1 Urban African-American Populations

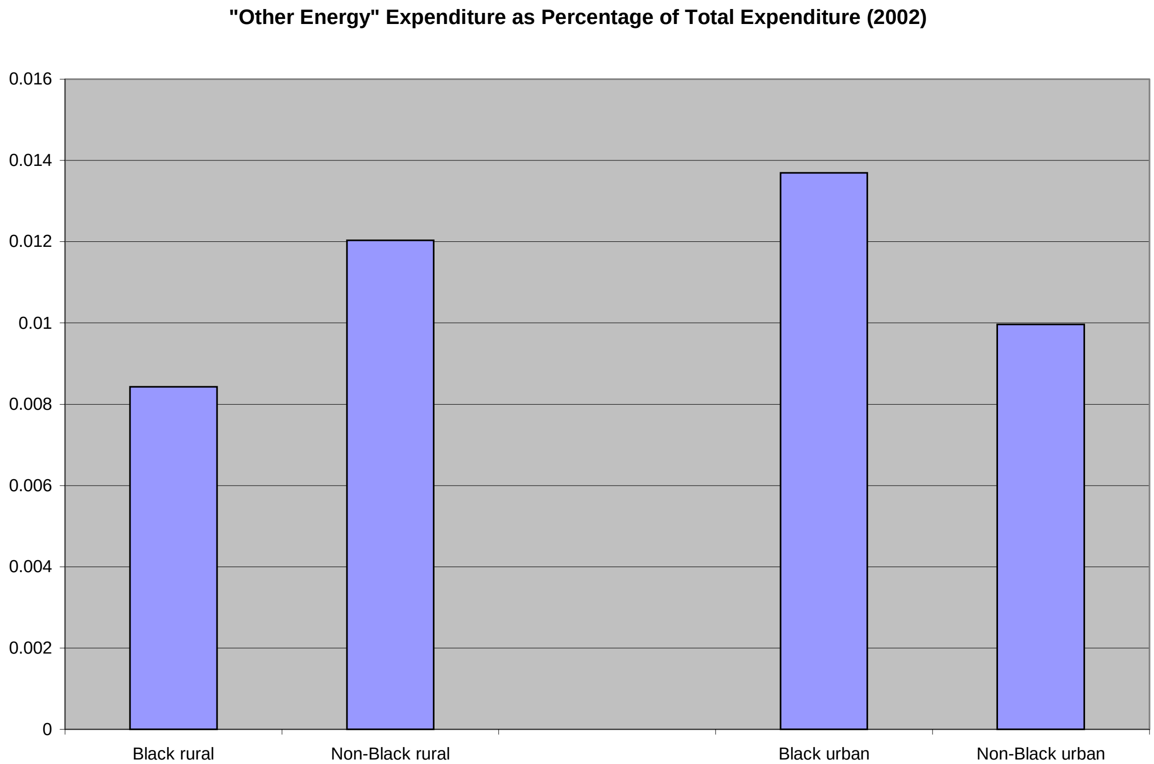
With respect to urban African Americans, the pattern outlined in Sections 1.1.2 and 1.4 is slightly different (See Appendix 1.4.1). While urban Black households also dedicate a higher fraction of expenditures to direct energy purchases, the types of energy forms purchased are markedly different. African Americans purchase *less* electricity as a fraction of expenditures than non-African Americans, but considerably *more* home heating fuels. In contrast, motor oils and gasoline are comparably low for all urban populations.

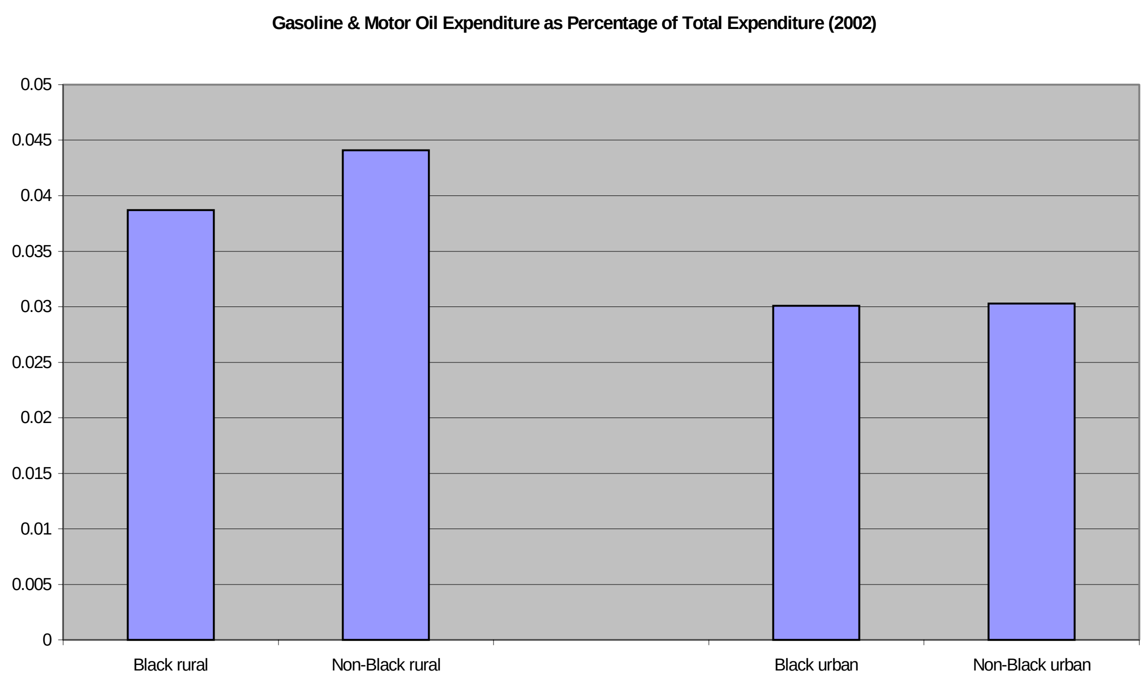
Energy Expenditure as Percentage of Total Expenditure (2002)



Electricity Expenditure as Percentage of Total Expenditure (2002)




"Other Energy" Expenditure as Percentage of Total Expenditure (2002)
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
Black rural
Non-Black rural
Black urban
Non-Black urban

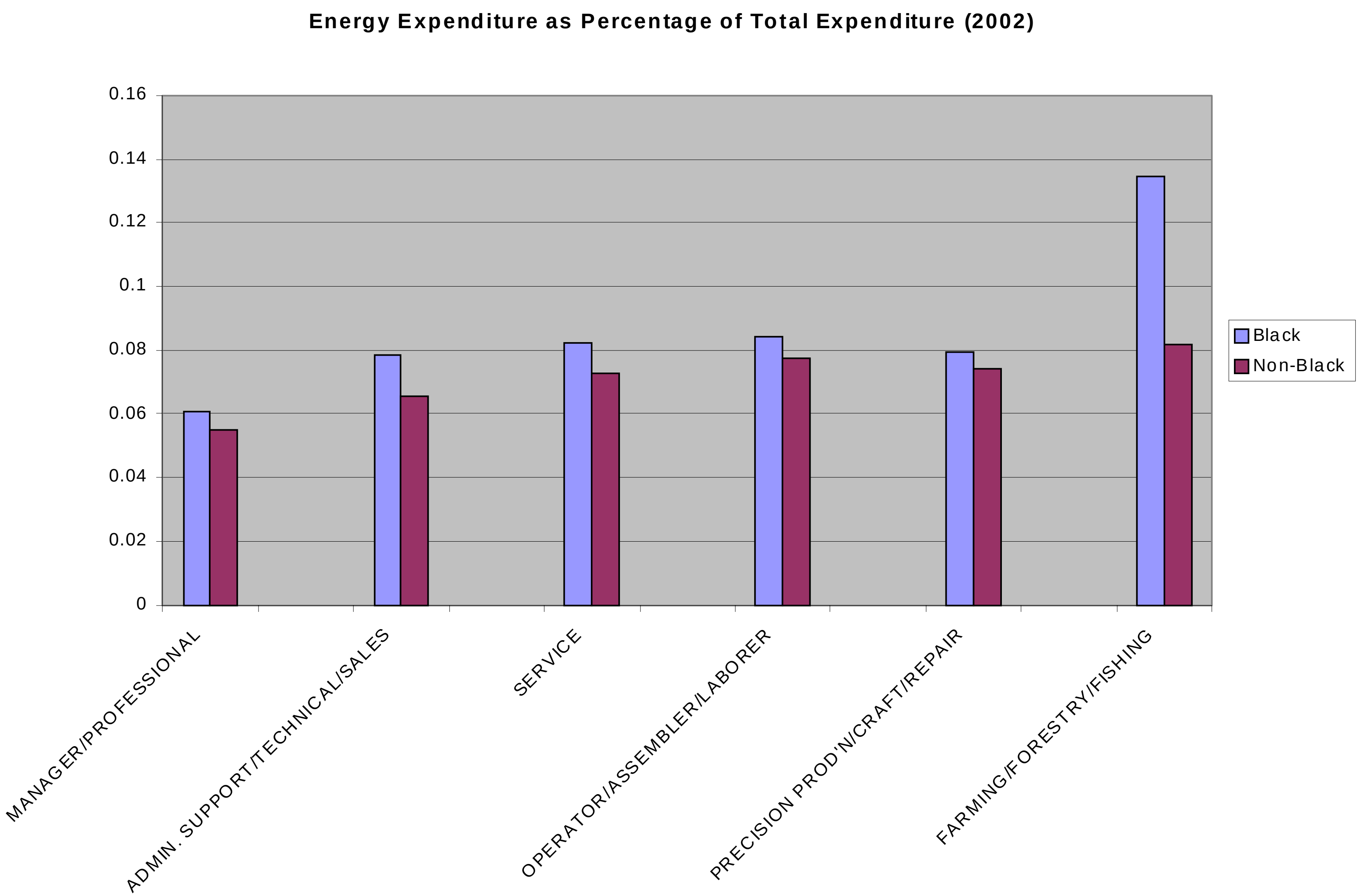

Gasoline & Motor Oil Expenditure as Percentage of Total Expenditure (2002)
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
Black rural
Non-Black rural
Black urban
Non-Black urban

1.4.2 African-American Farmers

Little information is available specifically for the limited number of African American farmers. With respect to minority-owned businesses in Agriculture, Forestry, and Fisheries, the 1997 Census of Minority Owned Firms indicates that only 2.5% of businesses in the sector are owned by African Americans, and collectively those businesses received just 0.65% of sales and receipts (See Appendix 1.4.4).

In general, energy prices are important for agriculture relative to other sectors of the economy for several reasons. First, agriculture tends to somewhat more energy intensive than the rest of the economy in general. With respect to the amount of commercial energy required per unit of production (in dollar terms), agriculture requires roughly 50% more than the average sector of the economy. Second, agriculture (and particularly small-scale agriculture) is not currently the most profitable section of the economy. Data from the 1997 Census of Minority Owned Firms indicates, the few agricultural firms owned by blacks have sales and receipts roughly a quarter of the amount of the average firm. As a consequence, African American farms may be more susceptible to bankruptcy due to higher energy prices than other firms.

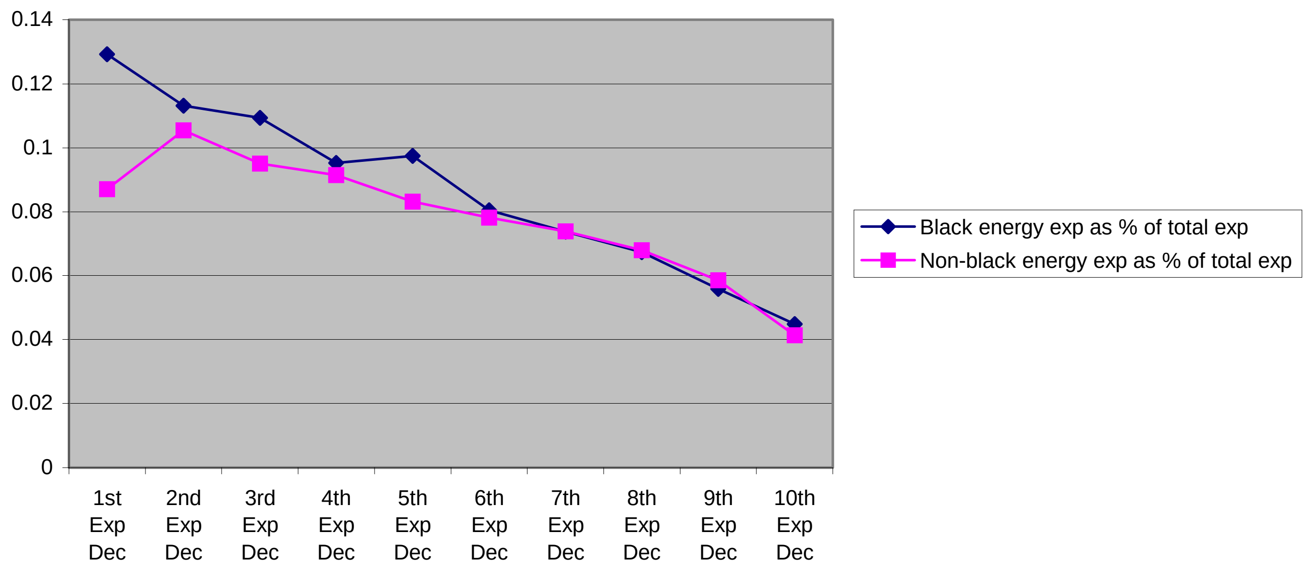
In addition, data is available in the Consumer Expenditure Survey on energy use by Black households who work in the Agriculture, Forestry, and Fisheries sector (Appendix 1.4.2). In keeping with the previous analysis, the CEX data indicates that, as a fraction of total expenditures, African Americans employed in this sector spend more than half-again as much as non-African Americans.


Energy Expenditure as Percentage of Total Expenditure (2002)
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Black
Non-Black
MANAGER/PROFESSIONAL
ADMIN. SUPPORT/TECHNICAL/SALES
SERVICE
OPERATOR/ASSEMBLER/LABORER
PRECISION PROD'N/CRAFT/REPAIR
FARMING/FORESTRY/FISHING

1.4.3 Low-income African-American Households

Relative to high-income African Americans or the poor in general, low-income African Americans are particularly vulnerable to high energy prices for multiple reasons. First, while African Americans spend a higher fraction of their expenditures at all income levels, this discrepancy is markedly higher for the lowest income decile (Figure 1.4.3.1). Low-income African Americans appear to spend a large fraction of expenditures on energy than any other income or racial group, and by a significant margin. African Americans in the lowest income decile reported spending approximately 13% of total expenditures on direct energy purchases, relative to just 9% of total expenditures for non-African Americans.

Figure 1.4.3.1 - Energy Expenditure as Percentage of Total Expenditure by Expenditure Decile (2002)



As a consequence of devoting a higher fraction of expenditures to direct energy purchases at all income deciles, high or rising energy prices will consume a larger fraction of the low-income African American household budget.

Second, African Americans are more likely to be in lower income groups than non-African Americans. Currently, African Americans make up 12.7% of the U.S. population. However, African Americans currently comprise a quarter of all Americans living in poverty, and 22% of individuals with household incomes of less than 150% of the federal poverty standard.

The effects of this disparity are likely to be significant. The available of reliable and affordable energy is essential to general health and well-being. African Americans are consequently substantially more likely to be among the fuel poor; those who spend a substantial fraction of their income on energy requirements and are often force to choose between purchasing fuel (home heating and cooling, transportation, cooking fuel, etc.) and purchasing other household necessities such as adequate food and health care.

1.4.4 African-American Owned Businesses

Background

Like individuals, businesses can be vulnerable to rising or variable energy prices. In general, energy prices (and oil prices in particular) have an often-disproportionate effect on the business cycle. For example, between World War II and present day, nine of the ten recessions have been preceded by increases in the price of oil. Moreover, the economy appears to responds asymmetrically to energy prices, with high prices causing negative effects more than low prices generate economic booms (Brown et al., 2003). Energy prices affect the overall performance of the economy in part by influencing the profitability of various sectors. This section focuses on the extent to which African Americans own businesses in particular vulnerable sectors.

Sections 1.1.1 through 1.1.3 relied on estimates of per capita energy use from Consumer Expenditure Survey data. In contrast, section 1.1.4 explores the effects of energy use by industry. In order to estimate the *relative* vulnerability of African American businesses, two data sets have been compiled. The first set is the share of black ownership of U.S. industries, both in terms of percent of total firms in the industry, and also in terms of percent of total sales and receipts. The most recently published comprehensive survey of minority- and black-owned businesses in the United States is the Census Bureau's 1997 *Survey of Minority-Owned Enterprises*. The second set is the relative energy intensity of each industry. As a proxy for this factor, RP has employed estimates of the carbon intensity from over 500 industries (following the methodology outlined in Hoerner and Mutl, 2000). Carbon intensity is expressed as the value of industrial output per ton of carbon emitted. Higher values imply lower energy intensity and concomitantly less vulnerability to rising energy prices. As a caveat, given the time constraints this analysis does not incorporate the substitutability of energy as an input in various industries, a factor which can weigh heavily on the sectoral effects of changing energy prices. Similarly, it does not investigate the differential effects of changing energy prices on industries in the energy sector.

Key Findings

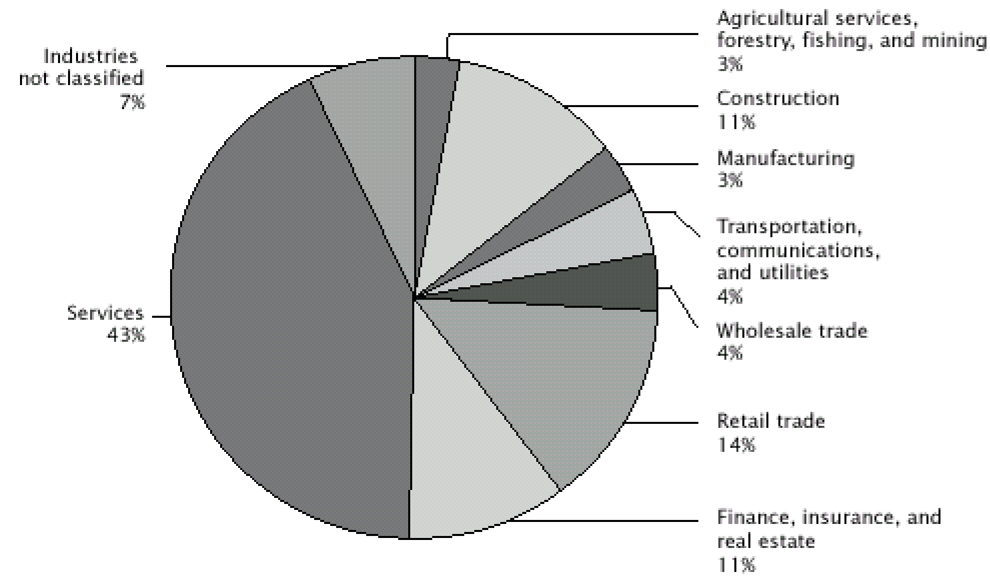
- Oil and energy prices have historically had a significant impact on the U.S. economy, though the relationship is beginning to weaken as the ratio between GDP and energy use decrease.
- Some sectors of the economy have significantly higher energy intensity than others.
- As of the mid-1990s, African Americans had a disproportionately small ownership share in U.S. businesses.

- In 1997, blacks owned approximately 3.95% of all firms in the United States.
- Black-owned firms were only responsible for 0.384% of total sales and receipts.

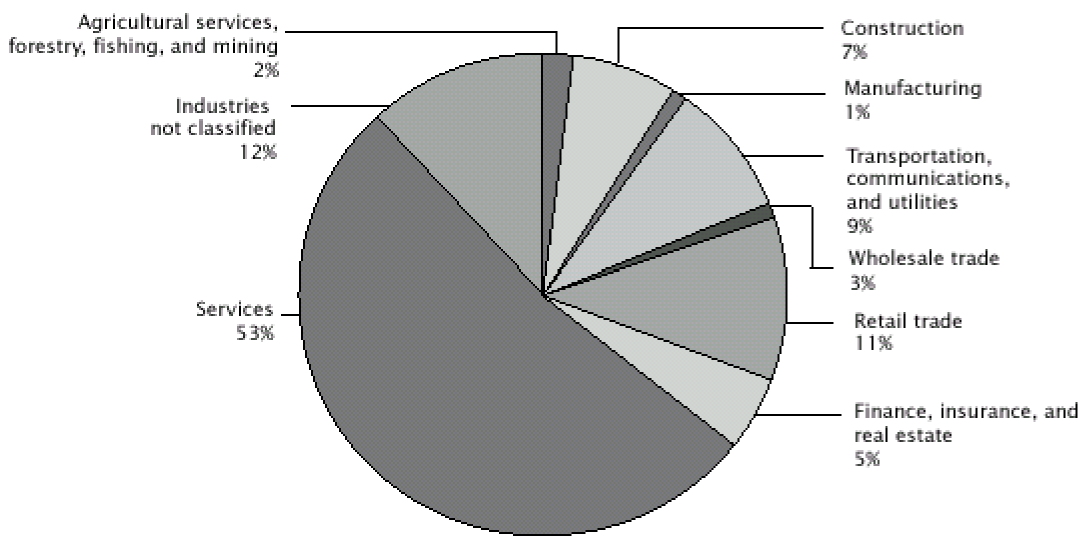
- The energy intensity of black-owned firms appears to be roughly equivalent to the energy intensity of all firms (Appendix 1.4.4).
    - In 1997, Black Americans owned 4.24% of U.S. firms in industries with greater than average energy intensities (in contrast to 3.95% average ownership).
    - However, black-owned firms in sectors with greater than average energy intensities were only responsible for 0.374% of sales and receipts (in contrast to 0.384% average sales and receipts).

Charts and Figures:

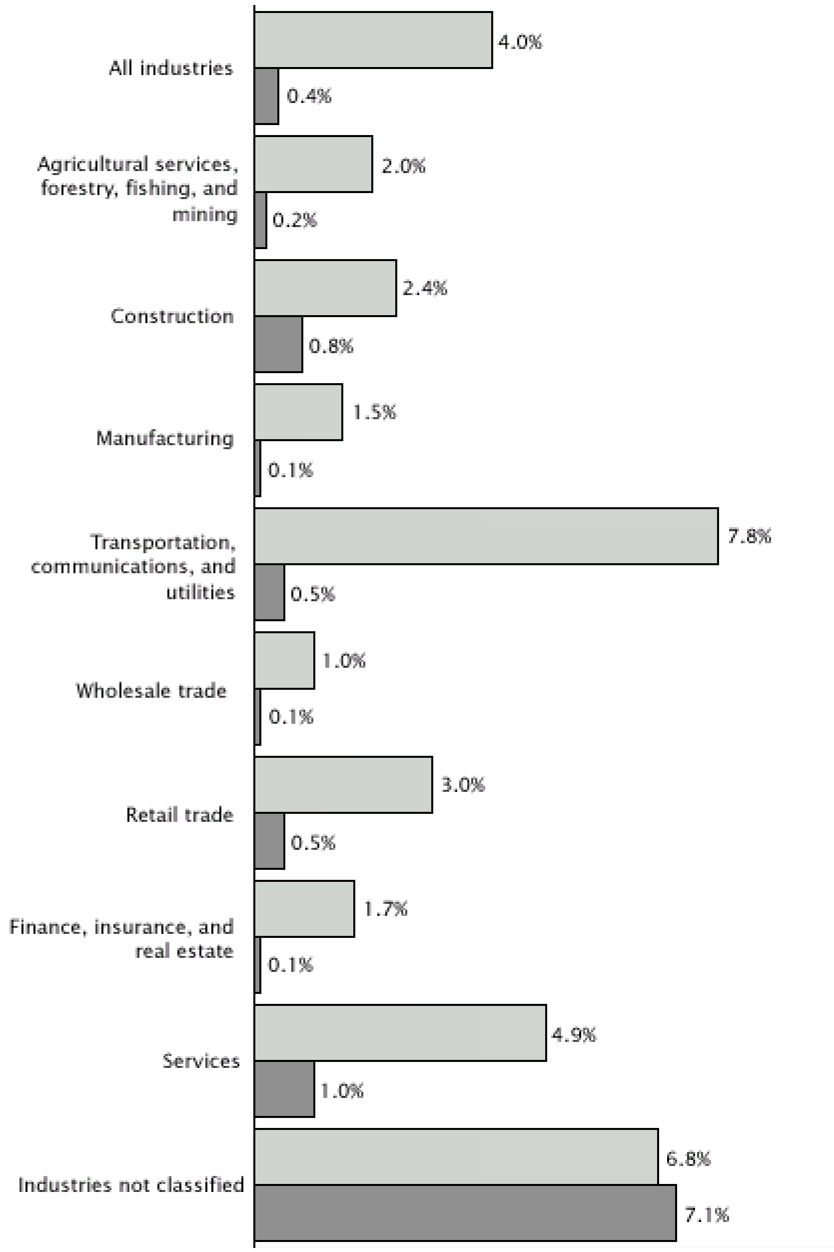
Percent Distribution of All Firms by Industry Division: 1997 (Census, 2001).



Percent Distribution of Black-Owned Firms by Industry Division: 1997 (Census, 2001).



Black-Owned Firms and Receipts as a Percentage of All U.S. Firms (Light) and Receipts (Dark) by Industry Division: 1997 (Census, 2001).



Data:
See Appendix 1.4.4.

1.5 – Effects of Energy Use on Health and Well Being

Background
Energy use contributes greatly to human health and well-being. As will be discussed in Section 2.1, the availability of affordable energy for such purposes as home-heating and cooling, refrigeration, sanitation, and cooking are basic necessities in modern society, which have a fundamental role in protecting human health. Similarly, the presence of lighting and electricity are basic components of well-being, with far-reaching implications for happiness, education, and human welfare.

However, large-scale energy production and use can also entail certain negative effects on human health and well-being. Unlike the benefits of energy use, which tend to be reaped exclusively by those who have purchased the energy, the negative effects of energy use are generally spread across local, regional, and global scales. The most obvious detrimental effect of fossil fuel combustion is air pollution, which can have dramatic implications not only for human health but also for ecosystem health. Such effects, however, are not only found in fuel combustion, but are often spread throughout the fuel production and use life-cycle, from the exploration and extraction of the raw materials to their transport, combustion, and waste disposal. Across that life-cycle, the available data indicates that African Americans often bear a significantly *higher* proportion of the shared costs than the general population. This section explores the negative effects of energy use on health and well-being, and the extent to which these effects are disproportionate

Key Findings

- African Americans have a significantly higher exposure to air pollution
    - 71 percent of African Americans live in counties in violation of federal air pollution standards.
    - 78 percent of African Americans are located within 30 miles of a coal-fired power plant

- The African American community has a rate of incidence of asthma, respiratory distress syndrome, and sudden infant death syndrome roughly three times that of the general population.

- Despite higher exposure, African Americans have more limited resources to combat pollution. The percentage of African Americans lacking medical insurance is 150% that of the general population.

- Climate change impacts such as ozone formation, increased heat-deaths, and higher disease incidence are also likely to disproportionately affect African Americans.

Analysis

Large-scale energy production and use has the potential to negatively affect human health and well-being throughout the production life-cycle, from the exploration and extraction of the fuel to its transport, combustion, and waste disposal (see Figure 1.5.1 and Figure 1.5.2). Most importantly, fossil fuel combustion has major implications for air pollution and exposure to toxic chemicals. Where data is available African Americans often bear a significantly higher share of these costs than the general population. Factors that make African Americans more vulnerable include spatial inequities (more polluted neighborhoods), resource inequality (less access to healthcare, savings, and capital), and limited adaptive capacity (often due to resource accessibility).

Figure 1.5.1: Potential Environmental and Health Effects of the Oil Industry by Stage

STAGE	EFFECT	SUBCATEGORY
Exploration	Deforestation Noise Pollution	• Emerging infectious diseases • Marine mammal disturbance
Drilling and Extraction	Chronic Environmental Degradation	• Discharges of hydrocarbons, water and mud • Increased concentrations of naturally occurring radioactive materials
	Physical Fouling	• Potential reduction of fisheries • Reduced air quality resulting from flaring and evaporation • Soils contamination • Morbidity and mortality of seabirds, marine mammals and sea turtles
	Habitat Disruption	• Noise effects on animals • Pipeline channeling through estuaries • Artificial islands
	Occupational Hazards	• Injury, dermatitis, lung disease, mental health impacts, cancer
Transport	Spills	• Destruction of farmland, terrestrial and coastal marine communities • Contamination of groundwater • Death of vegetation • Disruption of food chain
Refining	Environmental Damage	• Hydrocarbons • Thermal pollution • Noise pollution, ecosystem disruption
	Hazardous Material	• Chronic lung disease
	Exposure	• Mental Disturbance • Neoplasms
	Accidents	• Direct damages from fires, explosions, chemical leaks and spills
Combustion	Air Pollution	• Particulates • Ground level ozone
	Acid Rain	• NO_x, SO_x • Acidification of soil • Eutrophication
	Climate Change	• Global warming and extreme weather events, with associated impacts on agriculture, infrastructure, and human health

Source: Epstein and Selber (2002)

Figure 1.5.2: Health Effects of Power Plant Pollutants

Pollutant	What is it?	How is it Produced?	Health Effects	Most Vulnerable Populations
Ozone (O_3)	Ozone is a highly corrosive, invisible gas.	Ozone is formed when NO_x reacts with other pollutants in the presence of sunlight.	Rapid shallow breathing, airway irritation, coughing, wheezing, shortness of breath. Makes asthma worse. May be related to premature birth and low birth weight.	Children, the elderly, people with asthma or other respiratory disease. People who exercise outdoors.
Sulfur Dioxide (SO_2)	SO_2 is a highly corrosive, invisible gas that is formed in the gases when coal is burned. Sulfur occurs naturally in coal.	SO_2 is formed in the gases when coal is burned. SO_2 reacts in the air to form sulfuric acid and sulfates. Together with NO_x, it forms acidic particles.	Coughing, wheezing, shortness of breath, nasal congestion and inflammation. Makes asthma worse. SO_2 gases can de-stabilize heart rhythms. Low birth weight, increased risk of infant death.	Children and adults with asthma or other respiratory disease.
Particulate Matter (PM)	A mixture of small solid particles (soot) and tiny acidic particles.	Formed by SO_2 and NO_x in the atmosphere	PM is inhaled deep into the lungs, affecting respiratory and cardio-vascular systems. Linked to low birth weight and premature birth, and sudden infant death.	The elderly, children, people with asthma. African American children may be especially susceptible.
Nitrogen Oxide (NO_x)	A family of chemical compounds including nitrogen oxide and nitrogen dioxide	NO_x is formed when coal is burned. In the atmosphere can convert to nitrates and form fine acidic particles. Reacts in the presence of sunlight to form ozone smog.	NO_x changes lung function, increases respiratory disease in children. Helps form ozone and acidic PM .particles which are linked to respiratory and cardio vascular disease, low birth weight and premature birth.	The elderly, children , people with asthma.
Mercury (Hg)	A metal that occurs naturally in coal	Mercury is released when coal is combusted.	Developmental effects in babies that are born to mothers who ate contaminated fish while pregnant. Poor performance on tests of the nervous system and learning. In adults may affect blood pressure regulation and heart rate.	Fetuses and children are directly at risk. Pregnant women and women of child bearing age need to avoid mercury exposure.
Carbon Dioxide (CO_2)	Coal has the highest carbon content of any fossil fuel	Carbon dioxide is formed when fossil fuels are combusted.	Indirect health effects from climate related effects such as the spread of infectious disease, higher ozone levels, increased heat related illnesses.	Children, the elderly, people with asthma.

Source: Adapted from Keating and Davis (2002)

Spatial Inequality:

Higher Exposure to Air Pollution
A growing body of work indicates that African Americans are significantly more likely to live and work in locations where they are exposed to higher levels of pollution than the general public. There is a considerable body evidence indicating that African Americans are more likely to be near major point sources of pollution. With respect to energy facilities specifically, in 2002 it has been estimated that 71 percent of African Americans lived in counties that were in violation of federal air pollution standards, as compared to 58 percent of the white population (Keating and Davis, 2002). Similarly, 78 percent of African Americans are located within 30 miles of a coal-fired power plant, where the environmental and health impacts of the smokestack plumes are most acute, as compared to 56 percent of whites (Keating and Davis, 2002). Along the same lines, African Americans comprise nearly a sixth of the people living within five miles of a power plant waste site, whereas they comprise 12.3 percent of the total U.S. population. Often, these patterns are evident on a much smaller spatial scale. For example, in Massachusetts, less than six percent of communities have large Black populations (>15% African American), however, those few communities were home to over 18 percent of all active power plants, while a further 23 percent of *proposed* power plants were slated to be sited there.

Exposure to pollution from power plants can be through direct inhalation of air pollutants or through more indirect exposure. Indirect exposure can occur when drinking water or eating meat, vegetables, dairy products or fish that have been contaminated by emissions deposited in the earth and accumulated in the food chain. Some power plant air toxics can also be absorbed via skin from direct contact with contaminated water or soil. For example, children can be exposed to power plant toxics by ingesting contaminated soil while playing.

Higher levels of ozone smog and asthma
One of the main concerns with air pollution is its effect on asthma in Americans. Asthma occurs on exposure to air pollution and attacks are exacerbated by presence of fine particulate matter, SO_2 and ozone – all major power plant pollutants. Poverty and lack of access to health care also increase occurrence in African Americans.

The incidence of asthma and subsequent deaths in the U.S. are increasing and affect African Americans disproportionately. It has been documented that African Americans visit the emergency room at three times the rate of whites for asthma attacks. Similarly, hospitalization for asthma for African Americans is more than three times the rate of whites (35.6 admissions per 10,000 population vs. 10.6 admissions per 10,000 population). Lastly, African Americans have a death rate from asthma that is twice that of whites (38.7 deaths per million population vs. 14.2 deaths per million population) (Keating and Davis, 2002).

A recent study also concluded that prevalence of new cases of asthma was related to heavy exercise and outdoor sports in communities that had high concentrations of ozone (McConnell et al., 2002). Another study carried out in Atlanta in a neighborhood of African American children found that asthma is exacerbated among children from low-income families following periods of high ozone pollutions (White et al., 1994).

Respiratory Distress Syndrome (RDS) and Sudden Infant Death Syndrome (SIDS)
Two major life-threatening conditions for newborns are the Respiratory Distress Syndrome (RDS) and Sudden Infant Death Syndrome (SIDS). When a baby is born prematurely and the lungs are not fully developed, RDS occurs. Mortality rate of babies born with RDS has been reduced with advances in medicine, but even so, the mortality rate for African American babies is significantly higher than that of white babies. In 1998, the RDS mortality rate was 70.2 per 100,000 for blacks as compared to 26.7 per 100,00 for whites — a difference of more than 163% (ALA, 2000).

SIDS, often called crib death, is the third biggest cause of infant death. The reason SIDS occurs is unknown but defects in the infant's breathing mechanism may be responsible (ALA, 2000). African American babies have been found to have a higher incidence of SIDS than white babies. In 1998, the SIDS rate for white babies was 57.7 per 100,000, while the rate for African American babies was almost three times higher at 149.2 per 100,000. Reasons for the higher rate are unknown but there is a correlation with premature birth.

Some studies indicate a link between air pollution and RDS and SIDS. In a comparison of 86 cities in the U.S., researchers found that the mortality rate of infants living in a highly polluted city during their first two months of life was 10% higher than infants living in the city with the cleanest air (Woodruff et al., 1997). Investigators in this study found that high particulate matter levels were related to a 26% increased risk of SIDS and a 40% increased risk of respiratory mortality. In a preliminary study extending this work, researchers recently estimated that 11% of the infant mortality in the U.S. is attributable to particulate matter, even at low to moderate levels (Kaiser et al., 2001). A study in Mexico City has also linked infant death to particulate matter (Loomis et al., 1999). A study carried out in Taiwan concluded that the occurrence of delivery of pre-term babies was significantly higher in mothers living near petrochemical industrial complexes as compared to control mothers living elsewhere (Yang et al., 2002).

Higher Exposure to Mercury Pollution
Coal-fired power plants are the largest industrial dischargers of mercury, producing over one third of all mercury pollution in the U.S (EPA, 1997; EPA, 1998). Airborne mercury is frequently deposited into water bodies where it is converted to methylmercury. Mercury is quickly taken into the food web, where the chemical is stored in lipids. Bioaccumulation occurs when smaller fish are eaten by larger fish and concentrations of mercury in the fish rise as one progresses up the trophic web. Larger carnivorous fish have higher mercury concentrations than smaller fish. As a consequence, human exposure to mercury primarily occurs by eating contaminated fish. (EPA, 1998).

Forty-four states in the United States have issued fish consumption advisories following the wide spread mercury contamination in fish across the country (EPA, 2003). Eleven states out of the above have consumption advisories for every inland water body for at least one fish species; six states have consumption advisories for canned tuna, and eight have statewide coastal marine advisories for king mackerel. The U.S. Food and Drug Administration has also issued a consumer advisory for pregnant women, women of childbearing age, nursing mothers and young children to not eat swordfish, tilefish, shark and king mackerel because of high mercury levels (FDA, 2001).

Methylmercury interferes with the development and function of the central nervous system in humans (NRC, 2000). Prenatal exposure arising from maternal consumption of fish can cause later age impairments in children. Infants might appear normal during the first few months of life, but later display subtle health effects such as poor performance on neurobehavioral tests, particularly on tests of attention, fine motor function, language, visual-spatial abilities (e.g., drawing) and memory. These children will likely have to struggle to keep up in school and might require remedial classes or special education (NRC, 2000). Children and developing fetuses are most vulnerable to mercury exposure. Methylmercury in fish consumed by the mother has been found to pass through the placenta to the developing fetus. Mercury exposure prior to pregnancy is as critical as exposure during pregnancy because mercury is stored in tissues and is only slowly excreted from the body. The first weeks of pregnancy also represent a critical time for fetal development. Pregnant women and women of childbearing age (i.e., 15 to 44 years of age) are those who should most avoid mercury exposure (NRC, 2000; EPA, 1997b).

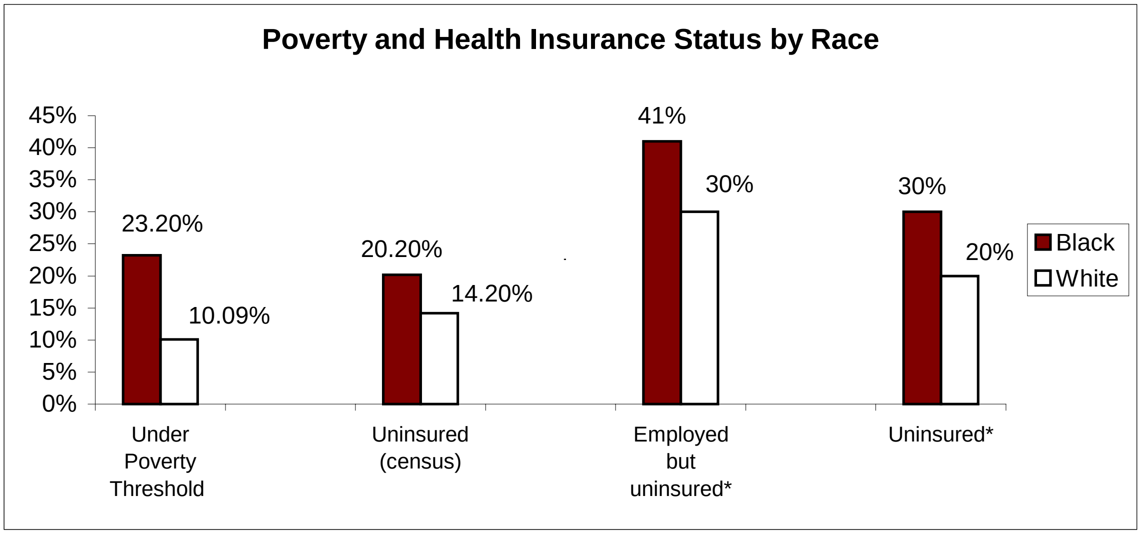
African Americans are enthusiastic fisherpeople. 1.8 million licensed African American anglers spent over $813 million dollars on fishing trips and equipment in 1996 (FWS, 1996). One-third of African Americans are active anglers and eat fish in larger portions and more often than whites (EPA, 1997b; RBFF, 2002). The amount and type of fish consumed affect the exposure to and contamination from mercury, which puts African Americans at a higher risk. Studies show that in all parts of the country, African Americans are more likely to eat what they catch, eat more of it, and be less aware of health advisories than the white fish-eating population (Tilden et al., 1997; Burger et al., 1999).

Resource Inequality: Reduced Ability to Adapt to Pollution

In addition to having higher levels of exposure, African Americans are less likely to have the resources necessary to limit the effects of pollution from energy system. A disproportionately high percentage of African Americans live in poverty, substantially increasing vulnerability to the effects of air pollution. Likewise, limited housing options and lack of health insurance, have resulted in harsher effects for African American communities.

As of the 2002 Census, average poverty rates from 2000 through 2002, 11.7 percent of Americans lived in poverty. However, the racial component to this statistic is striking. Of white Americans, 10.1 percent were under the poverty threshold, while black Americans remain more than twice as likely (23.2 percent) to live in poverty. Partially as a consequence of this income divide, African Americans are much less likely to have access to quality health care than the general population. According to Census data, African Americans are one and half times as likely to be uninsured as whites. A second survey of health care, the Commonwealth Fund 2001 Health Care Quality Survey, similarly indicated that thirty percent of African Americans between the ages of 18 and 64 lack any health insurance. This figure contrasts poorly against the twenty percent of whites in the same age groups lacking insurance. In other words, African Americans are almost 150% more likely to be uninsured than whites. Similarly, the Commonwealth Fund survey indicated 41% of African Americans who are employed do not have health insurance.

Figure 1.5.3 – Race, Poverty, and Health Insurance



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These figures are from The Commonwealth Fund 2001 Health Care Quality Survey
Figure 1.5.1: Adapted from Collins et al. (2002)

As a partial consequence of this lack of access to adequate medical treatment, African Americans are more vulnerable to the effects of air pollution and toxics exposure outlined in Figure 1.5.2. For many of the same reasons, African Americans are also more likely to be disproportionately exposed to the negative effects of global climate change.

Greenhouse gases and climate change
Climate change disproportionately affects the health, economic and social well-being of African Americans. Changes in the Earth's atmosphere are occurring due to the buildup of greenhouse gases in the atmosphere. Power plants account for 38% of the most prevalent greenhouse gas, carbon dioxide, emitted from fossil fuel use in the U.S. Warming of the planet, together with more drought conditions in some regions and flooding in other regions, could induce crop failures, famines, flooding and other environmental, economic and social problems (Miller and Brown, 2000). In some regions, global climate change is also expected to exacerbate existing problems such as ozone formation and air pollution (Hansen, 2000). The potential health impacts of climate change include increased prevalence of infectious disease such as Dengue fever and West Nile virus, more heat-related stress and illness, and higher levels of ozone smog (EPA, 2001; IPCC, 2001). The African American community is particularly vulnerable to these.

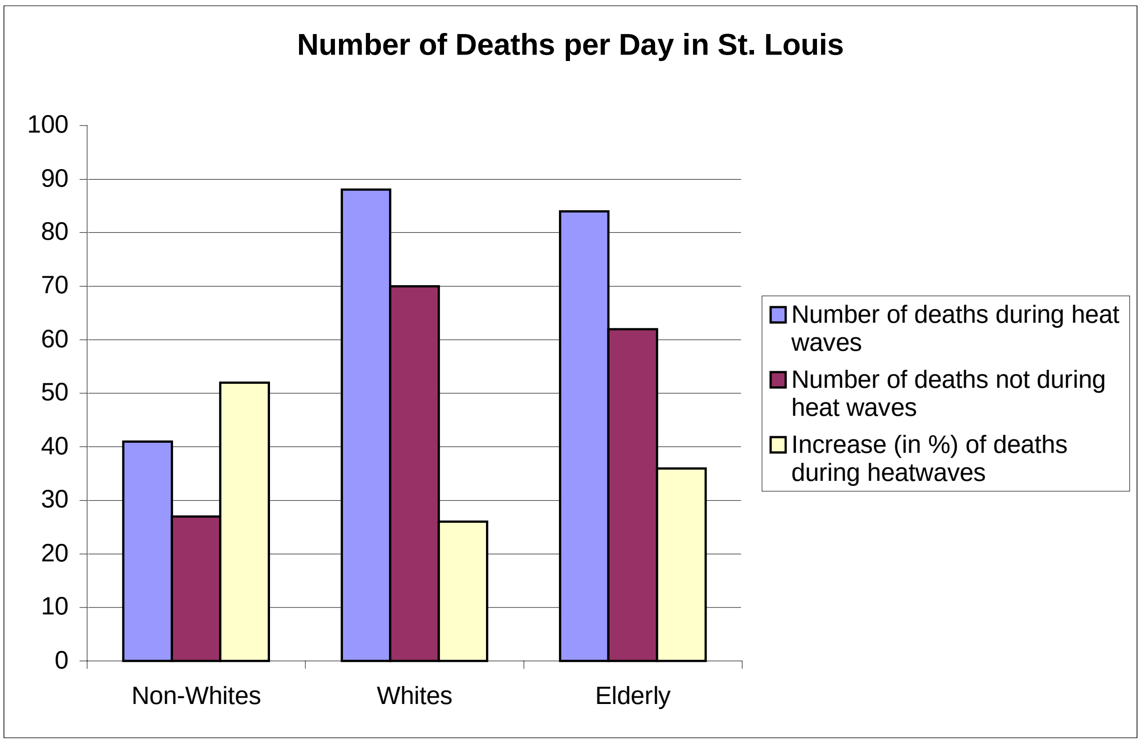
A study of the fifteen largest cities in the U.S. found that climate change would increase heat-related deaths by at least 90% (Kalkstein, 1992). Most African Americans live in inner cities (McKinnon and Humes, 2000), which tend to be about 10 degrees warmer than surrounding areas. In fact, studies have shown that African Americans are twice as likely to die in a heat wave (Kalkstein, 1992).

Figure 1.5.5: Age-specific, heat-related death rates, Chicago 1999 heat wave[a]

Age Group (years)	Percent of Population	Population in each Age Group in 2000	Rate of Heat-Related Death[b]
25-44	33.4%	966,467	0.9/100,000 (8)
45-64	18.9%	547,196	5.5/100,000 (30)
65-74	5.5%	159,915	7.5/100,000 (12)
≥ 75	4.8%	138,888	20.9/100,000 (29)

[1] During and immediately after July 29-August 1, 1999
[b] Population totaled 2,896,016, based on 2000 U.S. Census. Decedents totaled 80
Source: Naughton, et al. (2002)

Figure 1.5.6: Heat Deaths in St. Louis



Source: Kalkstein, 1992

In addition to increasing the incidence of heat-related deaths, a warmer climate means that more areas of the U.S. will be hospitable to insects and rodents which can carry a wide range of communicable diseases including like malaria, St. Louis encephalitis, Lyme disease, Dengue fever, and Hanta virus. Many of these disease cause flu-like symptoms and can be treated when caught early. However, these diseases can be fatal when not treated, and even with treatment, can be fatal in seniors and people with compromised immune systems. Since many African Americans lack health insurance and regular medical access, they are particularly at risk.

Figure 1.5.4: Major vector borne diseases expected to increase with global warming

Disease	**Predicted sensitivity to climate change**
Malaria	Highly likely
Filariasis	Likely
Onchocerciasis	Likely
Schistosomiasis	Very likely
African trypanosomiasis	Likely
Arboviral disease	
Dengue	Very likely
Yellow fever	Likely
Other	Likely

Source: Adapted from Kiska (2000)

1.6 – Relationship between energy and economic development in the African-American community

Background
Providing a source of employment is one of the most direct ways in which the energy industry affects Americans and African Americans in particular. This section describes general trends of employment in the energy sector over the past two decades.

Key Findings

- For the eleven industries examined, over the past two decades the fraction of employees who are black has *risen* from 6% to 8%.

- However, there has been a 28% *decrease* in overall energy sector employment during this period.

- As a result, the total number of African Americans employed in the energy industry has *fallen* over the past two decades, from a high of 215,000 in 1989 to approximately 176,000 in 2002.

- Nearly two thirds of blacks employed in the energy sector live in the South, due in large to the higher African American population there.

- The total percentage of black Americans who are employed in the U.S. energy sector has fallen from around 1.8% in 1983, to 1.1% today.

- African Americans have consistently represented a lower fraction of employees in the energy sector than they have in the economy overall, in services, or in manufacturing jobs.

Analysis
This analysis looked at average annual employment levels in eleven energy-related industries over the past two decades. Two data sets were employed for this analysis. The first is a set of annual employment statistics gathered by the Bureau of Labor Statistics. Data for Energy-related industries was culled and listed in Appendix 1.6.1. This data is analyzed for trends in the composition and size of the energy sector workforce, particularly as it relates to African Americans. In addition, monthly data from the Current Population Survey was used to explore the regional distribution of employment by energy industry, race, and year. The detailed statistics are provided in Appendix 1.6.2.

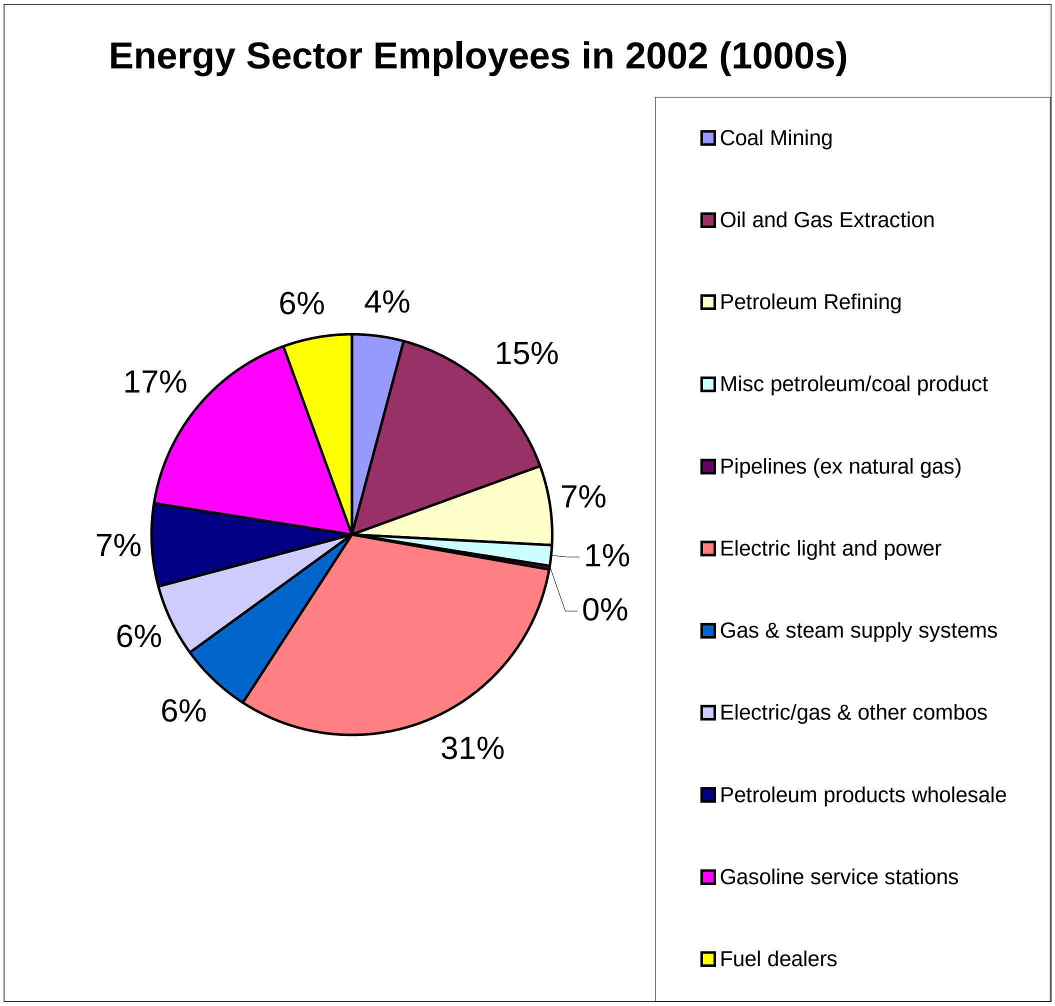
Industrial Composition of Energy Sector
The energy sector as defined by this analysis is made up of multiple industries. These industries included extractive industries (coal mining and oil and gas extraction), production (petroleum refining and misc. petroleum and coal products), energy use (electric light and power, gas and steam supply, and electric/gas & other combinations), and fuel sales (wholesale petroleum dealers, gas stations, and fuel dealers). The percentage of employees in each of these industries varies from the very low (e.g. coal mining) to relatively high (e.g. electric/gas combinations)

(Table 1.6.1). The relative contribution of each industry to the overall employment of African Americans in the energy sector is graphically depicted in Figure 1.6.2.

Table 1.6.1 Percentage of Energy Employees who are Black, 2002 (Data: BLS)

Industry	**Percent Black**
Total	8.62%
Coal Mining	1.90%
Oil and Gas Extraction	4.60%
Petroleum Refining	12.00%
Misc petroleum/coal product	10.90%
Pipelines (ex natural gas)	0.00%
Electric light and power	9.60%
Gas & steam supply systems	5.30%
Electric/gas & other combos	16.30%
Petroleum products wholesale	9.10%
Gasoline service stations	11.30%
Fuel dealers	2.20%

Figure 1.6.2 – Distribution of Employment in the Energy Sector (Data: BLS)



Geographic Distribution of Energy Sector: How is employment in the energy sector distributed across regions?

There is considerable variation in the regional employment of all races in the energy sector (Table 1.6.2). In general, the South is home to the highest number of energy employees, followed by the Midwest, West, and Northeast. With respect to African Americans in particular, nearly two-thirds of blacks employed in the energy sector live in the South (63%). The remaining third is distributed almost equally between the Midwest, Northeast, and West (Table 1.6.3). In part, the high concentration of African American energy employees is an artifact of the regional distribution of African American populations in the United States. To address this, Table 1.6.4 presents regional energy employment by race as a fraction of the regional population of each race. The data indicates that nationally, about 0.55% of blacks are employed in the eleven energy industries analyzed here. The distribution is somewhat variable between regions, with a high of 0.64% blacks employed in the South and a low of 0.36% blacks employed in the Northeast.

Table 1.6.2 – Employment in the Energy Sector by Region and Race (Average November Employment, 1996-2002) (Data: CPS)

	National	Northeast	Midwest	South	West
	2317252	336248	477186	1058543	445276
White	2036209	303310	437184	907541	388174
Black	194127	23503	29971	122629	18024
Am. Indian, Aleut, Eskimo	28460	1461	3420	10480	13099
Asian or Pac. Islander	58456	7974	6611	17893	25979

Table 1.6.3 – African American Employment in the Energy Sector by Industry and Region (Average November Employment, 1996-2002) (Data: BLS)

	National	Northeast	Midwest	South	West
Coal Mining	1501	0	0	1449	52
Oil and Gas Extraction	18642	333	0	17499	811
Petroleum Refining	14607	242	2075	10554	1737
Misc petroleum/coal product	2653	0	1431	1223	0
Pipelines (ex natural gas)	907	0	0	907	0
Electric light and power	64757	9039	8441	40059	7218
Gas & steam supply systems	11515	1749	4802	4344	619
Electric/gas & other combos	16065	1965	2159	6934	5007
Petroleum products wholesale	7995	1196	0	4452	2347
Gasoline service stations	49862	7168	10767	31694	233
Fuel dealers	5622	1812	297	3513	0
Total	194126	23504	29972	122628	18024
Regional Share		**12.11%**	**15.44%**	**63.17%**	**9.28%**

Table 1.6.4 – Regional Employment in the Energy Sector by Percentage of Population (Average November Employment, 1996-2002) (Data: BLS)

Percent of Population by Race Employed in Energy Sector (Avg. Nov. Employment 1996-2002)					
	National	**Northeast**	**Midwest**	**South**	**West**
Total	0.85%	0.65%	0.76%	1.11%	0.72%
White	0.91%	0.70%	0.80%	1.23%	0.75%
Black	0.55%	0.36%	0.46%	0.64%	0.58%
American Indian	1.05%	0.78%	0.73%	1.29%	1.05%
Asian	0.54%	0.41%	0.54%	0.95%	0.46%

Trends in African American Employment: Is there progress or regress in terms of overall percentage of employment?

In 2002, the most recent year for which annual data is available, a total of 176,000 blacks were employed in eleven energy-related industries. On average, the number of blacks employed in the energy sector over the past five years represented roughly 0.55% of the total black population. In stark contrast, the national average for employment in the energy sector (all races) is 0.85%, and the average rate for whites is 0.91%. In other words, African Americans are significantly underrepresented as employees in the energy industry. This under-representation is true across all four regions.

In terms of trends, over the past 20 years African Americans have comprised between 5.5% and 8.5% of energy sector employees. Generally, the share of African Americans in the energy sector workforce has increased slightly over the past two decades, from roughly 6% to 8% (Figure 1.6.2). However, over the same time period overall employment in the American energy sector has fallen. As a consequence, the total number of African Americans employed in the energy industry has actually fallen over the past two decades, from a high of 215,000 in 1989 to approximately 176,000 in 2002 (Figure 1.6.3).

Figure 1.6.2 – African American Percentage of the Energy Sector Workforce (Data: BLS)

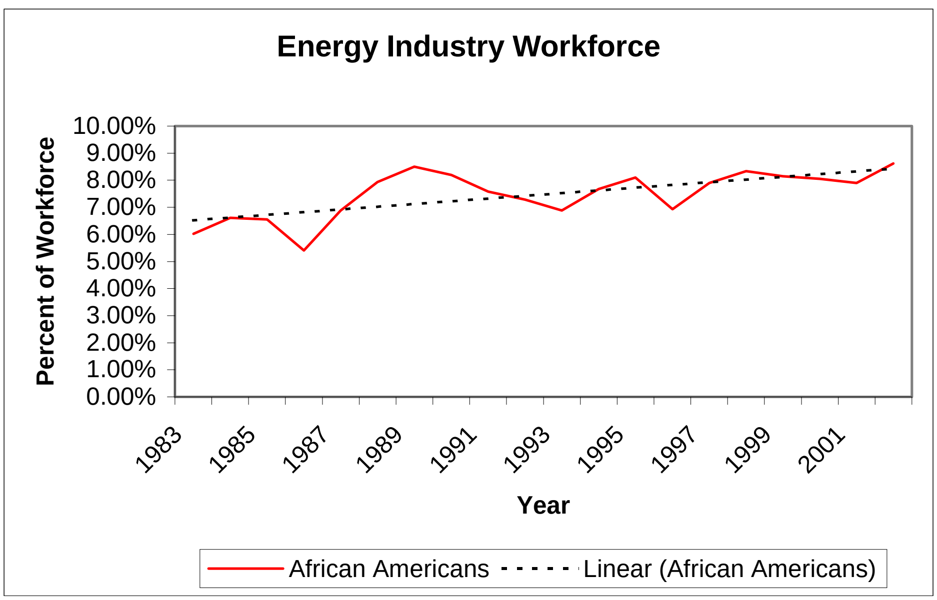
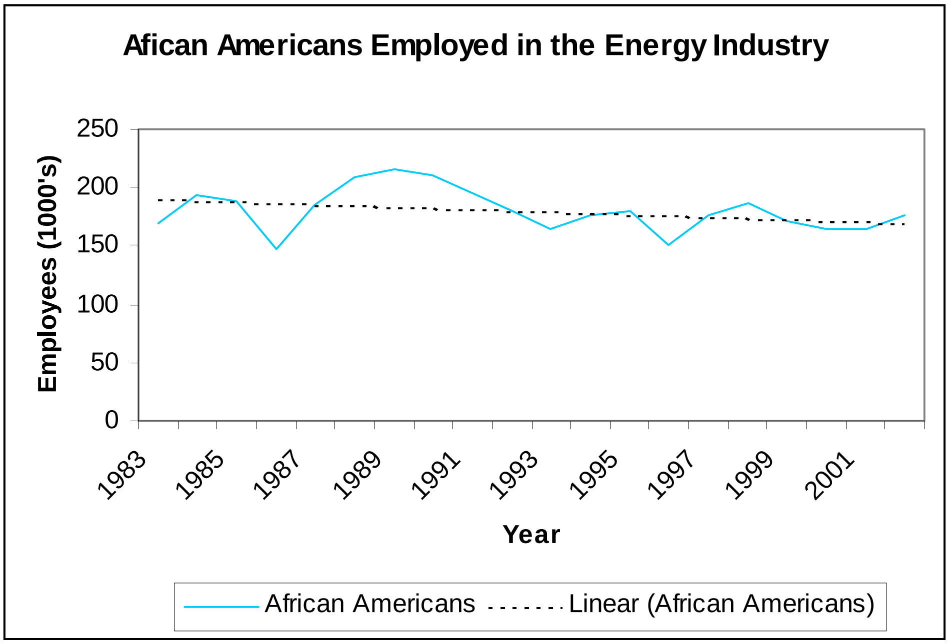


Figure 1.6.3 – African American Employment in the Energy Sector (Data: BLS)



Comparison: How does employment in the energy sector compare to manufacturing jobs generally? To services?
Relative to other sectors African American employment in the energy sector is low. In 2002, blacks represented 10.9% of the U.S. workforce and 12.2% of those employed in service industries. However, blacks only comprised 9.6% of manufacturing jobs, and 8.6% of energy sector jobs (Table 1.6.4). This deficit has been true for every year in the past twenty, despite a general decline in the relative proportion of manufacturing jobs and held by blacks and an increase in the relative proportion of energy jobs held by blacks.

Over the past 20 years there has been a 28% *decrease* in overall energy sector employment, and an increase of 35% in overall employment. As a consequence, despite the fact that the fraction of energy employees who are black has risen from 6% to 8% over this time period, the total percentage of blacks employed in the U.S. energy sector has fallen from around 1.8% in 1983, to 1.1% today.

Table 1.6.4 – Black Employment in All Industries, Service Industries, and Energy Industries, 1983-2002 (Data: BLS)

	Total	Services	Manufacturing	Energy
2002	10.90%	12.20%	9.60%	8.62%
2001	11.00%	12.30%	9.70%	7.90%
2000	11.10%	12.50%	10.10%	8.05%
1999	11.30%	12.70%	10.60%	8.14%
1998	11.10%	12.20%	10.50%	8.34%
1997	10.80%	12.10%	10.40%	7.89%
1996	10.70%	12.10%	10.50%	6.93%
1995	10.60%	12.00%	10.40%	8.10%
1994	10.40%	11.90%	10.10%	7.68%
1993	10.30%	11.50%	10.20%	6.88%
1992	10.30%	11.50%	10.60%	7.28%
1991	10.30%	11.50%	10.40%	7.58%
1990	10.20%	11.50%	10.20%	8.19%
1989	10.20%	11.60%	10.10%	8.50%
1988	10.10%	11.80%	10.20%	7.94%
1987	10.10%	11.60%	10.30%	6.89%
1986	9.90%	11.50%	10.10%	5.40%
1985	9.80%	11.60%	10.00%	6.55%
1984	9.60%	11.60%	9.90%	6.61%
1983	9.30%	11.40%	9.60%	6.02%

1.7 – Impact of paradigm shift away from fossil fuels towards renewable energy on African American communities.

Overall Findings

- Renewable energy sectors, and particularly manufacturing, appear to have comparable percentages of African Americans employed.

- A shift toward renewable energy is likely to increase African American employment levels per unit of energy produced, but will have uncertain effects on overall energy sector employment.

- Shifting to renewable energy would require an estimated doubling of the federal energy research and development budget as well as numerous regulatory and economic incentives.

- Any reduction in the dependence on the volatile global oil market can reduce the vulnerability of the U.S. economy and African Americans in particular to the macroeconomic effects of oil shocks.

1.7.1 African-American employment in emerging energy and energy-efficiency industries.

Background

One concern about shifting to an economy that derives a larger fraction of renewable energy is the effects on employment and race. Section 1.7.1 explores African American employment patterns in emerging energy and energy-efficiency industries. As a caveat, in contrast to fossil-fuel energy sectors, less data is available for renewable energy sectors. Because of their small size to date, employment information in renewable sectors has been grouped into larger industrial categories.

Key Findings

- No published information is available for employment by race in the specific renewable industries.

- On a broader scale, African Americans comprise roughly 8.5% of employees in industrial categories that include renewable industries. This share is equivalent to African American employment in energy in general.

- In contrast to African American employment in the general energy sector, employment in the renewable sector is on the rise.

- A shift to renewable energy would likely increase *overall* employment levels in the energy sector per unit of energy produced.

Analysis

Size and Demographic Composition of Renewable Industry
It is difficult to collect information on the size of the renewables and energy efficiency industry to date, because of its relative small size and decentralized nature. The limited published evidence available indicates that – in employment terms – the renewables industry is small, though growing. For example, the Energy Information Agency collects annual information on employment from photovoltaic and solar thermal manufacturers (Table 1.7.1.1). Over the past six years, direct employment in these two limited groups has grown from approximately 2,000 to 3,000 person-years. However, employment in renewables includes far more than technology manufacturers. System design, installation, basic maintenance, R&D, education and training, human resources, energy auditing and management, and consulting are all associated occupations. For example, for a larger sector, the geothermal industry, The Renewable Energy Policy Project estimates that the industry directly employed 12,300 people 1996, and indirectly employed another 27,700 (REPP, 2001). Similarly, the Electric Power Research Institute estimates that that adding 5,900 MW in renewable capacity would generate 28,000 person-years in construction and 3,000 permanent operation and maintenance jobs

Table 1.7.1 - Employment (Person Years) in PV Manufacturing and Solar Thermal (Source: EIA)

Year	PV Manufacturing	Solar Thermal Manufacturing
1997	1736	184
1998	1988	207
1999	2013	289
2000	1913	284
2001	2666	256
2002	2696	356

In part because of the limited size of renewables industries to date, no data is collected on racial employment. To find a first approximation of employment in these industries, RP has found acquired employment data from the Bureau of Labor Statistics. Renewable industries (by NAICS codes) were top-coded (see Appendix 1.7.1) to the most detailed level for which racial information is available. For example, with regards to wind turbine manufacturing, the most detailed level for which racial data is collected is the larger industrial category of "Engines, turbines, and power transmission equipment manufacturing." The distribution of employees by race in these categories is listed in Table 1.7.1.2.

Table 1.7.1.2 – Employment by Race in Industrial Categories that include Renewable Industries (Data from BLS, 2003)

Renewable Energy	Industrial Categories Including Renewables	Employees			
		Total	White	Black	% Black
All	Construction (23)	11492540	10211087	879443	8.61%
All	Administration of economic programs and space research (926, 927)	606585	476111	77149	16.20%
Hydro	Electric and gas, and other combinations (Pts. 2211,2212)	107731	80821	10543	13.04%
Wind	Engines, turbines, and power transmission equipment manufacturing (3336)	51577	46102	5475	11.88%
Solar	Electrical lighting, equipment, and supplies manufacturing, n.e.c. (3351, 3353,3359)	440203	370956	26828	7.23%
Solar; Fuel Cells	Navigational, measuring, electromedical, and control instruments manufacturing (3345)	305614	248800	22550	9.06%
Solar; Fuel Cells	Electronic component and product manufacturing, n.e.c. (3344,3346)	823604	563644	60221	10.68%
Biomass	Crop production (111)	1114099	1046139	37601	3.59%
Tidal, Wave, Solar, Fuel Cells	Scientific research and development services (5417)	521370	457743	29447	6.43%
	Total	15463323	13501403	1149257	8.51%
	Excluding construction:	3970783	3290316	269814	8.20%
	Excluding construction and agriculture:	2856684	2244177	232213	10.35%

Table 1.7.1.2 indicates that the share of African American employment in renewables industry super-categories is comparable to African American employment in the general energy industry, about 8.5%. Moreover, if the much larger categories of crop production and construction are excluded, African American employment is over 10% of the total, due to the relatively high proportion of African Americans in certain manufacturing sectors.

Labor Intensity of Renewables

In addition to distributional effects, a switch to renewable energy is likely to have a scale effect. In part because of their often distributed nature and comparatively high cost to date, renewables tend to be significantly more labor intensive per unit of energy produced or dollar spent than fossil fuels. As a consequence, for a given amount of production a shift to renewable energy would likely increase overall employment levels in the energy sector. According to the DOE (1997): "There are two main reasons why renewable energy technologies offer an economic advantage: (1) they are labor-intensive, so they generally create more jobs per dollar invested than conventional electricity generation technologies, and (2) they use primarily indigenous resources, so most of the energy dollars can be kept at home."

Few systematic studies are available on the employment effects of switching to renewable energy. One study by REPP calculates that 35.5 person-years of labor are required per every megawatt of PV; likewise 4.8 person-years for every megawatt of wind energy. These labor requirements appear to be significantly higher than the labor requirements for coal plants. With respect to a co-firing biomass plant, REPP indicates that the labor requirements of the plant are in the range of 3.8-21.8 person-years for ten years of a megawatt of biomass, depending primarily on the type of fuel (REPP, 2001). REPP also estimates that wind and PV generate about roughly 40% more jobs per dollar spent than coal, where a higher percentage of the funds go into capital and fuel costs.

A similar early 1990s study by the Worldwatch Institute estimated that each 1000 gigawatt-hours of production would require 100 workers in a nuclear plant, 116 in a coal-fired plant, 248 on a solar thermal plant, and 542 on a wind farm (Sonneborn, 2000). Similarly, the American Council for an Energy Efficient Economy estimates that reducing U.S. energy usage through energy efficiency projects could create nearly 500,000 jobs in the United States in 2000 and nearly 1.1 million jobs by 2010. While these conclusions are somewhat outdated and largely anecdotal, the renewable sector appears to overall have higher labor intensity per unit of production. An interesting consequence of these findings is that a substantial effort to replace generation capacity from coal-fired plants with renewable plants would increase the overall level of employment in the energy sector.

1.7.2 How much would it cost the government to make the substantial and unprecedented investment in renewables?

Background

The costs of switching to a renewables based energy system are important to consider. Governmental costs can be both direct costs such as funding research and development, subsidies, and administrative costs, and indirect costs such as reduced tax revenue or unemployment outlays. The information available on the costs to government from switching to renewables is often vague. This section has summarized a number of general government studies tasked with reviewing these topics in order to make its assessments.

Key Findings

- The costs of making a "substantial and unprecedented investment" in renewables are highly variable depending both on the specific investments measured and the categories defined as costs.

- Government studies have indicated that the pursuit of renewables would require a substantial increase in spending on federal energy research and development. Specifically,
    - The 1997 PCAST study recommended energy technology R&D to be increased to over $2 billion (1997 dollars) for this fiscal year.
    - The DOE's Interlaboratory Working Group recommended a doubling of energy R&D to pursue a low-carbon future.

- In addition to enhanced research programs, significant regulatory programs such as CAFÉ standards or carbon trading systems are required to encourage the transition.

- Both the DOE's Five Laboratory Study (1997) and the Scenarios for a Clean Energy Future (2000) estimated that the overall costs of pursuing this strategy would be offset by the benefits.

Analysis

There have been a number of U.S. Department of Energy and Administrative reviews of renewable energy since the mid-1990s. Many of these studies have been prefaced by the notion that there are strong incentives to switch to renewable energy in the near future. For example, the U.S. DOE's Five Laboratory Study concluded in 1997 that, "It is quite likely that renewable energy technologies will play a crucial role in limiting carbon emissions and global warming in the long term…. With the continuing technological development and cost reductions of renewables, renewables may become preferred energy resources some time within the next one to three decades. Moreover, they will probably expand to become the world's primary energy resource in the latter half of the next century (EERE, 1997)." Similarly, the National Research Council (2000) has declared that, "R&D on renewable energy technology is now part of an overall approach to providing for clean, affordable energy, which is vital to the current and future well-being of the United States."

Generally, these reviews have indicated that the costs of switching to a renewable or low-carbon economy are more than offset by the benefits gained from the switch. The DOE's Five

Laboratories concluded that implementation of carbon-reduction scenarios would yield energy savings equal to or greater than costs (EERE, 1997). Similarly, the Interlaboratory Working Group's year 2000 study, Scenarios for a Clean Energy Future, concluded that, "Smart public policies can significantly reduce not only carbon dioxide emissions, but also air pollution, petroleum dependence, and inefficiencies in energy production and use. A range of policies exists – including voluntary agreements; efficiency standards; increased research, development, and demonstration (RD&D); electric sector restructuring; and domestic carbon trading – that could move the United States a long way toward returning its carbon dioxide emissions to 1990 levels by 2010. Additional means would be needed to achieve further reductions, such as international carbon trading and stronger domestic policies. *The overall economic benefits of these policies appear to be comparable to their overall costs*. The CEF policies could produce direct benefits, including energy savings, that exceed their direct costs (e.g., technology and policy investments). Indirect macroeconomic costs are in the same range as these net direct benefits. The CEF scenarios could produce important transition impacts and dislocations such as reduced coal and railroad employment; but at the same time, jobs in wind, biomass, energy efficiency, and other "green" industries could grow significantly."

As far as direct governmental outlays, one of the most important costs to the government is that of Research and Development in energy technologies. One landmark study on this topic is the President's Committee of Advisors on Science and Technology, Energy Research and Development Panel's 1997 Federal Energy Research and Development for the Challenges of the 21st Century (PCAST, 1997). The PCAST panel looked at the federal energy R&D portfolio and recommended a significant strengthening of DOE investment in several energy fields including end-use efficiency, fission, fossil, fusion, and renewables (Table 1.7.2.1). The PCAST budget recommendations were unanimous, despite a range of energy and science backgrounds on the committee.

Table 1.7.2.1. PCAST-Recommended R&D Energy-Technology Budget (millions of constant 1997 dollars) (Source: Holdren, 2001).

	FY1997 actual	FY2003 proposed	FY2003 increment over FY1997	Share of total increment
Efficiency	373	755	382	48.60%
Fission	42	102	60	7.60%
Fossil	365	371	6	0.80%
Fusion	232	281	49	6.20%
Renewables	270	559	289	36.80%
TOTAL	1282	2068	786	100%

Current outlays fall significantly short of PCAST's recommendations. A year 2000 review by the National Research Council noted that efforts to balance the national budget in the 1990s constrained discretionary funding for R&D, such that deployment of renewable energy technologies has not been consistently funded by Congress. They conclude that, "Overall, the Office of Power Technologies' deployment goals for renewable technologies are based on unreasonable expectations and unrealistic promises. OPT has not developed the policies or resources needed to achieve its goals in an increasingly competitive electricity market, in which electricity can be generated relatively cheaply from conventional sources, such as natural gas and coal."

In addition to direct expenditures in energy R&D, the Interlaboratory Working Groups outlines several key policies for their "Advanced" clean energy future scenario (2000). These include:

Buildings Industry
– Efficiency standards for equipment
– Voluntary labeling and deployment programs
– Voluntary programs
– Voluntary agreements with individual industries and trade associations

Transportation and Electric Generators
– Voluntary fuel economy agreements with auto manufacturers or CAFÉ standards
– "Pay-at-the-pump" auto insurance
– Renewable energy portfolio standards and production tax credits
– Electric industry restructuring

Cross-Sector Policies
– Doubled federal research and development
– Domestic carbon trading system

While it is difficult to assess the direct and indirect costs and benefits of all of these policies, the Working Group did some modeling on energy prices under the scenarios. They concluded that under this aggressive approach to carbon intensity, in both 2010 and 2020 the nation pays less for energy than it would under business as usual due to the reduction of primary energy use. Moreover, by 2002, the investments would lead to an estimated $124 billion in reduced costs, even with the price of carbon trading included. Energy use by the electricity sector is detailed in Table 1.7.2.2.

Table 1.7.2.2 – Generation by Scenario and Fuel in the Electric Sector (CEF, 2000)

			2010			2020		
Fuel	**1990**	**1997**	**BAU**	**Mod.**	**Adv.**	**BAU**	**Mod.**	**Adv.**
Coal		1800	2020	1940 (-4%)	1400 (-31%)	2170	2000 (-8%)	1060 (-51%)
Petroleum		80	22	17 (-23%)	14 (-36%)	18	15 (-17%)	11 (-39%)
Natural Gas		300	890	680 (-24%)	880 (-1%)	1270	830 (-35%)	1140 (-10%)
Nuclear Power		630	580	580 (0%)	630 (9%)	520	460 (-11%)	600 (15%)
Renewables		390	410	460 (13%)	590 (45%)	440	500 (13%)	630 (42%)
Hydro		350	320	320 (0%)	320 (-0%)	320	320 (0%)	320 (0%)
Wind		3	8	37 (386%)	140 (1760%)	9	51 (495%)	160 (1770%)
Biomass		4	26	37 (43%)	47 (83%)	31	26 (-17%)	48 (55%)
- Dedicated		4	11	15 (35%)	22 (100%)	19	16 (-12%)	32 (69%)
- Cofired		0	15	22 (49%)	25 (70%)	13	10 (-24%)	17 (33%)
Geothermal		16	24	37 (55%)	50 (109%)	47	67 (41%)	67 (41%)
Other		15	28	28 (0%)	28 (0%)	31	31 (0%)	31 (0%)
Other		-3	-1	-1 (0%)	-1 (0%)	-1	-1 (0%)	-1 (0%)
Total		3190	3920	3680 (-6%)	3520 (-10%)	4420	3800 (-14%)	3440 (-22%)
Net Imports		32	30	30 (0%)	32 (7%)	27	28 (4%)	30 (0%)

1.7.3 Would African Americans or the poor be disproportionately affected by this shift?

Background

Given the relatively vague nature of the description of the impacts of pursuing a renewable energy strategy, assessing the distribution of such impacts is more difficult. To the extent that it is possible, this section reviews what effects switching to a renewable energy system is likely to have on African Americans. There are several factors that need to be considered in terms of addressing the effects of the shift to renewable energy on African Americans. These include funding sources, employment, changing energy prices, and health effects.

Key Findings

The effects of a shift to renewable energy will be felt on multiple levels:

- The effects of federal outlays for R&D or subsidies are uncertain.

- Employment effects are likely to be positive overall, though there is no reason to believe that they will disproportionately go to African Americans.

- Economic effects from rising energy prices will be disproportionately felt by African Americans. However;
    - Reduced energy demand may offset the harms.
    - Reduced vulnerability to oil shocks will disproportionately benefit the poor and African Americans.

- Environmental improvements, such as improved air quality, will disproportionately benefit African Americans.

Analysis

Funding Sources
With respect to increased federal subsidies and R&D outlays, the true "cost" of the programs comes in the forms of the taxes or other revenue-raising measures used to pay for the programs. Alternatively, it can be expressed as the opportunity cost of other potential programs (health care, education, etc.) that are under-funded or not funded in order to pay for the investment. However, such outlays can also be paid for through the implementation of a carbon tax. With regards to the benefits of the outlays (funds received, etc.), effects on African Americans are equally nebulous. Given the absence of a concrete funding scenario or a counter-factual, it is difficult to speculate on the impact of these relatively minor funding initiatives on African Americans.

Employment
With respect to employment patterns, generally, a large scale shift to renewables is likely to have positive effects on African American employment in energy overall on a per megawatt production basis, due to the labor intensity of renewable energy discussed in section 1.7.2. This is particularly true given the declining ratio of labor intensity witnessed in the traditional energy sector over the past two decades. Offsetting this gain is the overall reductions in energy use by 2020, as modeled in CEF's "Advanced" scenario. In other words, a switch to renewable energy and energy efficiency would see increased labor intensity in the energy industry but a relatively smaller industry by 2020.

However, the net savings in the economy predicted by the CEF's model would presumably generate economic growth in other sectors, such as service industries in which African Americans are more heavily employed. The effects on employment levels from renewable energy or low-carbon policies, such as a carbon tax, depend in large on how the revenues from such a tax would be spent. Krause et al. (2003) studied potential job losses resulting from a carbon tax with revenue recycling, and concluded that the net effect on employment would be relatively minor or even positive. Even within relatively hard-hit sectors, such as the coal industry, they note that, "Job losses in the coal industry would likely be much lower than the percentage changes in coal consumption for several reasons. First, as discussed in the modeling work by the EIA (1998), a carbon charge would disproportionately affect the Western U.S. coal-producing regions, where coal production is much less labor-intensive than in the East. Second, there is a significant annual turnover of workers in the industry, both on account of retirement and because of workers choosing to seek other employment." Overall, there is no clear definitive indicator of what overall employment effects on African Americans would be given a substantial investment in renewable energy.

Price of Energy
A large-scale shift to renewables has the potential to significantly increase the price of energy, depending how it is structured. Increased research and development in renewable energy and energy efficiency and subsidies or tax incentives for the renewable industry do nothing to increase the price of energy: if anything, they can lower the price. In contrast, carbon taxes and

increased regulatory requirements such as renewable portfolios or carbon trading systems are likely to increase the price of energy, and estimates of those effects vary considerably. Due in large part to the presence of a carbon tax, the CEF study indicates that prices of petroleum, coal, natural gas, and electricity to consumers will all be higher in the Advanced scenario in 2020 than they would be under the Business as Usual scenario. As section 1.1.2 indicated, African Americans currently spend a disproportionately high fraction of their expenditures on direct energy purchases. As such, they would be particularly vulnerable to increases in the price of energy.

While a shift to renewables may increase the price of energy overall, there are at least two factors which may soften or even reverse the negative effects of rising energy prices on African Americans. First, according to the CEF study, expected price increases in all forms of energy are *more than offset* by reduced demand for energy due to increased energy efficiency. If those energy efficiency gains apply equally to all demographic groups over the next two decades, then African Americans would likely benefit from the switch. As section 1.4 discussed, however, efficiency gains are likely to be constrained some by factors such as the age and the inefficiency of the current housing stock, the lower rate of home ownership among African Americans, and the lower access to capital due to lower asset levels.

The second, and perhaps more important, factor that can offset the negative effects of rising energy prices on African Americans is the macroeconomic effect of oil price shocks. As section 1.4.4 discussed, the majority of recent economic downturns in the United States since World War II have been preceded by increases in the price of oil (Brown et al., 2003). The current dependence of the U.S. and American industries on global oil supplies and the volatility of this market can trigger downturns. Such economic downturns are typically felt hardest by the poor and by African Americans. By reducing the current dependence on foreign oil, a transition to renewable energy and energy efficiency would decrease the magnitude of oil price shock effects and thereby cushion African Americans from larger and potentially more devastating swings in the U.S. economic cycle.

Health effects

As section 1.5 detailed, the current dependence on fossil fuels entails significant health risks for Americans, and in particular for African Americans. In contrast, most (but not all) renewable technologies pose relatively lower health risks. Wind power and solar installation, for example, do not have the same effects on air quality that coal-fired plants do. As a consequence, the health benefits from a switch to renewable energy sources and energy efficiency are likely to be reaped disproportionately by African Americans.

2.1 – Impact of Existing Energy Policies on the African-American Community

Overall Findings

- African Americans are disproportionately benefited by LIHEAP and other energy assistance programs.

- Funding for LIHEAP has declined significantly over the past two decades in constant dollar terms.

2.1.1 The usage of LIHEAP by African American communities?

Background

LIHEAP, or the Low Income Home Energy Assistance Program is a Federal program administered by the Department of Health and Human Services' Division of Energy Assistance. The federal government provides block grant funding to state governments and tribes to aid low-income households in need of heating, cooling, and weatherization assistance. These funds are intended to reduce the number of heat- and cold-related deaths, while decreasing the economic burden of fuel prices on the poor. For administrative purposes, the federal government requires the collection of some demographic information with respect to the distribution of LIHEAP funds; however, it does not require reporting by race (Litow, 2004; Wolfe, 2004). As a consequence, most states do not currently collect information on LIHEAP fund recipients by race.

In order to estimate the usage of LIHEAP by African American communities, a simple eligibility model of LIHEAP funding has been developed. State populations by race and income level from census data are combined with state LIHEAP eligibility standards (based as a percentage of income) in order to determine the fraction of households eligible to receive LIHEAP funds by state. The eligibility data is then combined with current LIHEAP block grants by state to estimate the percentage of LIHEAP dollars likely directed toward African Americans. This model assumes that all eligible households have equal access to LIHEAP funds, which may not be the case.

For verification purposes, eleven states collectively receiving over half of total LIHEAP funds (New York, Pennsylvania, Illinois, Michigan, Ohio, California, Massachusetts, Minnesota, New Jersey, Wisconsin, and Connecticut) were directly contacted to find out if they gather racial data for their own purposes. Of those eleven states, five (Pennsylvania, Illinois, Massachusetts, Minnesota, and Wisconsin) collect racial data on the actual distribution of LIHEAP funds. Three of the four states reported that the actual distribution of funds to African Americans was higher than levels suggested by the eligibility model. As an aside, effects of the current distributional system on African Americans are investigated.

Key Findings

- African Americans comprise 12.7% of the overall population. Based on an eligibility model and self-reporting, blacks are estimated to receive an estimated 23-25% of LIHEAP funds.
- In 2003, 23% of the $1.8 billion in LIHEAP appropriations amounted to roughly $400 million in home energy assistance.
- In the few states for which data is available, blacks receive an even greater proportion of LIHEAP funds than suggested by their percentage of eligible recipients.
- Updating the antiquated state block grant allocation formula would increase the percentage of African American households eligible to receive LIHEAP funds.

Analysis

The model presented above provides a defensible estimate of the amount of LIHEAP funds received by heads of households who are black, by state. Based on the distribution of LIHEAP funds to various states and the demographics of eligible populations by state, it is estimated that 23% of LIHEAP funding is received by African Americans. In 2003, 23% of the roughly $1.8 billion in federal LIHEAP appropriations amounted to over $400 million in home energy assistance.

For verification, data is presented from the Pennsylvania, Illinois, Massachusetts, Minnesota, and Wisconsin, the five four states of the major recipients that collect racial data in their LIHEAP distribution programs. In those five states collectively, blacks are estimated to have received $102 million, approximately 25% more than the eligibility guideline model indicates. This disproportionate payment may be due to the higher population of poor African Americans in urban areas, particularly in Illinois.

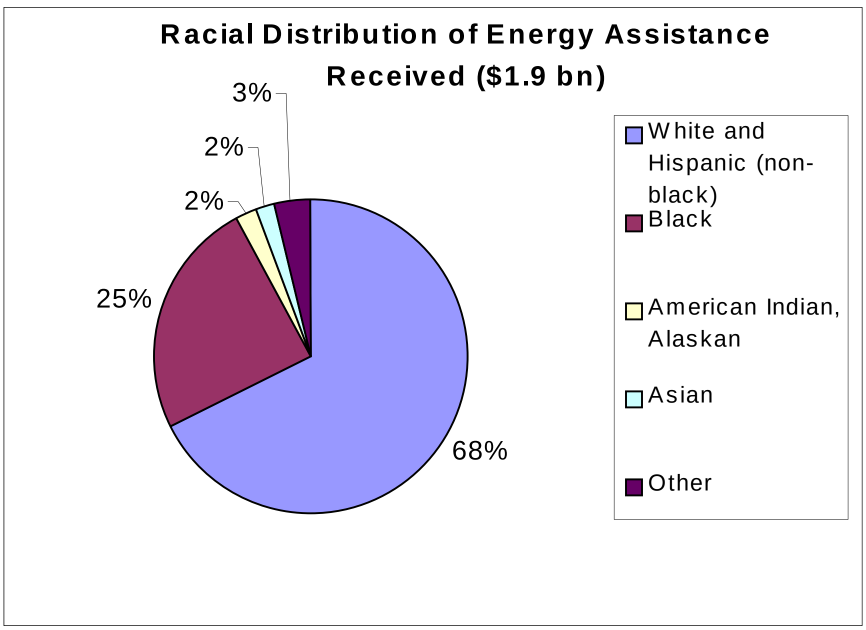
Table 2.1.1 – LIHEAP Funding as Predicted by Eligible Populations, and as Actually Received in 2003

State	Predicted Amount to African Americans	Actual Amount to African Americans
Illinois	$32,681,241	$46,744,000
Massachusetts	$11,322,503	
Minnesota	$8,386,020	$7,815,614
Pennsylvania	$30,533,086	$33,000,000
Wisconsin	$10,320,423	$14,360,000

In addition, data was obtained from the March 2003 Current Population Survey (CPS). Self-reporting in the CPS indicated that roughly 25% of energy assistance funds went to African Americans (Table 2.1.2).

Table 2.1.2 – Energy Assistance Funds by Race in 2002-2003 (Source – CPS, March 2003)

Race	Energy Assistance Funds	Percent of Total
White and Hispanic (non-black)	$1,278,228,846	67.63%
Black	$472,937,947	25.02%
American Indian, Alaskan	$40,613,228	2.15%
Asian	$38,857,196	2.06%
Other	$66,256,336	3.51%
Total	**$1,889,941,420**	**100%**



A related issue is that of the federal LIHEAP allocation formula. The distribution of LIHEAP funds to states is governed by a complex and antiquated system of allotment fractions, which reflected several compromises in the early 1980s. A more up-to-date formula that takes into account cooling as well as heating requirements exists, but is not utilized. Currently, the law stipulates that if LIHEAP funding were to exceed $1.9 billion, the new allotment formula would be applied, resulting in a significant redistribution of funds (Appendix 5). LIHEAP funds, which currently favor Northern and Midwestern states, would be increasingly distributed to Southern and Western states. As a consequence of this shift, the eligibility of African American households would increase slightly from 22.7% to 24.7%. It is estimated here that adding $212 million in additional LIHEAP appropriations would generate a net increase of $93 million in LIHEAP funds to blacks, largely due to the shift in distribution between states.

2.1.2 Has the amount of federal dollars increased or decreased for energy assistance programs?

Background

The amount of federal money directed toward LIHEAP and other energy assistance program such as the Weatherization Assistance Program (WAP) is highly variable. As a consequence, the number of households that can be served by these programs is likely to increase or decrease with available funding.

Key Findings

- In the short term (over the past five years) the amount of federal money directed toward LIHEAP and WAP has increased significantly from a programmatic low of $1.2 billion in 1996 to $2.3 billion in 2003.
- Over the longer term, LIHEAP and WAP funding over the past three fiscal years is 4% less than funding in the first three years of the LIHEAP program, from 1982 to 1984.
- In constant dollar terms (annually adjusted by the CPI), LIHEAP funding has approximately been halved over the past two decades.
- Beginning in the 1990s, there has been regular use of supplemental or emergency contingency funding to make up for shortfalls in annual appropriations.
- Variable funding poses a significant obstacle to improving LIHEAP services.
- FY 2004 funds appropriated for LIHEAP to date sum to $1.79 billion.

Charts and Graphs

Figure 1 – Two Decades of LIHEAP and WAP Funding

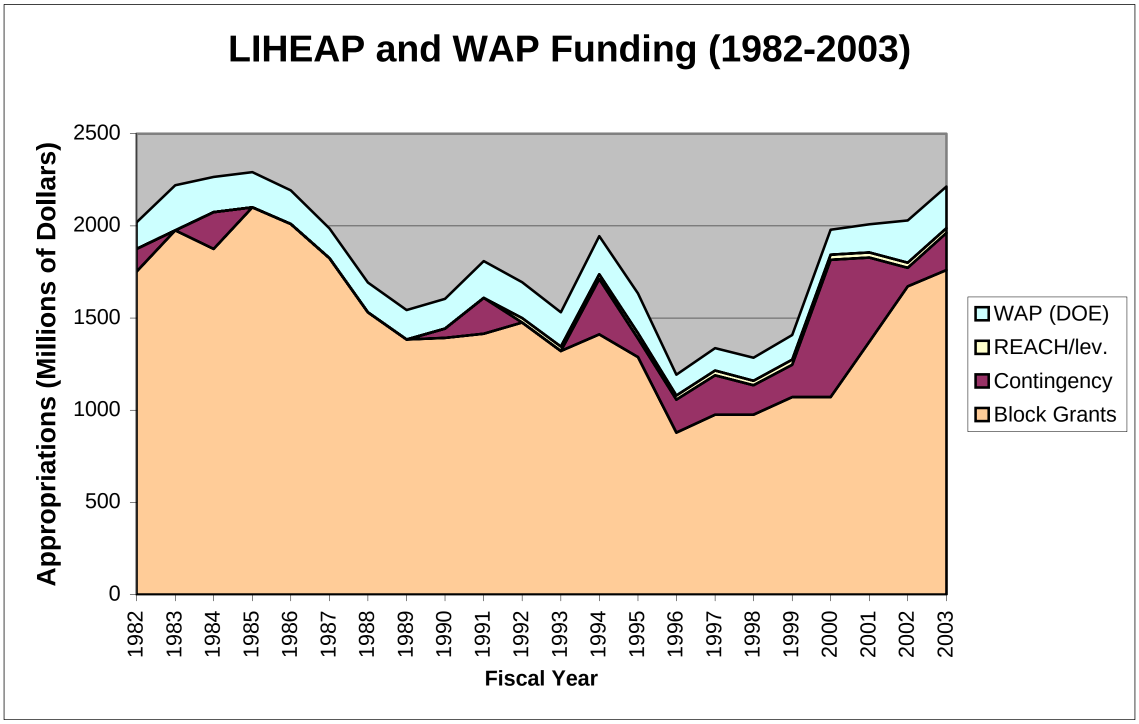
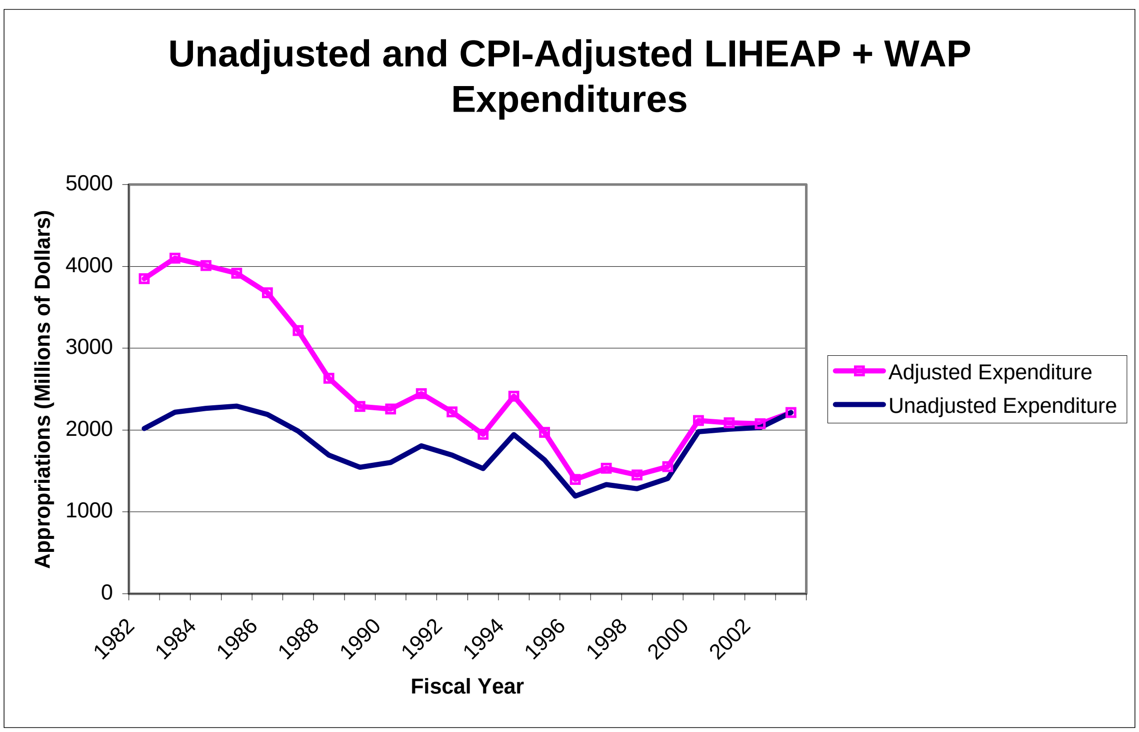


Figure 2 – LIHEAP and WAP Funds in Constant Dollar Terms



2.1.3 Have the numbers of African Americans using existing programs, such as LIHEAP, increased or decreased over the past 5 years?

Background

Determining the number of African Americans who use LIHEAP funds is difficult due to the laxity of federal block grant reporting requirements. Data is not available on federal level to indicate changes in the number of African Americans assisted by LIHEAP over the past half-decade. However, it is possible to estimate changes by applying the LIHEAP race eligibility model developed in section 2.1.1.1 to the variable distribution of regular and emergency LIHEAP funds by state over the past five years. This methods provides an estimate of the amount of LIHEAP funds directed toward African American households. In FY 2000, 3.6 and 5.0 million households in the United States were assisted by the LIHEAP program (Appendix 6). This range is due to the fact that some households received multiple forms of assistance (e.g. heating and weatherization assistance).

Key Findings

- The number of African American households helped in FY 2000 is estimated to be between 830,000 and 1,150,000.

- Between FY 2000 and FY 2004, the number of African American helped does not appear to have changed significantly.

Analysis

In FY 2000, between than 3.6 and 5.0 million households in the United States received funds from the LIHEAP program totaling just short of $2.0 billion. This corresponds to an average payment per service of approximately $400. Given the allocation of funds to different states, the number of African American households helped in FY 2000 is estimated to lie between 830,000 and 1,150,000, receiving a total of $425,000,000. The model assumes that average payments are the same across all eligible households, regardless of race.

Since FY 2000, despite small changes in annual LIHEAP appropriations, the amount of LIHEAP assistance directed toward African Americans does not appear to have changed significantly. The eligibility model indicates that African Americans have remained approximately 23% of eligible recipients over this time period, and that total funds to the African American population have remained between $400 and $450 million, despite a 12% increase in the consumer price index for fuel and utilities between 2000 and 2003.

2.1.4 The impact of blackouts on African American communities.

Background

The August 14, 2003 blackout that affected 50 million Americans highlighted the fact that electricity reliability is a fundamental component of economic growth. Unreliability, expressed as sudden or rolling blackouts, can have significant impacts on communities (Appendix 13). Such effects can be economic such as reduced productivity and employment effects, as well as social (theft, arson, health effects, etc.). With respect to economic effects of blackouts, the burden is born disproportionately by certain industries. While no systematic information exists addressing the economic or social effects of blackouts on communities of different races, it is possible to estimate employment in vulnerable sectors by race and thereby infer whether effects are likely to be disproportionately felt by African Americans.

Key Findings

- No systematic data is available on the impact of blackouts on communities of color.

- Generally, the economic impacts of blackouts are significant. The effects of the August 14, 2003 data may be as high as $6 billion.

- Rudimentary data indicates that on a national level, blacks are slightly less likely to be employed in industries that are highly vulnerable to blackouts.

Analysis

Little work has been done since the early 1990s on quantifying the economic impact of blackouts, despite their sizeable effect on national economic performance. The most recent and notable blackout was the largest in U.S. history: a failure of the transmission system surrounding and within the northern Ohio and eastern Michigan load centers led to the loss of roughly 62 gigawatts of load, mainly in New York, Ontario, and the Midwest (NERC, 2003). This blackout impacted 50 million people, across eight states and two Canadian provinces. Costs from the August 14 power failure are believed to approach $6 billion (Rosenberg, 2003). Similarly, the June 14, 2000 blackouts in California caused tens of millions of dollars of losses in Silicon Valley alone. California may have lost half a percentage point of economic growth due to the 2000 rolling blackouts (NERC, 2003; Forbes, 2001).

In general, while the cost and reliability of electricity supply are critical to business (Crow, 2002), outage costs are difficult to assess because they cannot be observed directly. Rather, such costs include a number of categories such as costs to households in forgone consumer surplus, loss to producers in forgone profit, and loss to utilities through non-random rationing (Beenstock et al., 1997; Grosfeld-Nir and Tischler, 1993). Such costs may be estimated through proxy methods, contingent valuation, or market-based methods. Outage costs can also be indirectly inferred from private investment in backup generating capacity and uninterruptible power supplies. Unfortunately, little work of this nature has been done in the United States.

One of the few systematic studies on the economic effects of blackouts was a private study by AUS Consulting in 2001, that examined the likely economic effects of continued rolling blackouts on California's economy (AUS, 2001). The study estimated that rolling blackouts in California culminating in 20 hours of lost electricity would reduce Gross State Output for California by $21.8 billion, or 1.7 percent. That figure is the sum of direct losses from reduced output ($6.8 billion) and indirect losses from "the fact that each dollar of output by one industry represents the purchase of output (i.e. goods and services) by other industries." The firm concluded that this loss would reduce average household income in California by $104, and cause the loss of 135,755 jobs.

Perhaps more relevant to the question of effects of blackouts on African Americans is the fact that blackouts are likely to have different effects on different sectors of the economy. Several researchers have indicated that certain industries, such as electronics and rubber and plastic production are more significantly affected by electricity outage than other industries such as textiles or mining and quarrying (Grosfeld-Nir and Tischler, 1993). Similarly, the AUS study determined that farmers are among the more vulnerable groups as the irrigation needs of agriculture in dry region's such as California's central valley can lead to crop failures without the requisite energy to pump water.

AUS generated a table of industries, and estimated output and productivity declines, in terms of ouput per week for one hour of outage. The most highly impacted sectors appear to be certain manufacturing industries, such as food products, chemical and petroleum product production, and stone, clay, and glass manufacturing. Agriculture, electronics, and the hotel sector are also significantly affected by the loss of energy.

Using this output loss as an indicator of vulnerability, Appendix 14 combines industrial vulnerability estimates with black employment data obtained from the December 2004 Current Population Survey. The results indicate that nationally, blacks are slightly less likely to be employed in vulnerable industries than non-blacks.

2.2 – Energy Policy and African Americans

Introduction

A variety of proposed energy policy changes are currently being debated in Congress or have recently been enacted. Section 2.1 examines a collection of these broad policies and considers what specific impacts they might have on African Americans. Table 2.2.1 summarizes the findings. More detailed discussions are given below, alphabetically.

Table 2.1 – Summary Table of Policy Pros and Cons

Policy	Benefits	Drawbacks	Issues Specific to African Americans
Appliance Efficiency Standards	• Significant life-cycle consumer savings • National energy savings • Reduced fuel use and associated externalities	• Higher initial appliance costs • Reduced profitability in some sectors	• Higher life-cycle savings for low-income groups • Significant benefits for home-renters • Reduced urban air impacts
Arctic National Wildlife Refuge	• Increased domestic oil supply • Marginally reduced energy prices • Economic benefits for oil and gas sector, and regional benefits (e.g. Alaska)	• Environmental concerns over Arctic wilderness and climate • Only marginal effects on energy prices or price volatility	• Disproportionately small employment benefits
CAFE Standards	• Significant consumer savings over life of vehicles • Reduced national petroleum consumption, and economic susceptibility to oil price shocks	• Possibly higher traffic fatalities • Higher initial vehicle costs • Reduced profitability for vehicle manufacturers • Economic efficiency concerns	• Fewer direct effects due to lower rate of car ownership among African Americans • Disproportionate benefits in terms of improved air quality and reduced economic vulnerability to oil price shocks.
Ethanol Promotion	• Potential improvements in air quality • Reduction in dependence on foreign oil • Stimulates domestic agriculture industry	• High costs of production • Environmental issues associated with higher agricultural production • Opportunity cost of tax dollars spent on promotion, or economic efficiency issues associated with regulatory burden	• Few African American farmers to directly benefit • Potential air quality benefits
Fossil Fuel Tax Incentives	• Reduced energy prices • Increased domestic oil, gas, and coal supplies and reduced reliance on foreign energy. • Economic benefits for domestic energy industries.	• Three billion in lost revenues • Environmental and health externalities associated with fossil fuel. • Reduced competitiveness of renewable sectors	• Higher benefits from reduced energy prices. • Higher costs from fossil fuel externalities.
Hydrogen Promotion	• Environmentally clean fuel	• High economic costs of production • Environmental issues associated with source of hydrogen • Possible safety issues	• Improved air quality disproportionately benefiting African Americans. • Reduced vulnerability to oil price shocks disproportionately benefiting African Americans.
Jeffords	• Reduces four criteria pollutants • Reductions in health impacts from mercury and ozone. • Economically efficient trading program created	• Distributional effects on economy • Continued environmental externalities • Probable increase in price of electricity	• Reduced air pollution disproportionately benefits African Americans, as do efforts to mitigate climate change • Energy price increases negatively affect African Americans

LIHEAP and WAP	• Improved health and reduced financial burden for low income households • Improved energy efficiency	• Opportunity cost of LIHEAP and WAP funds • Subsidizes environmental and health externalities	• Significantly higher use of LIHEAP program than general population
McCain-Lieberman	• Reduces greenhouse gasses in economically efficient manner. • Likely to reduce emissions of other criteria pollutants. • Recycles revenues with adjustment fund	• Distributional effects on economy • Continued environmental externalities • Probable increase in price of electricity	• Health benefits disproportionately go to African Americans • Impacts of higher energy prices likely to be disproportionately felt by African Americans unless adjustment fund dedicated to relieving effects.
New Source Review Modifications	• Reduced costs for existing generating facilities and other point sources • Potential marginal cost savings for consumers	• Significantly higher levels of air pollution	• Unclear effects on jobs or fuel prices. • Notably higher health effects due to air pollution from existing facilities.
Nuclear Promotion	• Carbon-free electricity generation • Marginally reduced fuel imports	• High costs of electricity generation • Opportunity costs of nuclear subsidies • Environmental concerns associated with nuclear waste and proliferation	• Few issues specific to African Americans
Renewable Tax Incentives	• Economic benefits through learning-by-doing • Environmental benefits • Increased labor requirements per unit of energy produced	• Lost governmental revenue	• Health benefits of reduced fossil fuel consumption disproportionately benefit African Americans
Renewable Portfolios	• Reduced carbon dioxide, NOx, and SOx emissions • Reduced vulnerability to global energy prices • Potential consumer savings	• Potential price increases • Regulatory burden	• Disproportionate health benefits from reduced fossil fuel combustion
RTO/ISO	• Increased efficiency • Enhanced reliability	• Difficulties for small utilities • Financial penalties	• Unclear benefits

2.2.1 Appliance Efficiency Standards

Background

Appliance energy efficiency standards are one regulatory tool the government can use to encourage increased energy efficiency and reduced electricity demand. Other tools to encourage energy efficiency include building codes, CAFE standards, research and development, and economic instruments such as energy taxes and subsidies. The U.S currently has appliance and equipment efficiency standards for numerous products such as refrigerators, air conditioners, clothes washers, and electric motors.

Goals

Appliance standards exist to reduce use energy use and improve general efficiency. Standards are intended to address the "efficiency gap"; the tendency of consumers to overemphasize initial appliance costs and future savings with regard to energy efficient appliances.

Benefits

The fundamental benefit of appliance efficiency standards is that they lead to reduced energy use by consumers. As a result, consumers spend less money on electricity purchases and society uses less energy.

Consumer savings

- On a national level, the projected cumulative net savings (taking into consideration the cost of more efficient equipment) are approximately $33 billion from 1990 to 2010. Even if fuel and electricity prices were to decline over the next decade, net savings would still sum to nearly $30 billion (Koomey et al., 1998).
- Researchers at Lawrence Berkeley National Laboratories (LBNL), which has been responsible much of the work on this topic, used Monte Carlo simulations to model life cycle spending based on technology costs and consumer expenditure survey data. They estimated that an additional efficiency improvement of 35% would create savings for four out of five households under the full range of hypothetical scenarios (McMahon and Liu, 2000).

Reduced national energy use

The national energy savings from the current appliance efficiency standards enacted are estimated to be significant. According to LBNL, national energy savings are substantial. Efficiency standards are responsible for a reduction in primary energy use in the United States in 2004 of approximately 0.7 exajoules (roughly 700 trillion Btus), with cumulative savings from 1990 to 2010 of around 10 quadrillion Btus (Koomey et al., 1998).

National economic benefits

Efficiency standards in the residential sector have been a highly cost-effective policy instrument for promoting energy efficiency. According to research at LBNL:

- Every federal dollar spent on implementing appliance standards will contribute $165 of net present-valued savings to the US economy between 1990 and 2010.
- The average benefit/cost ratio for residential appliance efficiency standards is about 3.5 (Koomey et al., 1998).

Environmental benefits

- LBNL has projected that from 2000 to 2010, appliance efficiency standards reduce U.S. carbon emissions by approximately nine million tons per year, the equivalent of 4% of annual emissions in 1990 (Koomey et al., 1998).
- The ACEEE estimates that the most recent appliance efficiency standards finalized in January, 2003 (clothes washers, water heaters, and air conditioners) will reduce the need to build new generating capacity over the next two decades by 170 power plants.
- Reduced electricity generation also decreases the concentration of associated pollutants such as NO_x, ozone, SO_x, and mercury.

Drawbacks

The primary drawback to appliance efficiency standards is that it entails increased up-front appliance costs to consumers, as well as increased manufacturing costs.

- The burden of an additional up-front cost is hardest felt by those with low incomes and seniors.
- According to most reviews, these additional costs are, on average, significantly outweighed by energy savings. The American Council for an Energy-Efficient Economy, for example, notes that in most instances appliance market transformations have had low incremental costs and rapid paybacks (ACEEE, 2003).

Issues Specific to African Americans

- The burden of higher initial costs for appliances can be particularly difficult for low income groups. However, the benefits of reduced electricity use are even greater for low income groups. Researchers at Lawrence Berkeley National Laboratories used Monte Carlo simulations to model life cycle spending based on technology costs and consumer expenditure survey data. They estimated that a 35% improvement in efficiency standards would yield a net savings for 79% of the general population and 81% of low-income families, depending on access to capital (McMahon and Liu, 2000).

- The benefits of mandatory appliance efficiency standards are disproportionately reaped by those who rent homes, as renters pay for electricity use but generally do not purchase large appliances. Given that over fifty percent of African Americans in the United States rent (compared to less than 30% of other Americans), this factor is particularly important for African Americans.

- The health benefits of reduced primary energy use will be disproportionately felt by African Americans (see Section 1.5).

2.2.2 Arctic National Wildlife Refuge Oil Exploration

Background
The Arctic National Wildlife Refuge (ANWR) is comprised of 19 million acres in northeast Alaska. Currently, it is administered by the U.S. Fish and Wildlife Service (FWS), a part of the Department of the Interior (DOI). The fields on this federal land are believed to hold at least two billion barrels of economically recoverable oil and could hold as many as 13 billion barrels of economically recoverable oil, depending on the cost of oil (Corn et al., 2003). ANWR is also home to a variety of flora and fauna and remains one of the largest undeveloped areas in the world.

Current federal law prohibits oil exploration and drilling in ANWR. A variety of current energy legislation measures would allow for oil exploration in part or all of ANWR.

Goals
The goals of opening up ANWR to oil exploration include: reduced dependence on foreign oil, reduced U.S. trade deficits, marginally reducing the price of gasoline to consumers, and stimulating economic growth and job creation, both in Alaska and nationally.

Benefits
Increased domestic supply of fossil fuels

- Opening ANWR could provide a relatively large new source of U.S. oil at a time when many U.S. oil reserves have passed peak production. This domestic supply would help to partially reduce the burgeoning natural resources trade deficit of which petroleum products is by far the largest factor. Proponents argue that increasing the supply could help decrease volatility in the world oil markets.

- Large quantities of natural gas may also be found in ANWR, the extraction of which would increase the domestic gas supply and potentially reduce gas prices. While there is currently no economically viable means to deliver the gas to market, current energy legislation also calls for support for the construction of a natural gas pipeline that could deliver this gas (CRS, 2003). Proposals include a $10 billion loan guarantee for companies that undertake the project, tax credits to guarantee a minimum price for Alaskan natural gas, and accelerated depreciation allowances on natural gas gathering and distribution lines (CRS, 2002)

Economic benefits
Drilling in ANWR would clearly create petroleum extraction and refining jobs, both in Alaska and elsewhere, as well as associated jobs due to the economic multiplier effect. Drilling would also help to protect existing jobs by extending the life of the trans-Alaska oil pipeline.

Drawbacks

Environmental concerns

- Significant opposition exists from many sectors to opening up the relatively pristine Arctic lands to oil exploration.
- Increasing the supply or decreasing the price of oil is likely to exacerbate the environmental externalities embodied in global climate change.

Overstated National Security Benefits

The total amount of economically recoverable oil in ANWR is relatively insignificant compared to global oil production.

- Peak production, which would occur around 2027 if drilling commenced immediately, would most likely produce 750,000 bbl per day, at best, or less than 4% of daily U.S. petroleum consumption (USGS, 2003).
- Average production levels would only account for 1% of U.S. oil consumption.
- Increasing domestic petroleum supply generally would not provide substantial protection against global petroleum price spikes. The price of petroleum is determined in the global petroleum market, and domestic supplies enter that market as a very small percentage increase in total global production. Because production is increased by only a small percentage, the global price is only marginally affected.
- Improved energy efficiency and increased renewable incentives could reduce energy consumption more quickly and without comparable environmental externalities.
- Phasing in CAFE standards of 40mpg by 2012 would save an amount of oil over the next fifty years an estimated fifteen times greater than ANWR is likely to produce (NRDC, 2003).

Issues specific to African Americans

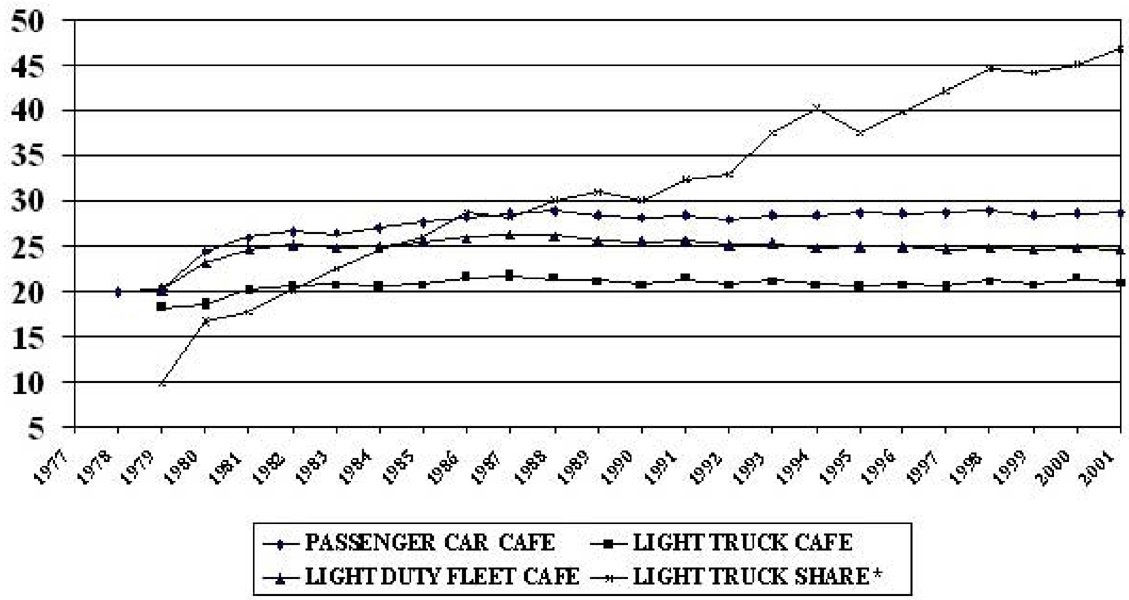
Few issues with drilling in the Arctic are clearly specific to African Americans. While exploration and extraction in ANWR is likely to create a number of jobs, for which estimates vary, most jobs will be located in Alaska where African Americans comprise less than 4% of the population. Jobs are also likely to be concentrated in the oil and gas extraction and petroleum refining industries for which African Americans represent approximately 5% and 10% of the workforce, respectively (and primarily in the South). As such, African Americans are unlikely to garner significant direct employment opportunities from oil exploration above the Arctic Circle. Indirect benefits through general economic growth are likely to be too marginal to speculate on.

With respect to more general health and economic effects, African Americans are likely to disproportionately benefit from any marginal reduction in the price of natural gas and electricity, but benefit less than the average American from reduction in gasoline and motor oil prices. Moreover, to the extent that ANWR can reduce the price of gasoline, increased consumption and pollution emissions will disproportionately impact African-Americans.

2.2.3 Corporate Average Fuel Economy (CAFE) Standards

Background
CAFÉ standards were introduced in the United States in 1975, following Congress' passage of the Energy Policy and Conservation Act of 1975. Following the 1973 oil crisis, this act intended to reduce U.S. dependence on foreign oil. The program requires automobile manufacturers to meet sales-weighted average fuel economy standards for passenger cars and light-duty trucks, or face civil penalties. If a manufacturer does not meet the standard, it is liable for a civil penalty of $5.00 for each 0.1 mpg its fleet falls below the standard, multiplied by the number of vehicles it produces. As of 2002, the standards were 27.5 miles per gallon (mpg) for passenger cars, and 20.7 mpg for light trucks (NRC, 2002). CAFÉ standards have remained essentially unchanged since 1985. During that time, vehicles have become, on average, 20% heavier and 25% faster in terms of 0-60 mph acceleration.

Corporate Average Fuel Economy Standards (NHTSA, 2002)



The bulk of this assessment relies on the 2002 report of the National Research Council's Committee on the Effectiveness and Impact of Corporate Average Fuel Economy (CAFÉ) Standards. The NRC's review represents one of the most comprehensive surveys of CAFÉ standards to date.

Goals
Fuel efficiency standards are intended to reduce overall fuel consumption in order to address two major externalities. First, reduced petroleum consumption lessens the accumulation of carbon dioxide in the atmosphere, thereby mitigating the future effects of global climate change. Second, reduced imports of petroleum will lessen both the downward pressure that oil imports currently place on the strength of the American dollar and the vulnerability of the U.S. economy

to macroeconomic shocks (NRC, 2002). To this end, the CAFÉ program has already increased the average fuel economy of the U.S. light-duty vehicle fleet.

Benefits

CAFÉ standards can result in significant fuel savings to consumers.

- The NRC's average scenario indicates that if cost-efficient standards are set based on the 14-year average life of a vehicle (assuming a 12% discount rate), consumers would save between $700 and $2,500 during that period despite the higher initial cost of the vehicle. These savings are highest for large SUVs and pickups, and more moderate for cars.
- If one requires economy standards to pay for themselves over just a three-year period (undiscounted), cost-efficient standards would still result in the savings of up to $700, depending on the vehicle class.

CAFÉ standards can reduce fuel national consumption.

- A 15% increase in fuel efficiency (mpg) would reduce national consumption of gasoline by 22 billion gallons between 2000 and 2030.
- A 45% increase would correspond to a fuel savings of 55 billion gallons over the same period (NRC, 2002).
- The NRC (2002) estimates the social value of reduced fuel use lies within the range of $0.05 to $0.50 per gallon, with a best guess at $0.26 per gallon. This figure incorporates:
    - Environmental damages from climate change at $0.12 per gallon of gasoline (corresponding to social damages of $50/ton carbon dioxide emitted).
    - Social and economic damages from gasoline dependence at $0.14 per gallon (corresponding to an external marginal cost of oil consumption from security and monopsony of $5.00 per barrel)

CAFÉ standards can reduce other criteria pollutants such as NO_x and volatile organic compounds (VOCs).

- While these pollutants are already controlled by federal- and state-mandated limits on grams per mile, some especially efficient vehicles operate well below established standards.
- The relationship between fuel efficiency and emissions is particularly evident in vehicles in which the control systems have started to fail.

Drawbacks

CAFÉ standards may marginally increase *traffic fatalities:*

- While there was some dissension, the NRC (2002) estimated that the downweighting and downsizing of vehicles partially due to CAFÉ standards "probably resulted in an additional 1,300 to 2,600 traffic fatalities in 1993."

Higher automobile prices:

- CAFÉ standards generally result in high sticker prices. The NRC states that, "The price for higher fuel economy technology is paid when a vehicle is purchased."

Reduced profitability:

- Part of those costs may be borne by the car manufacturers. Reduction in car sales have recently resulted in reduced profits, decreased discretionary spending, job losses though voluntary retirement plans, and delayed launch schedules (NRC, 2002).
- NRC reports that the effects of CAFÉ standards on overall employment will be insignificant.

Economic Efficiency

- Other policies may be able to accomplish the same goals (reduced fuel consumption) at lower costs.
    - CAFÉ standards with trading – The NRC (2002) strongly supports the institution of a trading regime, wherein automobile manufacturers can purchase fuel efficiency offsets from other manufacturers. Such a regime would encourage innovation and reduce overall costs to the manufacturer and consumer.
    - Gasoline taxes – Gasoline taxes would encourage consumers not only to buy more fuel efficient automobiles, but also to drive less. Similarly, they encourage improved vehicle maintenance and the retirement of low fuel economy vehicles.
    - Carbon taxes – Like a gasoline tax, a carbon tax would encourage fuel efficiency on many levels, but would be instituted economy-wide. Both carbon and gasoline taxes would have larger distributional consequences in terms of financial transfers. However, revenues from such taxes can be used to offset regressive effects.

Issues specific to African Americans

Economic Effects

African Americans would be relatively *less* affected by the *direct* economic costs and benefits of enhanced CAFE standards than non-African Americans.

- The consumer expenditure survey indicates that African Americans dedicate a lower fraction of household expenditures to gasoline and motor oil than other groups, due in part to lower levels of car ownership. As a consequence, increased fuel efficiency and reduced vulnerability to oil price shocks are proportionally less important to African Americans than to non-African Americans in America.
- However, African-Americans may be more susceptible to economic downturns resulting from oil price shocks (see Section 1.4). In this way, CAFE standards may be disproportionately beneficial.
- The primary economic cost of CAFE standards to consumers is an increase in the price of new cars. Lower levels of car ownership would reduce the burden of this cost on communities of color in the United States. Moreover, the NRC indicates that reductions in fuel use owing to increased efficiency are likely to more than offset extra purchase costs over the first several years of use.

Health Effects

In contrast to direct economic effects, the health and environmental benefits of CAFÉ standards are likely to be shared disproportionately by African Americans.

- The environmental benefits of reducing the effects of climate change through reduced carbon dioxide emissions are difficult to disaggregate at this time.

- Increased CAFÉ standards will likely be accompanied by marginal reductions in the emissions of other pollutants such as NOx and volatile organic compounds. The resulting improvements in air quality would disproportionately benefit urban, African Americans who are among those most adversely affected by current poor air quality standards. (see Section 1.5)
- To an unknown extent, improvements may be offset by the fact that fuel economy standards may encourage the increased use of diesel engines. While more fuel efficient, diesel engines create emissions that are considerably more toxic than those from unleaded gasoline.

2.2.4 Ethanol Promotion

Background
Ethanol is used as an oxygenate additive in gasoline, reducing air pollution from carbon monoxide and ozone, and increasing octane levels. Ethanol is primarily produced and consumed in the Midwest, where corn, the primary feedstock for ethanol production, is grown. Ethanol production has been stimulated in the past by partial exemption from the motor fuels excise tax, as well as the Clean Air Act Amendments of 1990 which require reduced carbon monoxide and volatile organic compounds emissions through use of oxygenated or reformulated gasoline in non-attainment areas (For further background information, see Yacobucci and Womach, 2003).

HR. 6, the recently passed House energy bill, includes among its provisions a requirement that an increasing percentage of gasoline contain renewable fuels such as ethanol. The bill would require the use of 5.0 billion gallons of renewable fuel (including ethanol) by 2015. S. 14, the Senate version of HR. 6, would require 5.0 billion gallons of renewable fuel by 2012. Most of this requirement would be met with ethanol.

Ethanol use is also encouraged in current legislation through renewal of existing tax incentives for ethanol, and the banning of MBTE, which has also been used as a fuel oxygenate, along with renewed requirements for oxygenates to be added to motor fuels.

Goals
The ostensible goals of mandatory or subsidized ethanol requirements are improving air quality and reducing reliance on fossil fuels.

Benefits
Proponents of the tax incentive argue that gasoline additives such as ethanol lead to improvements in air quality.

- The EPA estimates that reformulated gasoline (RFG) reduces volatile organic compounds (VOCs) emissions from vehicles by 17%, and has decreased toxic emissions by one-third.
- Detection of benzene has also declined since the advent of RFG.
- RFGs reduce carbon monoxide emissions.
- Oxygenates in fuels displace other, more dangerous compounds such as benzene.
- According to a study by the Argonne National Laboratory, vehicle fuels containing 10% ethanol reduce greenhouse gas emissions by 1%. With improvements in production processes, by 2010 the reduction in greenhouse gas emissions from gasoline containing 10% ethanol could be as high as 8-10% (Wang, 1999).

The use of ethanol as a motor fuel may minimally reduce U.S. reliance on oil imports therefore reducing susceptibility to price shocks and oil shortages.

- Petroleum dependence could be diminished through the use of ethanol. While the energy requirements associated with the production of ethanol are problematic, most of the energy used to produce the liqued comes from natural gas or electricity (i.e. coal, nuclear, and natural gas).

Ethanol promotion benefits the agriculture sector due to the increased demand for corn (Olsen, 1997)

Drawbacks

Economic costs

- Ethanol is expensive. The price is roughly twice that of gasoline. While there are currently a variety of federal and state incentives that artificially reduce the effective price of ethanol, without these incentives, little or no ethanol would be used in the transportation sector (Yacobucci and Womach, 2003).
- The tax exemption for ethanol is a corporate subsidy that may encourage the inefficient use of agricultural and other resources. It may also increase the cost of corn (Yacobucci and Womach, 2003).
- Ethanol tax incentives deprive the Highway Trust Fund of needed revenues. In 1997, the General Accounting Office estimated that the tax exemption lead to approximately $7.5 to $11 billion in foregone Highway Trust Fund revenue over the 22 years from 1979 to 2000 (Wells, 2000).

Environmental Issues

- RFGs have been associated with increased emissions of nitrogen oxides (NO_X) (EPA, 1999).
- As of the mid-1990s, the amount of energy required to produce ethanol was approximately equal to the amount of energy obtained from its combustion. As a consequence, ethanol use may not lead to decreased dependence on fossil fuels (Shapouri, 1995).
- Increased agricultural output is associated with numerous environmental externalities including soil erosion, nitrate pollution, and eutrophication particularly in the Gulf of Mexico.

Issues Specific to African-Americans

Economic Effects

- Since most economic benefits from ethanol promotion go to areas with few African-Americans, there is little direct economic benefit from ethanol subsidies or requirements.
- While ethanol requirements could increase gasoline prices moderately, African Americans tend to spend a smaller portion of expenditures on gasoline.
- Ethanol requirements could moderately reduce the effects of price shocks.

Health Effects

- Ethanol use reduces some forms of air pollution and could lead to improved air quality in urban areas where are African Americans are disproportionately affected.
- Similarly, ethanol use could reduce greenhouse gas emissions, which may have disproportionate impacts on African-Americans.

2.2.5 Fossil Fuel Industry Tax Incentives

Background

A variety of federal tax breaks exist for the various fossil fuel production industries, which reduce the amount of revenue collected by the federal government. The Congressional Budget Act of 1974 (Public Law 93-344) requires the government to list such "tax expenditures" and projections of future expenditures in the budget. For the fiscal year 2003, the tax expenditures listed for energy production (excluding alcohol fuel credits and conservation subsidies) were:

FY 2003 Federal Tax Expenditures on Energy (OMB, 2004)

Category	Expenditure ($ Millions)
Expensing of exploration and development costs	210
Excess of percentage over cost depletion, fuels	640
Alternative fuel production cost	1,280
Exception from passive loss limitation for working interests in oil and gas properties	20
Capital gains treatment of royalties on coal	100
Exclusion of interest on energy facility bonds	90
Enhanced oil recovery credit	400
New technology credit	280
Total	3,020

In FY 2003, federal tax expenditures on energy summed to over three billion dollars.

Goals

There are several goals for tax expenditures on fossil fuels depending on the specific category. In general, the goal is to increase the economic viability of domestic energy industries while providing affordable and reliable energy supplies to consumers.

Benefits

Taken as a whole the primary benefits of tax incentives for the fossil fuel industry are economic. Fundamentally, these incentives serve to reduce the overall production costs, and therefore sales costs, of energy supplies such as electricity, home heating fuels, and gasoline. In addition, reduced energy prices can help to decrease the price of other goods purchased by consumers (e.g. food, appliances, etc.) that use energy in the production and distribution processes. Additional benefits include job creation or preservation in various energy industries, increased investment by energy corporations, and general economic stimulation.

Drawbacks

There are two main categories of drawbacks with regard to fossil fuel tax incentives. The first category consists of the distortionary economic effects associated with subsidizing the energy industry relative to other industries, and the lost federal revenue. The second category consists of the externalities associated with increased energy use.

Economic Effects

- By creating tax incentives for the energy industry, the federal government deprives itself of approximately $3 billion in annual revenues. The opportunity cost is reflected in other potential uses of the revenue (e.g. health care, tax incentives for other industries, etc.).
- Tax incentives also create an “unequal playing field” between fossil fuel industries and other industries in general and competing industries in particular (e.g. energy efficiency and weatherization sectors, renewable fuels, etc.).

Externalities

As discussed in Section 1.5, fossil fuel use includes a number of environmental and health externalities. The list of externalities associated with the fossil fuel energy system includes global climate change through the release of carbon and other gasses, acid rain, reduced agricultural productivity, infrastructure damage, increased atmospheric deposition of nitrogen, mercury pollution, and various health effects (respiratory illnesses, asthma, etc.). The list of such externalities and there effects are too long to be addressed in this section. For a full review of the climate effects of fossil fuel use, see the IPCC report on global climate change (2001). Health effects are well summarized on EPA and other governmental health related web-sites.

Issues Specific to African Americans

African Americans are both disproportionately benefited and harmed by fossil fuel tax incentives. With respect to benefits, the primary benefit received by African Americans is a marginal reduction in the price of energy, in particular home heating fuels and energy embedded in purchased products. As African Americans spend a considerably higher percentage of expenditures on fuel purchases, a reduction in the price of fuel disproportionately benefits the African American community. Similarly, the African American community is more vulnerable to recessions caused by global energy price shocks. The exact mechanism by which energy price increases cause economic downturns is controversial. Candidates include reducing consumer demand as a result of having fewer dollars to spend on non-fuel goods, changes in the terms of trade that harm America because we are a net fuel importer, reduced production efficiency caused by running machinery and processes designed for low energy prices at higher energy prices, and increased uncertainty about prices and costs (Balke, Brown & Yücel, 1999; Brown, 2000; Hamilton, 2000; IMF, 2000).

It is well known that the Black population is disproportionately vulnerable to economic downturns. In particular, during downturns the unemployment rate of African Americans increases by a larger percentage than the unemployment rate of non-African Americans, and incomes follow a similar pattern (Bradbury 2000a, Bradbury 2000b; Eaton and Kisor, 1996).

As a consequence, fossil fuel production incentive policies that tend to stabilize energy prices or reduce energy consumption as a share of all consumption therefore provide protection against economic downturns, a protection that disproportionately benefits Black populations. This includes supply side policies, but also policies that improve energy efficiency, such as CAFE standards for automobiles, and policies that increase the price of fuels but return the revenue in a progressive manner, such as European-style environmental tax reform with revenues from energy taxes used to cut labor taxes. In general, the supply-side policies are likely to be less effective at reducing the effects of price shocks on African Americans, as such shocks are determined by the general dependence on fuels, and global fuel prices (which tend to be positively correlated).

With regard to health impacts, Section 1.5 indicates that the health effects of energy use are disproportionately felt by African Americans. Similarly, there are reasons to believe that climate effects will also affect African Americans more than the average American.

2.2.6 Hydrogen Promotion

Background

Hydrogen is the most common element on the planet, although it appears in pure form in small quantities. The largest repository of hydrogen is water. Other sources are fossil fuels and other hydrocarbons. In an energy context, hydrogen has recently garnered significant attention as a secondary fuel source; a means to store and transport energy derived from other sources (e.g. solar energy or fossil fuels). The benefit of using hydrogen as an intermediary is that it is a zero-emissions fuel; the byproduct of combustion is only water.

Physically, hydrogen can be generated from water or stripped from hydrocarbons. Currently, natural gas is the main source for hydrogen fuel. Because fuel can be continuously supplied, fuel cell-powered electric vehicles do not face some of the range and fueling limitations as battery-powered electric vehicles. Currently, no production vehicles are powered by pure hydrogen.

Hydrogen use as a fuel has received government support since the early 1990s. In recent energy legislation and proposed legislation, hydrogen has been promoted in a number of ways (Bamberger, 2003; Sissine, 2003).

- In January 2003, President Bush announced a new $720 million research and development program for hydrogen as a transportation fuel. The Hydrogen Fuel Initiative, as it is termed, works together with the FreedomCAR initiative, with a goal of producing hydrogen-fueled engine systems that achieve much higher efficiency than today's conventional engines at a comparable cost by 2010.
- The Administration's 2004 budget request would increase overall funding for research into hydrogen fuel, fuel cells, and vehicle technologies by roughly 30%, or an additional $720 million over five years. The House Appropriations Committee elected to increase hydrogen funding by $700 million. The Senate Appropriations Committee agreed to fully fund the President's hydrogen budget request. The Senate energy legislation, however, does not authorize increased funding for hydrogen.
- The Senate version of HR. 6 would require the production of 100,000 hydrogen-fueled cars by 2010 and 2.5 million vehicles by 2020 and annually thereafter.
- The Administration is also seeking $4 million for the Nuclear Hydrogen Initiative, a new DOE program in which nuclear reactors would produce hydrogen to fuel motor vehicles. The Senate approved legislation that included a $500 million authorization to construct a demonstration reactor in Idaho to produce hydrogen.

Goals

The fundamental goal of hydrogen research is to develop a clean and cost effective fuel.

Benefits

Environmental Benefits

Hydrogen use as a fuel is inherently very clean, producing only water as an end product. As a consequence, hydrogen powered vehicles could greatly improve air quality; particularly urban air quality where vehicle emissions represent a large portion of total emissions.

If hydrogen is produced from non-fossil fuel sources, or paired with effective, long-term carbon sequestration, it can mitigate the effects of global climate change.

Drawbacks

Economic Issues

Producing hydrogen is currently very expensive, relative to producing other fuels. As fossil fuels are currently and likely to remain the main source of hydrogen production, increased prices for gas, oil, or coal would also increases the price of hydrogen.

Hydrogen production, depending on how this occurs, can have significant *environmental impacts* (Morgan, 1995):

- The fundamental issue with hydrogen is how it is produced. Hydrogen could ultimately be produced using solar or other renewable sources of energy. However, in the near- and mid-term it is more likely to be produced from fossil fuels and nuclear-generated electricity. Unless fossil fuels are paired with sequestration efforts (another DOE research area) the carbon benefits of hydrogen are essentially zero, or even negative.
- Production from fossil fuel leads to higher carbon dioxide emissions for amount of embodied energy produced than the emissions from using the fossil fuel itself as a fuel.
- Production of hydrogen from renewable sources might considerably reduce production emissions, but these techniques are not, as of yet, adequately developed.
- In the future, hydrogen could be generated from water using solar energy, making an emission free fuel cycle.
- In the near-term, the most likely source for hydrogen is natural gas. Although not emission-free, the use of natural gas as a feedstock for hydrogen would still lead to much lower overall emissions compared to petroleum.

Hydrogen development may reduce funding and *political* will-power critical to other programs (CRS, 2002).

- Critics of the hydrogen program suggest that it is intended to undermine attempts to significantly improve vehicle CAFE standards, and that it reduces the automotive industry's responsibility in developing technological innovations.
- Funding for hydrogen development has reduced funding for other programs that could have a greater positive impact on the environment in the short run.

Safety Issues

Hydrogen is highly flammable. As a consequence, the transport, storage and distribution of hydrogen must be arranged carefully. Currently, there is little infrastructure to support a move towards using hydrogen as a common fuel (CRS, 2002).

Issues specific to African Americans

Economic Effects

- In the near-future, any hydrogen fuel system is likely to be more expensive than the fuels that it is replacing, particularly automobile fuels. Currently African Americans spend a smaller fraction of expenditures on gasoline and motor oils, and as such are less likely to be affected.
- A large-scale transition to hydrogen will reduce U.S. dependence on the global oil market. African Americans are more vulnerable to economic downturns associate with price spikes in this market, and as such will be disproportionately benefited.

Health Effects

- Hydrogen has the potential to improve urban air quality significantly, which would disproportionately benefit African Americans. (see Section 1.5)

2.2.7 Multi-pollutant Power Plant legislation (the Jeffords/Lieberman/Collins Clean Power Act S. 366)

Background

Multi-pollutant power plant legislation sets regulations for the four main pollutants emitted by power plants: nitrogen oxides (NO_x), sulfur dioxide (SO_2), mercury (Hg) and carbon dioxide (CO_2). There are three main versions of the bill discussed in congress: the Clean Power Act (S. 366), the Clean Air Planning Act (S. 844), and the Bush administration's Clear Skies Act (S. 485) (which does NOT include CO_2). The Bush administration has implemented several pieces of the Clear Skies Act through the executive branch, and the Clean Air Planning Act has received little attention of late. Therefore, we will focus on the Clean Power Act.

Goals

To reduce the four most harmful pollutants from power plants in a comprehensive piece of legislation (see section 1.5 on health and well-being for impacts of these pollutants). The Clean Power Act sets the following emission limits by 2009: for NO_x, a 1.51 million ton cap; for SO_2, a 2.255 million ton cap; for Hg, a five ton cap. For CO_2, the bill sets a 2.05 billion ton cap by 2009. The bill allows trading of all pollutants except for mercury.

Benefits

Economic Efficiency

- Establishes a comprehensive mechanism for addressing pollution from power plants. By addressing all of the pollutants at once, power companies achieve certainty over how their business will be regulated; all modifications to plants may be done at once.
- Establishes a system-wide economically efficient market for the trading of pollution permits.
- Establishes transition assistance for individuals and communities by allocating a percentage of revenue generated from emissions allowances, and a certain percentage is determined for each year starting at 6 percent in 2008, and then reduced by 0.5 points each year thereafter until 2017.
- By using a multi-pollutant approach, the Clean Power Act has the potential to address toxic hotspots in an economically efficient manner.
- The Clean Power Act prohibits the trading of mercury, which is a particularly harmful toxic for neighboring communities (see section 1.5).

Health and Environmental Benefits

- Reduction in the environmental and health externalities associated with criteria pollutants.
- Reductions in total greenhouse gas emissions.

Drawbacks

Continued Externalities

- Critics have argued that the cap placed on CO_2 emissions is not sufficiently low to halt global climate change (see Climate Stewardship Act below for more information).
- Though the legislation prohibits trading of mercury, it does allow inter-pollutant trading of SO_2, NO_x, and CO_2, which have different levels of toxicity and impacts. This inter-pollutant trading could lead to the creation of toxic hotspots. Proponents, however, argue that the levels of reductions are tight enough to eliminate this problem.
- Permits created for trading in this legislation are given away, rather than auctioned, creating windfall gains for existing polluters. As a consequence, there is no double dividend for the fiscal policy (see Climate Stewardship Act below for more information).

Economic Costs

- Increased pollution control is likely to entail economic costs, particularly for the power generating industry. There will be some distortionary economic effects from permits, as well as transaction costs and enforcement limitations.

Issues Specific to African Americans

- Pollution from power plants disproportionately impact African American communities (see section 1.5). As such, reducing air pollution in an efficient and comprehensive manner would disproportionately benefit Black communities.
- Since hotspots are disproportionately located in African American communities, ensuring that these hotspots do not occur would also disproportionately benefit the same communities.

2.2.8 LIHEAP and WAP

Background
LIHEAP, or the Low Income Home Energy Assistance Program, is a Federal program administered by the Department of Health and Human Services' Division of Energy Assistance. WAP is the Department of Energy's Weatherization Assistance Program. These federal programs provide block grant funding to state governments and tribes to aid low-income households in need of heating, cooling, and weatherization assistance. These funds are intended to reduce the number of heat- and cold-related deaths, while decreasing the economic burden of fuel prices on the poor.

Benefits
Improved health for low-income households:
- LIHEAP provides heating and cooling assistance to more than 5 million low-income households.
- The program is associated with a reduction in heat- and cold-related deaths; in particular, LIHEAP and WAP reduce the risks of hypothermia.
- LIHEAP particularly focuses on households with the elderly, disabled individuals or children under the age of six. These groups are particularly at risk for life threatening illnesses or death due to extreme temperatures.
- LIHEAP also leads to a reduction in the use of unsafe methods to keep homes warm, such as fireplaces, stoves, improperly vented portable heaters, barbecue grills, or overloading electrical circuits. These methods are not only fire hazards, but also create the risk of carbon monoxide poisoning.

Improved *energy efficiency* through weatherization programs:
- The Weatherization Assistance Program is estimated to return $1.30 in energy-related benefits for every $1 invested.
- WAP provides energy efficiency services to more than 70,000 homes every year, reducing average annual energy costs by $224 per household.

Reduced economic burden on low-income households.
- LIHEAP reduces the necessity of choosing between heating and cooling and paying rent or purchasing food, medicine or other vital necessities.
- Low-income households typically spend 14% of their total annual income on energy, compared with 3.5% for other households. Rising energy prices can increase this burden to 20% or more.
- Both LIHEAP and WAP are successful at leverage other funds. For example, for every dollar invested by DOE in WAP, the program leverages $3.39 in other federal, state, utility and private resources.

Environmental benefits
- Weatherization assistance can reduce the need for electricity generation, thereby improving local air quality and mitigating adverse health effects, particularly asthma.
- Improved energy efficiency can also reduce the quantity of greenhouse gases emitted to the atmosphere.

Drawbacks

The fundamental argument against subsidy programs such as LIHEAP and WAP is that the funds used in these programs could be more efficiently employed elsewhere. For example, other potential uses of such funds are:

- Reduced federal income taxes, particularly for low-income brackets
- Increased spending on education or healthcare
- Increased spending on renewable energy sources

In addition, LIHEAP can have *unintended negative environmental effects*

- Unlike weatherization assistance, heating and cooling assistance can subsidize increases in total energy consumption. The increased generation, particularly during peak summer demand, can add to atmospheric pollution.
- No information is available on the relative effects of LIHEAP and WAP in terms of increasing or decreasing total energy use.

Issues Specific to African Americans

Most states do not currently collect information on LIHEAP fund recipients by race. RP's analysis (see section 2.1) indicates that African American households are almost twice as likely to be eligible for LIHEAP assistance as non-African American households. Moreover, in the few states in which data is actually available, the amount of LIHEAP funding directed toward African Americans exceeds the level predicted by a simple eligibility model. However, LIHEAP and WAP funding on a constant dollar basis has declined substantially over the past two decades despite the fact that According to the Department of Health and Human Services, over the last two decades the number of LIHEAP eligible households rose 50 percent.

- In 2003, 23% of the $1.8 billion in LIHEAP appropriations amounted to roughly $400 million in home energy assistance.

- African Americans receive a disproportionately large share of LIHEAP funds.
    - African Americans comprise 12.7% of the overall population. Based on an eligibility model, African Americans are estimated to receive an estimated 23% of LIHEAP funds.
    - In states in which data was available, African Americans received a significantly greater share of funds than suggested by the eligibility model.
    - Updating the antiquated state block grant allocation formula would increase the percentage of African American households eligible to receive LIHEAP funds.

- The significant decline in LIHEAP and WAP funds on a CPI-adjusted basis over the past two decades has disproportionately impacted Black community's ability to pay for heating and weatherization.

2.2.9 The Climate Stewardship Act (McCain-Lieberman)

Background
The Climate Stewardship Act, proposed by Senators McCain and Lieberman, is an example of a system-wide greenhouse gas reduction program. The legislation establishes a cap-and trade program for all six of the Kyoto Protocol greenhouse gases, administered by the United States Environmental Protection Agency (EPA). Greenhouse gas emitters (covered entities) are required to submit a tradeable allowance to the EPA for every metric ton of CO_2 equivalent they emit each year. The permits will have serial numbers that are retired after use, but they do not have to be used in the year that they were issued.

Goals
To begin to slow global warming by using the market to reduce greenhouse gas emissions to 5,896 million metric tons of CO_2 equivalent from 2010-2015, and 5,123 million tons in 2016 and after (roughly 1990 levels). Additionally, the legislation is intended to create a just transition fund for workers and consumers.

Benefits
Addresses Environmental Externalities

- Current environmental externalities associates with carbon dioxide emissions are likely to be significant. The IPCC reports that the range of estimates for damages from a ton of carbon lie anywhere from a few dollars to over two hundred dollars.
- The McCain Lieberman bill sets the groundwork for significant climate policy in the U.S. to begin to address these costs.
- By taking an economy-wide approach it avoids piecemeal policy solutions that are likely to be less economically efficient and administratively cumbersome.
- Similarly, economic efficiency is encouraged by establishing a permit auction mechanism to generate revenue.
- Uses revenue from auctions to establish a just transition fund for workers that would be displaced from the policy and for consumers that would face increased energy costs.
- Reduced carbon is likely to be associated with reductions in other pollutants and concomitant health benefits.

Drawbacks
Economic Costs

- Several studies have indicated that the total economic costs of addressing climate change in the United States are likely to be small, or even negative, given the presence of revenue recycling. However, strong measures are likely to have distributional effects within the larger economic umbrella. Specific energy intensive industries, such as coal-fired electric utilities, are unlikely to be as economically viable in the future relative to other facilities such as gas-fired or wind-powered plants.

Continued Environmental Externalities

- The cap currently contemplated by the Climate Change Stewardship Act is less ambitious than the Kyoto Protocol and even the second phase leaves the United States on course for drastic climate change. The caps in the act are less stringent than the Kyoto protocol standard of 7% below 1990 emissions. Scientific consensus indicates that emissions will ultimately need to reach levels of no more than 50% of 1990 emissions at most, and even this will likely only mitigate climate change, not avoid it entirely.

- Only a fraction of the permits are auctioned, the rest are assigned freely to polluters. Windfall gains, as such, are not as economically efficient as recycling revenues from permit auctions. The impact on energy prices will ultimately be the same, and the returned revenue is crucial in offsetting the impacts of energy prices increases, costs associated with global warming, and investing in clean energy and energy-efficiency research and development.
- A good carbon permit trading program would ensure that emissions trading does not lead to the creation of toxic hotspots. Greenhouse gases are not toxics, and therefore do not in and of themselves create disproportionate amounts of pollution in vulnerable communities. However, the processes that create greenhouse gases (the burning of fossil fuel) usually generate other toxic pollutants. Though it is possible to address this issue, the McCain-Lieberman version of the bill does not at this point in time.
- The Climate Stewardship Act allows companies to offset their emissions through the purchase of credits from carbon sequestration (sinks) projects and from international trading. The long-term effectiveness of sequestration projects remains subject to considerable uncertainty which can undermine the physical and economic effectiveness of the emission limits.

Issues Specific to African Americans

- Since global warming is expected to disproportionately impact African Americans (as described in section 1.5 on health and well-being), a policy that aims to meaningfully reduce global warming is important.
- Also as described in section 1.5 on health and well-being, toxic hotspots are disproportionately found in African American neighborhoods.
- Since African Americans are disproportionately impacted by global warming, the just transition fund mentioned above could be expanded to address the costs associated with global warming as well as the policy itself. This would be particularly helpful to households that lack the resources to adapt to climate changes.

2.2.10 New Source Review Modifications

Background
New Source Review provisions in the Clean Air Act require that certain classes of facilities need to install updated pollution control equipment when making modifications of upgrades that will significantly increase their air emissions. Approximately 20 thousand facilities fall under the provisions of NSR. Types of facilities include power plants, incinerators, iron and steel foundries, oil refineries, chemical plants paper mills, cement plants, and some manufacturing facilities.

NSR requirements before EPA suggested modifications are an efficient and effective regulatory tool because of the remedial actions EPA can seek the court to impose on affected utilities. EPA can ask the court to require a facility that violates NSR to install the most recent BACT. Existing control devices can reduce emissions of SOx and NOx by approximately 70-90%, depending on the specific case (Parker, 2000).

EPA rule changes for NSR are threefold:

- Allowing facilities to make their emission baseline, against which predicted new emissions will be compared, to be their two highest polluting ears of the past ten years. Current law requires the baseline to be based on emission from the last two year.
- Facilities would be exempt from installing new pollution control when making modification to a piece of equipment, if the existing pollution control equipment was considered adequate as much as 15 years ago. This has been called the "clean unit exemption".
- The EPA's "plantwide applicability limit"(PAL would allow facilities to trade emission increases with emission reductions made in the past within the same plant. (NRDC, 2002; McCarthy, 2002)

NSR changes have been successfully challenged in court based on the negative impact these changes will have on air quality and human health.

Goals
Decreased regulatory burden on polluting facilities.

Benefits
Economic Benefits

- Reducing NSR requirements would likely save existing generating facilities and other large polluters significant money through reduced investments and litigation requirements. Some of these savings could potentially be translated into cost savings for consumers.

Drawbacks
The changes in NSR will increase air pollution and negatively impact public health.

- According to the EPA, the change in baseline rules could reduce the facilities subject to NSR by 50%, thus increasing overall air emissions (EPA, 2002).
- The "clean units" exemption and PAL requirements will also allow for increased air emissions (NRDC, 2002).

- Deregulation may further encourage the trend of extending the life of existing coal-fired capacity, as a cost-effective alternative to constructing new capacity. With this trend, NSR is an even more important tool for mitigating the environmental effects of existing plant modifications with its BACT requirements (Parker, 2000).

Issues specific to African Americans

Economic Effects

- The jobs impact is likely to be small due to the underrepresenation of African Americans in the energy sector. Moreover, job saving resulting from plants not needed to adhere to stronger NSR may be similar to jobs created in the pollution control industry if NSR is left intact.
- Changes in price of energy and other goods are unknown, though likely minimal.

Health Effects

Like other regulatory or structural changes that increase air emissions, these changes in NSR will disproportionately affect African-Americans (see Section 1.5).

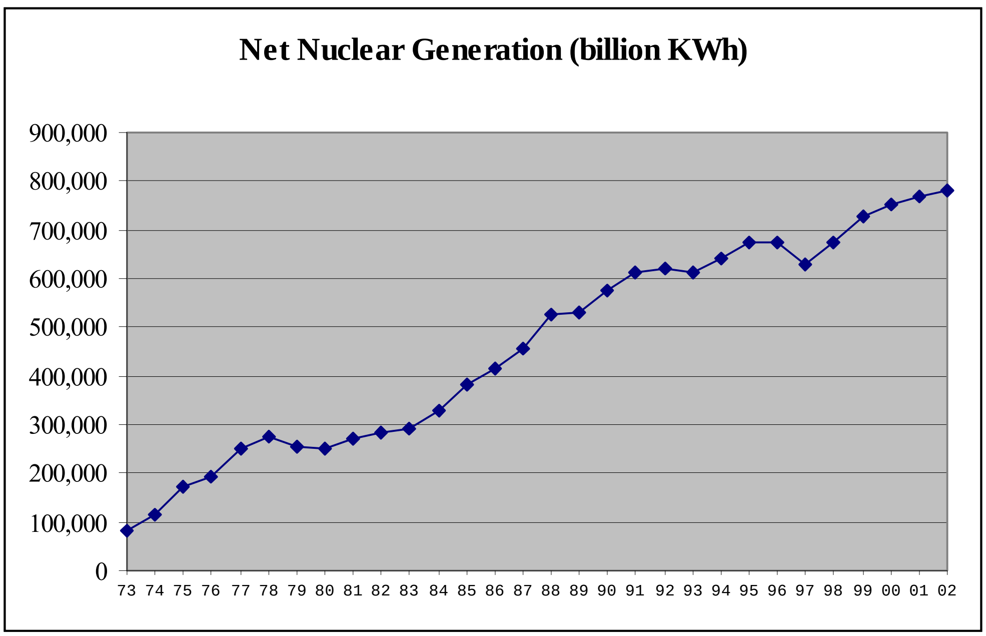
- These changes in NSR will detrimentally affect air quality in the vicinity of polluting facilities. African-Americans may be disproportionately adversely affected.
- Changes in NSR will also detrimentally effect air quality and acid rain production in more distant areas. Acid rain has numerous associated health impacts including deteriorization of public water quality due to increased metals leaching.
- Reducing NSR requirements will increase the emission of greenhouse gases, increasing the human effect on climate change. Climate change may disproportionately effect African-Americans.
- These changes will increase mercury in the environment, which may disproportionately affect African-Americans.

2.2.11 Nuclear Promotion

Background

Recent legislation and proposed legislation provides assistance to the nuclear industry through government bonds, tax incentives, and government backed insurance.

The United States began using nuclear power to produce electricity in 1957 (EIA, 2004b). As of May 2002, there were 104 commercial nuclear generating units licensed to operate in the United States. Net generating capacity has increased fairly steadily since 1957 with a short decline in 1997. According to the EIA January 2004 Monthly Energy Review a total of 780,064,087 MWh of electricity was generated in 2002, or approximately 20% of total electrical generation. Net generation can increase in the future through rerating existing facilities to produce more energy and through the construction of additional nuclear generating facilities. Net generation decreases when existing facilities are not operating at full capacity or when plants are taken off-line.



Source: EIA, http://www.eia.doe.gov/cneaf/nuclear/page/nuc_reactors/reactsum.html 2/10/04

Goals

The goal of government promotion of nuclear power is to produce clean, reliable energy at low cost. An additional goal is the diversification of the electricity generation portfolio.

Benefits

Nuclear energy generation entails less air emissions of criteria pollutant and toxins than fossil fuel plants. While the construction of nuclear power plants does entail significant release of greenhouse gases due to the amount of concrete used, the production of energy itself is cleaner than fossil fuels.

- For every 1000MW capacity nuclear power plant operating at 90% capacity, approximately 1,275,000 metric tons carbon equivalent is displaced given the current energy mix in power generation (50% coal, 2.3% petroleum and 18% natural gas) (Hagen, 2001; EIA, 2003).
- Similarly, the existence of nuclear electricity generation significantly reduces potential levels of SO_2, NO_x and mercury emissions.
- Given the predicted increase in power consumption over the next 20 years, if nuclear power generation does not also increase, greenhouse gas emissions will grow unless expanding energy needs can be met with non-emitting renewable energy sources and efficiency improvements.

Nuclear power plants can run at a higher capacity than many other types of generating facilities and are able to provide consistent power generation.

Drawbacks
While the full cost of nuclear generation is difficult to estimate, by most accounts nuclear power is expensive.

- Capital costs are higher than with other generating facilities, comprising about 80% of total generating costs. Estimates of the cost of nuclear power generation depend heavily on economic assumptions such as the discount rate.
- The future costs of plant decommissioning are not well known and could also change the calculation of the cost of nuclear energy generation. The discount rate selected would influence this as well.
- The cost of fuel disposal is another addition to the total cost of generation.
- All aspects of nuclear power generation, from research to construction, have received government subsidies over the past half-century. These subsides could be included in the full cost accounting of nuclear power.

Nuclear power is *potentially dangerous*

- There have been a few, small radioactive releases in the United States, with minimal damage to human health and well-being. However, there is the potential, however small, of a larger release, which could cause significant loss in human, environmental and material well-being (Lochbaum, 2000). Because of this potential, nuclear power plants have needed government assistance for insurance.
- The problem of nuclear waste disposal has not yet been solved. Given the half-life of nuclear waste, this is a problem for both future and current generations.

Economic Efficiency

- Other policies may be able to accomplish the same goals (clean, reliable energy) at lower costs. Government assistance for renewables and energy efficient technologies has been and continues to be much smaller than the assistance to nuclear power. Government support of energy sources such as solar and hydrogen could potentially allow for the generation of electricity at lower costs than nuclear and without many of the problems, such as radioactive waste and plant decommissioning, associated with nuclear energy.

Issues specific to African Americans

Economic Effects

- Nuclear energy (and its subsidies) is relatively expensive. In as much as African-Americans spend a larger portion of their income on electricity expenses, the high cost of electricity burdens African-Americans more than other sectors of society.
- The trillions of dollars in government subsidies for nuclear power could be used for programs that would be of greater benefit to African-Americans.

Health Effects:

- Nuclear power reduces the health burdens associated with fossil fuel use, which fall heavily on African-Americans (Clear the Air, 2002). By offsetting air emissions, nuclear power reduces the risk of asthma and other health effects of air pollution in nearby communities.
- Nuclear power releases fewer greenhouse gases than fossil fuel power generation, reducing the human impact on the climate. Some studies suggest that African- Americans may be more susceptible to climate change than some other segments of society. Therefore, the health benefits of reducing climate change gases may be more important to African-Americans than many other groups (Miller and Brown, 2000).
- It is unclear whether the location of nuclear waste depositories are disproportionately close to African-Americans communities.
- A number of nuclear power plants are located in areas with as high percentage of African-American families. These communities are at the highest risk of affected by an accidental release or terrorist act at a nuclear power plant.

2.2.12 Renewable Energy Tax Incentives

Background
Several renewable tax incentives currently exist in the Federal budget. The Congressional Budget Act of 1974 (Public Law 93-344) requires the government to list such "tax expenditures" and projections of future expenditures in the budget. For the fiscal year 2003, there were two tax expenditures listed for energy production relevant to renewable energy and conservation:

- $30 million in alcohol fuel credits (i.e. ethanol – see Section 2.2.4), and
- $80 million in exclusion from income of conservation subsidies provided by public utilities (OMB, 2004)

In addition there was a tax expenditure of $70 million in tax credits and deductions for clean-fuel burning vehicles. However, a recent review of CAFÉ standards by the NRC has recommended the removal of this tax credit due to its relatively ineffective nature (NRC, 2002).

Most energy-related tax credits are structured to provide a percentage of the value of investment in specified eligible equipment. Historically and in many *ex ante* economic analyses, the bulk of the tax credit funds go to businesses or consumers who would have purchases the eligible equipment in any event. This suggests that credits are generally ineffective in promoting the development of new technologies (EIA, 1999). There is, however, an important special case where credits may be cost-effective: when they are targeted to relatively immature industries that are still achieving rapid cost reductions through learning-by-doing effects. Learning by doing is a decrease in production cost and price caused by the experience of producing a larger number of units. It is usually measured in terms of the number of doublings in cumulative output that have taken place since some base period. See Leiby et al. (1997) for a discussion of learning-by-doing. In such cases, the reduction in price due to the technological advance can cause the value of the credit to consumers to exceed the cost of the credit to the government, providing an economic benefit to the economy as a whole (Hoerner and Gilbert, 2000).

Goals
The goals of the tax credits are generally to encourage the growth of the renewable energy industry.

Benefits
Tax credits can stimulate the growth of the renewables industry by encouraging investment and technological growth through learning-by-doing. The environmental and health benefits of encouraging renewables are manifold. They include reduced carbon intensity and global climate change, reduced air pollution for most renewables (e.g. wind, solar, geothermal, hydro), and reduced health impacts from fossil fuel use.

Current tax incentives for renewables are unlikely to affect the price of energy much, but to the extent that they do so subsidized energy sources can have economic benefits by reducing the price of commercial energy in some situations (e.g. by reducing commercial demand through solar usage or by installing large wind production facilities). Employment benefits are generally higher for investment in renewables than for investment in other energy industries (See Section 1.7).

Drawbacks

The fundamental drawback of the few renewable industry tax incentives is the opportunity cost of the current (comparatively small) lost federal revenues from renewable industry tax breaks.

Issues Specific to African Americans

The environmental quality improvements associated with switching to renewables are likely to disproportionately benefit African Americans, particularly in urban and non-attainment areas (See Section 1.5). Similarly, reduced vulnerability to oil price shocks disproportionately benefits the African American population. However, given current incentive levels, these effects are likely to remain small. There are few economic employment issues specific to African Americans. Those relating to specifically to ethanol production have been addressed in Section 2.2.4, whereas employment in the renewable industry is addressed in Section 1.7. Neither analysis found particularly notable effects for African Americans.

2.2.13 Renewable Portfolios

Background

A renewables portfolio standard (RPS), also known as a national renewable electricity standard (RES), requires a given percent of national electrical generation to be produced through the use of renewable energy sources such as hydroelectric, solar, geothermal, biomass, tidal and wind energy. Bills before congress suggest increasing the percentage of renewable generation in the range of 10% by 2020 (HR 6, and S. 1766) beyond existing renewable generation as of January 1, 2002.

Currently, approximately 8.3% of electrical generation is from renewable energy sources (primarily hydropower); the EIA predicts this figure to increase to 8.7% in 2020 and then drop to 8.4% in 2025 (EIA, 2004a). Most of this generation will continue to come from conventional hydropower. Wind and geothermal are predicted to each comprise approximately 1% of total electrical generation. Other renewable source will make up the remainder of total renewable generation.

An RPS of 10% would require 10% of additional renewable generation above the approximately 8.3% that existed pre-January 1, 2002. As some of the pre-2002 facilities may be taken off-line, total renewable generation will be less than 18.3% even if all utilities are able to make the 10% target. The program will be implemented through a tradable credit program. If some utilities are able to exceed their required RPS, they can sell their credits to utilities that are unable to meet the RPS. Utilities that are unable to meet the RPS target and who do not purchase credits to make up for the shortfall, must pay a penalty based on total KWh produced. (See EIA, 2002, for more details on proposed legislation.)

Goals

The goal of the RPS is to increase the production of clean, renewable electrical generation thereby decreasing pollutants associated with fossil fuel use and reducing dependence on foreign energy imports.

Benefits

The increased use of renewables to generate electricity is predicted to reduce the emissions of some air contaminants and greenhouse gases.

- According to a study by the Energy Information Administration (2002), an RPS of 10% by 2020 will reduce emissions of CO_2 by 7%.
- An RPS would reduce fossil fuel use and the environmental impacts associated with mining, transport, and burning of fossil fuels.
- An RPS is predicted to have little impact on NO_x and SO_2 emissions, depending on the type of renewables that replace fossil fuel use (such as biomass) and the technology used for burning.

Increased use of renewables would buffer the energy market against price spikes associated with the global petroleum price fluctuation.

Because of decreased demand for natural gas for generation, the price of natural gas is expected to fall, leading to potential savings for consumers. By 2010, the total residential natural gas bill is predicted to be 1% lower ($534 million) in the RPS case than in the base case. The savings for the commercial and industrial sectors are even greater; 2% and 4% respectively.

Electricity prices may decrease with an RPS.

- A study by the Interlaboratory Working Group, in the Department of Energy, found that an RPS of 7.5% by 2010, when combined with energy efficiency programs, would save consumers over $65 billion per year by 2020(1997$) (CEF, 2000).
- A report by the Union of Concerned Scientists indicates that by including energy efficiency incentives (such as those suggested in S. 1333), an RPS of 20% by 2020 would save consumers $35 billion per year by 2020 (UCS, 2001).

Drawbacks

Electricity prices may increase moderately, according to the EIA RPS scenario. However, a study by the Interlaboratory Working Group found that the EIA report overestimates the cost of using more renewable electricity because it uses higher cost and worse performance assumptions for renewable technologies than used in projections by the Electric Power Research Institute or DOE. These assumptions are also higher than are found by experience (CEF, 2000). Using more accurate assumptions, an RPS could be found to save more money than predicted from gas price decreases alone (CEF, 2000).

Issues specific to African Americans

Economic Effects

- As stated above, increased use of renewables may have little effect on electricity prices but may lower natural gas prices. This is likely to help African-American families who use a disproportionate amount of income for energy.
- Since African-Americans may be more susceptible to price shocks than other groups, as well as price induced recessions, reducing the probability of energy price shocks will be particularly beneficial to African-American families.

Health Effects

- Electrical generation with renewables somewhat reduces the health burdens associated with fossil fuel use, depending on the renewable used, which fall heavily on African-Americans (Clear the Air, 2002). By offsetting air emission, renewable power reduces the risk of asthma and other health effects of air pollution in nearby communities.
- Increased use of renewables reduces greenhouse gas emissions. As Section 1.5 documents, African Americans may be more susceptible to climate change than some other segments of society. The health benefits of reducing climate change gases may be more important to African-Americans than many other groups.

2.2.14 Regional Transmission Organization (RTO)/Independent System Operator (ISO)

Background

A regional transmission organization (RTO) is an independent organization (for profit or non-profit) established to operate the transmission assets and provide wholesale transmission services within a defined (usually multi-state) geographic region (Porter 2002). Usually the RTO will not own the transmission facilities but will operate them on behalf of the transmission-owning utilities.

The Federal Energy Regulatory Commission (FERC) has been encouraging the formation of RTOs. FERC's goal is to give control of the transmission system to independent operators who would rely on market prices to control flows from the utilities. Currently many grids are a patchwork of ownership, which means that power flow is not always adequately coordinated and may not be prepared to handle new generation needed from population growth.

However, many utilities and state officials disagree with FERC on the need for this kind of deregulation. The debate is around the impact of forming RTOs and the associated policies. RTO formation can take multiple forms, such as:

- An incremental approach relying on voluntary agreements between existing utilities to increase efficiencies in the system.
- A more aggressive approach would create an independent agency that would plan and schedule power transfers regionwide, but with limited authority to spend money or enforce reliability rules.
- A comprehensive Regional Transmission Organization with the ability to control (dispatch) generation and create markets for power sales.

Goals

RTOs roles can include facilitating or operating a day-ahead energy market; planning transmission; monitoring markets; managing the queue for generator interconnections; and administering the transmission tariffs for transmission service, congestion pricing and ancillary services.

Benefits

RTOs could: (1) minimize the potential for transmission owners to favor their own generation resources at the expense of other competitors that do not own transmission; (2) minimize transmission rate “pancaking” of power that is transmitted over multiple transmission systems; (3) facilitate the development of market-based approaches for congestion management; and (4) enhance reliability through regional transmission planning and operation (Porter, 2002).

Drawbacks
RTO arrangements and market rules may present new problems for small utilities, such as renewable energy technologies. Tough financial penalties imposed on generators if they fail to meet scheduled power deliveries may act as a market barrier to intermittent renewable energy technologies or smaller utilities. Multiple transmission charges between RTOs—so-called "seams" between RTOs—may restrict power markets, and therefore opportunities for smaller producers.

Issues Specific to African Americans
In 1997, African Americans owned 2.3% of the companies in the Electric, Gas, and Sanitary Services sector, which contains power producers. However, these African American firms collected just 0.18% of the sales and receipts, meaning that these firms tend to be smaller on average. Given their relative size, a key issue in the policy decisions around the RTO is the potential role of small producers; will they be able to sell back to the grid?

A second important question is will the chosen management structure raise or lower barriers to entry for these smaller operators, given that data indicates that African American owned electrical facilities are smaller on average? In the Pacific Northwest, smaller public utilities, and other groups resisted forming an RTO, fearing an RTO would become a costly bureaucracy, spend large sums on new transmission, and bring dysfunctional, California-style markets to their power grids (NW Energy Coalition 2004).

Electricity reliability is also a potential issue. If the transmission system becomes completely deregulated, then some fear that the RTOs will extract rents from the system, leading to higher prices. Higher prices places more risk on low-income consumers in terms of losing heat in the winter and losing cooling during life-threatening heat waves.

2.3 – Market Mechanisms

Background

In recent decades, many nations including the U.S. have increasingly used market-based approaches to achieving environmental goals. The reason for this is that such systems, if properly designed, allow emitters the maximum flexibility in the time, place, and manner of reductions. This in turn permits emissions reductions to be achieved at the lowest possible cost.

The two most important market-based regulatory systems to be enacted in the U.S. are the tradable emissions permit system for sulfur dioxide under the 1990 Clean Air act Amendments and the Ozone-Depleting Chemicals Tax. Both of these systems have produced large reductions in emissions at a cost far below that projected by either industry or the Environmental Protection Agency (Cook,1996; Schmalensee et al., 1998). Similar systems have been proposed for emissions of oxides of nitrogen, mercury, greenhouse gasses such as carbon dioxide, and other pollutants.

In this section we compare two traditional regulatory approaches, best available control technology (BACT) and plant-level emissions restrictions, to four market-based approaches: tax incentives for specified new technologies, emissions permits that are given to firms (grandfathered), emissions permits that are auctioned, and pollution taxes.

Discussion

Efficiency

In order to achieve emissions reductions at the lowest possible social cost, it is necessary that reductions at different times and places and by different approaches can be compared, and that the reductions with the lowest total cost can be selected. Different mechanisms vary in the extent to which they provide this flexibility. For example, while a BACT strategy provides little choice as to time, place or manner, plant-level emissions caps allow full choice as to the manner of achieving the reduction, while continuing to specify time and place. Tax incentives for new technologies, on the other hand, specify the manner of the reduction while allowing full freedom on the time and place of the reduction. Tradable permits and pollution taxes both provide the full range of flexibility.

Information requirements and transaction costs

Monitoring of emission levels can be difficult and costly, especially where there are a large number of small emitters. In these cases, BACT-type regulations or tax incentives for clean technologies may be less expensive than alternatives that require direct emissions monitoring. Indeed, these technology-based approaches may be the only feasible regulation type in such cases.

However, this is not universally true. In some cases emissions may be closely associated with some more easily observable quantity. For example, the emission of carbon dioxide is directly proportional to the consumption of fossil fuels. In this case, it is almost certainly less expensive to regulate fossil fuel purchases through tradable permits or taxes than to monitor the technology of fuel consumption at tens of thousands of individual sites.

Local impacts

The freedom of choice as to time and place of emissions that market-based approaches produce, though it reduces overall cost, also raises the possibility that emissions may be highly concentrated at certain times and places. This creates the potential for local "hot spots" that could have a deleterious effect on local human or ecosystem health. This problem is especially severe when the health impact of a specified pollutant increases more than directly proportionally with emissions. This is true of many pollutants of concern, such as SOx, NOx, and mercury, although it is not true for greenhouse gases. In such cases, higher concentration increases total health effects.

In principle, this problem could be addressed with a more complex trading mechanism that takes these local effects into account. However, this would increase the cost of administering the market mechanism and reduces its advantage over more traditional regulatory forms. In such cases market mechanisms may be inappropriate, or it may be desirable to use the market mechanism to set overall targets while retaining a regulatory backup to address the worst of the local impacts.

Windfall profits

Pollution emissions may be regarded as an "input" into production, in the sense that production costs are lower when thee allowable emissions per unit of output are higher. Thus restricting pollution emissions will generally raise the cost of production. However, such restrictions will typically raise the cost of the marginal (last) unit of production by more than it raises the cost of the average unit of production. This is because the lowest-cost reduction opportunities are normally used first.

Because price in competitive markets is set equal to marginal cost, such regulations will raise the price of output sold to consumers by more than the average cost of production, in theory. Thus instruments like grandfathered permits give rise to windfall profits. In the case of auctioned permits, no such windfall arises, because the auctioneer (presumably the government) captures the difference between average and marginal cost. It can then be returned to consumers in the form of cuts in other taxes or as essential public services.

Tax incentives also create windfall profits, but by a different mechanism. Individuals or firms that were going to buy the eligible technology even without the tax incentive will generally receive the tax incentive, even though it has not affected their behavior. Thus the subsidy constitutes a windfall to these individuals or firms.

Revenue recycling

In addition to the efficiency gains that come from least-cost emissions reductions, some market mechanisms (auctioned permits and taxes) also generate revenue. Note that, in general, these mechanisms do not impose a higher cost on consumers than non-revenue mechanisms such as grandfathered permits. Instead, both mechanisms raise costs to consumers by more than the average cost of compliance for producers. As discussed above, the difference between marginal and average costs is raised from consumers regardless; the only difference is to whom it is paid (See, e.g. Fullerton, 2001).

When the pollution scarcity rent is collected by the government, a second source of efficiency can come into play if the revenues are used to reduce other taxes. Since most taxes cause economic distortion costs in addition to the revenue they raise, this "revenue recycling" effect can produce additional efficiency benefits for the economy. These efficiency benefits may partially or fully offset the economic costs of the environmental regulation. It is more likely that the economic costs will be fully offset if the revenues are used to cut highly distorting taxes, and if the market mechanism is combined with "no regrets" technology promotion policies and with the elimination of market barriers to new, cleaner technologies (Parry et al., 1999; Krause et al., 2002).

Technology promotion

In many cases we do not know how to achieve the full degree of emission reductions that we desire, or we do not know how to do so at reasonable cost. It is therefore important whether a particular approach to environmental regulation stimulates the development of new control technologies that can achieve a specified level of emission reductions at a lower cost than current technologies.

BACT-type regulations generally do not provide any stimulus to developing new control technologies, and indeed may impede the development of such technologies by specifying the allowable technical approach and providing no incentive for improvement. Taxes and tradable permits do provide an impetus to develop new technologies, as all emissions reductions result in economic savings proportional to the tax rate.

In the case of tax credits, the stimulus to technology is more ambiguous. Like BACT regulations, tax credits typically apply only to specified technologies. Thus, they are generally effective in stimulating technological advance only in the case of relatively immature industries that are still achieving rapid cost reductions through learning-by-doing effects (Leiby et al., 1997). However, in such cases, the reduction in price due to the technological advance can cause the value of the credit to consumers to exceed the cost of the credit to the government (Hoerner and Gilbert, 2000).

Market and Regulatory Instruments and their Economic Effects						
Instrument	Least-cost reductions	Information requirements	Local hot spots	Windfall profits	Recycling efficiency	New techno.
Regulation: BACT	No	Low	No	No	No	No
Regulation: Facility caps	Partial	High	No	No	No	Yes
Tax incentives	Partial	Low	Yes	Yes	Negative	Yes
Grandfathered permits	Yes	High*	Yes	Yes	No	Yes**
Auctioned permits	Yes	High*	Yes	No	Yes	Yes
Pollution tax	Yes	High*	Yes	No	Yes	Yes

*Information costs may be lower if emissions are easily monitored, as when they are proportional to fuel purchases. See text for discussion.
**For young industries with rapid learning curves only.

Issues specific to African-Americans

African-Americans have particularized interest in the choice of environmental policies for three reasons. First, African Americans are generally more vulnerable to pollution impacts because of their spatial distribution (see Section 1.5) Second, as a result of lower average income and wealth, blacks are on the average more economically vulnerable to energy price shocks. Third, for the same reason, African Americans are more vulnerable to environmental policies with regressive impacts. These include most environmental policies, which generally have distributional patterns similar to consumption taxes.

These three vulnerabilities, taken together, suggest a coherent Black position on market approaches to the environment. First, African Americans should support the move toward market approaches in general, because the lower general cost of environmental control is likely to disproportionately benefit African Americans. Second, African Americans should generally oppose the use of market mechanisms for pollutants that cause local hot spots, unless additional safeguards are added to limit the impact of local concentrations. Third, blacks should generally support revenue-raising mechanisms such as auctioned permits and taxes over non-revenue mechanisms such as grandfathered permits, with the additional proviso that the revenues should be distributed progressively (through taxes, transfers, or provision of public services) or used to finance further emission reductions or efficiency improvements.

2.4 – U.S. Energy Policy as it Relates to Africa.

2.4.1 – Aid to the private sector from the U.S. Export-Import Bank and the Overseas Private Investment Corporation for energy projects in Africa.

Background
Public financing through export credit and investment insurance agencies represents a major pathway through which the public sector can affect development in foreign nations. Collectively, the Export-Import Bank of the United States (ExIm Bank) and the U.S. Overseas Private Investment Corporation (OPIC) represent one of the largest public suppliers of direct financing, guarantees, and insurance for energy-intensive projects in developing regions worldwide, including Africa. Through investment in the power and oil and gas sectors, ExIm banks and investment insurance agencies can significantly affect growth in the African energy consumption and supply.

Key Findings
- From 1997 through 2002, the U.S. ExIm Bank provided a total of \$106 million in loans and \$1,054 million in guarantees for investment in the power and oil and gas sectors in Africa.

- OPIC currently provides political insurance coverage for the power and oil and gas industry in Africa summing to \$350 million of maximum contingent liability (MCL).

- African energy projects are a not a significant component of the ExIm Bank or OPIC's investment portfolio. Over the past six years, just 2-3% of total loans and guarantees have been dedicated to the African energy sector.

Analysis
Export credit and investment insurance agencies (ECAs) worldwide are a major force in energy-sector investment in developing nations. According to a review of proprietary data by the World Resources Institute (WRI), ECAs accounted for \$80-100 billion in loans per year in the 1990's (Maurer and Bhandari, 2000). The majority of this financing through the middle of the last decade (\$216.6 billion out of \$376 billion) supported the development of energy intensive industries: fossil-fuel power plants, oil and gas development, energy-intensive manufacturing, and transportation.

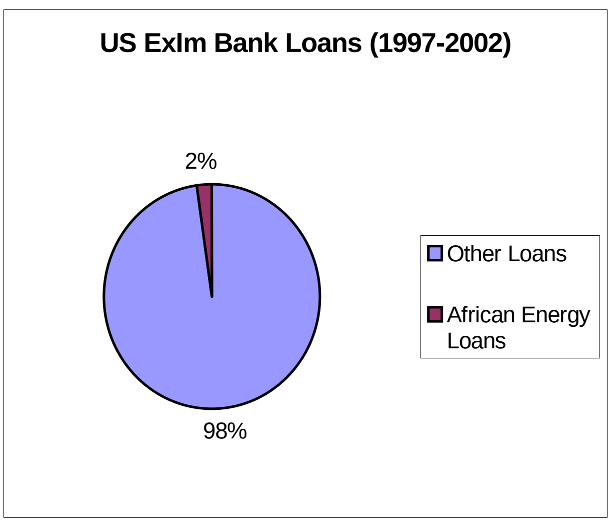
In addition to this direct infusion of capital, ECAs exert a powerful leveraging effect. The WRI reports that export credit agencies provided twenty percent of all energy-intensive sectors financing form 1994-1998 (\$44.4 billion), but their involvement helped to leverage projects totaling \$103 billion during this time period, or roughly half of all project financing. Of the \$103 billion, oil and gas development and fossil fuel power projects comprised 71% of the total (Maurer and Bhandari, 2000).

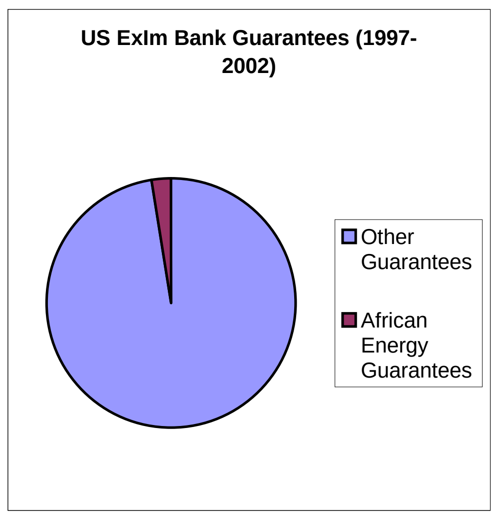
As a consequence, ECAs represent a significant force in the development of energy intensive industries and concomitant environmental and social effects in many regions of the world. In particular, the Export-Import Bank of the United States, along with Germany's Kreditanstalt fur Wiederaufbau and Japan's Export-Import Bank, represent the three largest public supplies of direct financing, guarantees, and insurance for energy-intensive projects in developing countries. As of September 2002, roughly a third of the U.S. ExIm Bank's outstanding gross loans ($3.15 billion) were tied up in foreign energy projects. Additionally, a quarter ($10.85 billion) of all guarantees, insurance, and undispursed loans were in the oil and gas sector and power sector.

Unfortunately, the U.S. ExIm Bank does not publish information on the extent of outstanding investment in African energy projects specifically. However, the ExIm Bank's available financial statements (2002-1997) list authorizations by project. Authorizations for projects in the African power or oil and gas sectors have been summarized and listed in Table 1. These authorizations total over $100 million in loans and over $1 billion in guarantees from 1996 to 2002.

However, with respect to total ExIm authorizations, investment in the African Oil and Gas Sector and Power Sector is relatively small. Over the past six years, less than 2.5% of US ExIm Bank loans and long-term guarantees have been directed to Africa's energy sector. Given that a third of outstanding loans and a quarter of existing guarantees are in the energy sector generally, Africa has not been the selected recipient.

Figure 2.5.1.1 – ExIm Bank Loans and Guarantees





With regard to the Overseas Private Investment Corporation, OPIC invests an additional $276 million in energy projects worldwide (12.3% of total OPIC investment), and it invests $167 million in African business (not exclusively energy projects) (8.1% of total investment) (Maurer and Bhandari, 2000). However, according to OPIC's FOIA Director Eli Landy, as of January 2004, "OPIC does not currently have any money 'invested' in the African energy sector, i.e. OPIC has no current active direct loans or loan guarantees outstanding in the African energy sector. OPIC does, however, currently provide political risk insurance for energy projects in Africa. Specifically, OPIC's aggregate insurance coverage for the oil and gas industry in Africa is $150 million of maximum contingent liability ('MCL'), and the aggregate coverage for the power sector is $200 million of MCL. Please be advised that MCL figures do not always reflect the amount of OPIC insurance that OPIC ultimate provides in insurance coverage, an amount that may be considerably less: the actual amount of insurance coverage for a particular company depends on a variety of factors, including the insured company's decision to opt for a lesser amount of coverage (OPIC, 2004)."

With respect to the effects of investment by the U.S. ExIm Bank and OPIC in the African energy sector, a recent World Bank review of extractive industries ought to be taken into consideration. In June 2000, World Bank Group President James Wolfensohn responded to criticism from NGOs with a promise to review what role, if any, the World Bank Group has in the extractive industries (i.e. oil, gas and mining). In July 2001, the Extractive Industries Review (EIR) was commissioned with the appointment of Dr. Emil Salim, former Minister of the Environment for Indonesia.

The Review found no instances where extractive industry investment caused significant poverty alleviation, and many instances where it contributed to worsening poverty, income inequality, and environmental degradation. According to the Final EIR Report, the role for investment in the extractive energy sector ought to be limited to nations and circumstances where poverty alleviation is possible. The main enabling conditions were determined to be:

- "Pro-poor public and corporate governance, including proactive planning and management to maximize poverty alleviation through sustainable development;
- Much more effective social and environmental policies; and
- Respect for human rights."

Moreover, the review determined that investment in oil and coal extraction has been largely detrimental, particularly relative to investment in renewables. The EIR recommended that, "On this basis, the WBG should phase out investments in oil production by 2008 and devote its scarce resources to investments in renewable energy resource development, emissions-reducing projects, clean energy technology, energy efficiency and conservation, and other efforts that delink energy use from greenhouse gas emissions. During this phasing out period, WBG investments in oil should be exceptional, limited only to poor countries with few alternatives. And the WBG has for the last few years not invested in new coal mining development. This should continue.

The WBG should aggressively increase investments in renewable energies by about 20 percent annually, thereby moving toward a better balance between support for fossil fuel projects, currently 94 percent of the energy portfolio, and support for renewables projects, currently just 6 percent. The promotion of renewable energy that is needed in poverty alleviation efforts and in response to climate change should be done by setting up a specialized WBG unit or team for renewables and energy conservation. The WBG should take the initiative to coordinate research globally on sustainable energy development."

These recommendations on extractive industries in developing nations clearly apply to African in general. Africa, with 13% of world population, accounts for just 2% of world economic output, representing the poorest inhabited continent on Earth. Commercial energy production in Africa has roughly doubled over the past three decades, and is likely to increase by double again in the next three decades, due in large to multinational investment. Roughly two-thirds of current energy production is oil, with coal and natural gas representing the bulk of the remainder.

With respect to the U.S. ExIm Bank and OPIC involvement in extractive industries, it should be noted that the two bodies do not share identical goals as the World Bank Group, which has global poverty alleviation as a core mission. As such, WBG findings and recommendations are not entirely germane to these institutions. However, the effects of encouraging extractive industries are likely to be comparable regardless of the source of financing. Moreover, much of U.S. foreign aid is dedicated toward reducing poverty. As such, U.S. investment in extractive industries in Africa and other developing regions should be more highly scrutinized, as there are clearly many instances where legitimate energy projects exacerbate existing poverty.

Data

Table 2.4.1.2 - U.S. ExIm Bank African Energy Sector Authorizations by Fiscal Year (in Millions; G = guarantees, L = Loans) (Source: ExIm 1998-2003)

Year	Country	Amount (millions)	Type	Purpose
2002	Nigeria	$135	G	LNG plant and equipment
2001	Algeria	$51	G	Oil field services
	Ghana	$5	L	Engineering and procurement
2000	Chad-Cameroon	$200	G	Pipeline
	Algeria	$136	G	Engineering and project services
1999	Angola	$64	L	Turbine generator sets
	Ghana	$21	L	Electrical distribution equipment
1998	Algeria	$15	G	Oil and gas field services
1997	Algeria	$150	G	Various
	Angola	$89	G	Oil field services
	Ghana	$41	G	Engineering services
	Morocco	$237	G	Steam boilers
	Morocco	$16	L	Engineering
Total (97-02)	Africa	$106	L	Various
	Africa	$1,054	G	Various

Table 2.4.1.3 - U.S. ExIm Bank Total Authorizations by Fiscal Year (in Millions)

Year	Total Loans	Loans to African Energy	Total Long-term Guarantees	Guarantees to African Energy
2002	$295.6	$0.0	$7,408.1	$135.0
2001	$871.2	$5.0	$6,101.0	$51.0
2000	$932.6	$0.0	$8,413.4	$336.0
1999	$902.7	$85.0	$8,299.0	$0.0
1998	$102.6	$0.0	$6,150.7	$15.0
1997	$1,548.9	$16.0	$7,761.1	$527.0
Total	$4,653.6	$106.0	$44,133.3	$1,064.0

2.4.2 – U.S. consumption of Africa oil.

Background

The United States is the world's largest consumer and importer of crude oil and crude oil products. A significant fraction of that oil currently comes from Africa, and West Africa in particular. As a consequence, U.S. demand promotes the development of the oil industry in Africa.

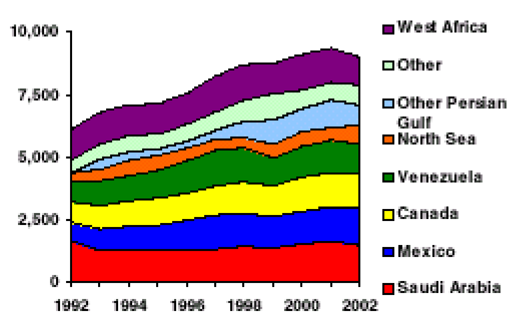
Key Findings

- In 2002, approximately 13.4% of U.S. crude oil and petroleum product imports originated in Africa.
- The fraction of U.S. oil imports from Africa has fallen slightly over the past five years from a high of 18% in 1997. This fall is due to the fact that U.S. demand has risen while African exports have remained relatively constant.
- The main African exporting nations are Nigeria, Angola, and Algeria.
- West African oil production and U.S. imports may rise significantly in the near future.

Analysis

The United States is the world's largest consumer of crude oil and petroleum products. The U.S. currently imports over 9 million barrels of crude oil and another 2.4 million barrels of petroleum products per day (EIA, 2002). This flow represents over half of American petroleum consumption. African oil represents a significant share of U.S. oil imports. In particular, West African oil currently accounts for approximately 14% of U.S. oil imports (Kreuger, 2002). West Africa's share of U.S. crude oil imports over the last 6 years has declined (though figures have remained roughly constant) as the Persian Gulf, Mexico, and the former Soviet Union have captured increases in demand.

Figure 2.4.2.1 – U.S. Oil Imports by Region (Source: Kreuger, 2002)



Thousand b/d

U.S. Crude Imports by Country of Origin

(Graph courtesy of PFC Energy.)

There are reasons to believe that African oil may become more important to the United States in the future. The May 2001 National Energy Policy Report noted that "Along with Latin America, West Africa is expected to be one of the fastest-growing sources of oil and gas for the American market…. African oil tends to be of high quality and low in sulfur, making it suitable for stringent refined product requirements, and giving it a growing market share for refining centers on the East Coast of the U.S." Some industry experts expect that West African output is poised to increase substantially. PFC energy predicts that by 2008, West African crude oil production may increase to 6.3 million barrels per day (from 2.6 million barrels per day in 2002). Similarly, VANCO Energy Corporation optimistically predicts that West Africa's share of U.S. oil imports may rise from 15% to 25% in the near future (Corey, 2002). Production increases are expected to come primarily from Angola and Nigeria, and to a lesser extent from Equatorial Guinea and Chad. The bulk of new West African oil discoveries are in offshore waters: as a consequence, the U.S. is looking to increase national involvement, particularly in the Gulf of Guinea (Doyle, 2002).

Table 2.4.2.2 – 2002 U.S. Imports of crude oil and products (1,000 barrels) (Source, DOE, 2003)

	Exports (1,000 barrels)					
U.S. Imports from Africa	**2002**	**2001**	**2000**	**1999**	**1998**	**1997**
Nigeria	226751	323025	327040	239805	254040	254770
Angola	121185	119720	109865	131765	170820	155855
Algeria	96230	101470	82125	94535	105850	104025
Gabon	52208	51100	52195	61320	75555	83950
Congo (Brazzaville)	10044	?	?	?	?	?
Cameroon	4681	?	?	?	?	?
Egypt	3867	?	?	?	?	?
Congo (Kinshaha)	1269	?	?	?	?	?
Tunisia	352	?	?	?	?	?
African Total	**516587**	**595315**	**571225**	**527425**	**606265**	**598600**
U.S. Imports Total	**3849290**	**3978500**	**3802935**	**3617880**	**3563860**	**3342670**
% of Total Imports	**13.42%**	**14.96%**	**15.02%**	**14.58%**	**17.01%**	**17.91%**

Table 2.4.2.3 – African Proven Recoverable Reserves (Source: WEC, 2001)

Crude oil and natural gas liquids: proved recoverable reserves at end-1999						
	million tonnes			**million barrels**		
	Crude oil	**NGL's**	**TOTAL**	**Crude oil**	**NGL's**	**TOTAL**
Algeria			**1 235**			**10 040**
Angola			**730**			**5 412**
Benin			**1**			**8**
Cameroon			**55**			**400**
Congo (Brazzaville)			**212**			**1 506**
Congo (Democratic Rep.)			**26**			**187**
Côte d'Ivoire			**14**			**100**
Egypt (Arab Rep.)	412	117	**529**	2 991	1 159	**4 150**
Equatorial Guinea			**1**			**12**
Ethiopia			**N**			**N**
Gabon			**342**			**2 499**
Ghana			**2**			**17**
Libya/GSPLAJ			**3 892**			**29 500**
Morocco			**N**			**2**
Nigeria			**3 000**			**22 500**
Senegal						
South Africa	5	2	**7**	46	18	**64**
Sudan			**36**			**262**
Tunisia			**40**			**308**
Total Africa			**10 122**			**76 967**
TOTAL WORLD			**142487**			**1051165**
Percent in Africa			**7.1%**			**7.3%**

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