THE ACID PRECIPITATION PROVISIONS OF THE 1990 CLEAN AIR ACT AMENDMENTS AND MINORITIES' ENERGY CONSUMPTION

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In November, 1990 Congress passed a comprehensive set of amendments to the Clean Air Act of 1977 with potentially very high compliance costs. The Amendments require that the U.S. Environmental Protection Agency regulate specified pollutants within given time frames. Since many specific regulations remain to be developed within the broad regulatory framework of the Amendments, the full costs and benefits of the Amendments cannot yet be assessed. However, the provisions pertaining to control of acid precipitation have been specified with sufficient detail to examine their cost impacts. These provisions will require investment in emissions control technology, mainly by electric utilities. Production costs will increase due to the required investment, resulting in higher electricity prices.

This paper examines the possible magnitude of these effects and whether there might be differential impacts on racial/ethnic minority groups. Differential impacts were considered a possibility because of the differences in the percentage of total income spent on energy by various population subgroups. In 1989, the Majority group (defined as non-Black, non-Hispanic) spent about three percent of household income on energy, while Blacks spent double that, six percent, and Hispanics spent about four percent. (The differences in income underlying these figures are greater, however, than the differences in energy expenditures.) To address these issues, we compare projected electricity consumption and expenditures and total energy expenditures for Black, Hispanic and Majority households. The distribution of benefits from reducing acid precipitation is not addressed since the possible effects on ambient air quality in specific geographical areas that are directly attributable to reducing utilities' sulfur dioxide emissions are highly uncertain. Differences in exposure of population subgroups in sulfur dioxide air quality nonattainment areas is addressed in a companion paper.
in this volume (Wernette and Nieves).

The focus of this investigation is Title IV of the Clean Air Act Amendments (Acid Deposition). The remaining provisions (National Ambient Air Quality Standards, Mobile Sources, Air Toxics, Permit Stratospheric Ozone, etc.) are outside the scope of this effort. The acid deposition provisions primarily affect utilities with the goal of reducing total U.S. utilities’ sulfur dioxide emissions by ten million tons from 1980 emissions levels. In addition, regulations will be forthcoming for nitrogen oxides. Emissions will be strictly regulated, with specific requirements set out for emissions reductions. During Phase I of control implementation taking effect in 1995, generating plants in Illinois, Indiana, and Ohio will receive special emissions allowances, recognizing their dependence on high sulfur coal. Phase II, effective in 2000, will require further reduction of emissions, to a rate of 1.2 lbs of sulfur dioxide per million BTU times average fuel use in the 1985-1987 period. To promote efficiency in investment for acid deposition control, utilities will be able to buy, sell and trade emission allowances. The future effects of the provisions on utility costs are somewhat uncertain because of the complexity of the emissions trading and emissions allowances authorized by the Amendments. Estimates of compliance costs and resulting changes in electricity prices available from the National Acid Precipitation Assessment Program (NAPAP) research are used in our analysis.

Benefits of reducing acid precipitation include reduced acidification of lakes, stress and damage to higher-altitude forests, damage to buildings and monuments, and possibly some reduction in the number or severity of some human respiratory system ailments. Estimates of the annual value of these changes have been projected by Portney (1990) and Blodgett (1990). Portney puts the total value of health and environmental effects combined within the range of $2 to $9 billion, while Blodgett estimates $10 billion for health improvement and $6
billion for the decrease in environmental degradation.

Annual compliance cost estimates for the first phase are widely divergent, from $.3 billion estimated by EPA, Office of Air and Radiation (1990) to $5.2 billion by Denny Associates (1990). Second phase cost estimates are much closer, ranging from $3 billion estimated by ICF Resources, Inc (1990) to $4.5 billion estimated by EPA. Even using the highest cost estimates, compliance costs are less than 0.1 percent of projected GNP (DOE National Energy Strategy) for 1995 and 2005.

Possible impacts of the compliance costs on energy consumption and expenditures of various population subgroups were modeled using the Minority Energy Assessment Model (MEAM) developed by ANL. The model projects patterns of residential energy use and expenditures by Black, Hispanic and Majority households or by poor and nonpoor households. In the first stage of this projection, MEAM allocates household expenditures between energy and nonenergy consumption categories. Then in the second stage, energy expenditures are allocated between electric and nonelectric consumption. The model is developed using standard neoclassical economic assumptions in a constrained utility maximization framework and estimated using the DOE/EIA Residential Energy Consumption Survey data.

Energy price and economic growth assumptions used as inputs to MEAM were taken from the National Energy Strategy (NES) "Current Policy Base Case" and "Clean Air Act Amendments Case" and electricity price projections are from the NAPAP final report. Since development of the NAPAP projections was coordinated with the NES assumptions, these projections provide a consistent set of input data. As part of the long range effort involved in NAPAP, utility sulfur dioxide (and nitrogen oxide) emissions were inventoried. Emissions
control technologies were evaluated with regard to efficiencies and costs so that emissions control costs could be estimated at the generating plant level. Cost information from ICF Resources Inc. (1990) was used in this effort and electricity prices reflecting Clean Air Act Amendments compliance costs were then projected by state and aggregated for regions and the U.S. The NAPAP national average residential electricity demand and rates "Base Case" and "Clean Air Act Case" were used as inputs to MEAM.

Differences between the Base and Clean Air Act Case price and income projections input to MEAM are relatively minor. With the Clean Air Act Amendments, the annual GNP growth rate is projected to decline by 0.1 percent during the 2000-2005 period. Also, electricity prices are projected to increase one percent and electricity demand to decline 0.4 percent by 2005. The NAPAP projection of electricity prices shows a decline in real terms through the year 2000. This is even true of the East Northcentral Region, which is expected to be most affected by the 1990 Amendments. There electricity prices are projected to increase about four percent over the base case by 2005, however.

Projections of energy expenditures, electricity consumption and electricity expenditures for Majority, Black and Hispanic households are shown in the graphs which follow. Figure 1 shows that after 2000 the Clean Air Act Amendments increase energy expenditures relative to the base case for all households. Differences in total energy expenditure levels per household are summarized in Table 1. Even by 2005 when the Acid Precipitation Provisions are fully implemented, changes in expenditures by minority households differ by less than one half percent from the impact projected for majority households. The range in Clean Air Act Amendment impacts is from a 1.9 percent increase in energy expenditures for Blacks to a 2.7 percent increase for Hispanics, compared to a 2.4 percent increase for the Majority group.
Figure 2 shows a slight decline in electricity consumption due to the Clean Air Act Amendments for all households after 2000. Here too, Table 1 shows a difference between each minority group and the Majority of less than one percent in the impact of the Amendments by 2005. Similarly, increasing electricity expenditures are shown in Figure 3 with minimal between-group differences.

The major feature of the graphs is the steep increase in both consumption and expenditures projected up to 2000. This is especially pronounced for Black households, which obtain a larger proportion of total energy use from nonelectric sources than do Majority households. Energy expenditure projections rise due to the effect of projected income increases on energy consumption and the effect of rising nonelectric energy costs on relatively price-inelastic demand. Concurrently, real costs of electricity are projected to decline, which leads to substitution of electricity for nonelectric energy. These usage patterns are not appreciably altered by the Clean Air Act Amendments.
<table>
<thead>
<tr>
<th></th>
<th>2001</th>
<th>2005</th>
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<tbody>
<tr>
<td><strong>MAJORITY:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Expenditures</td>
<td>0.7%</td>
<td>2.4%</td>
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<tr>
<td>Electricity Consumption</td>
<td>-0.4%</td>
<td>-1.4%</td>
</tr>
<tr>
<td>Electricity Expenditures</td>
<td>1.1%</td>
<td>3.6%</td>
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<tr>
<td><strong>BLACKS:</strong></td>
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<tr>
<td>Energy Expenditures</td>
<td>0.5%</td>
<td>1.9%</td>
</tr>
<tr>
<td>Electricity Consumption</td>
<td>-0.7%</td>
<td>-2.2%</td>
</tr>
<tr>
<td>Electricity Expenditures</td>
<td>0.7%</td>
<td>2.7%</td>
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<tr>
<td><strong>HISPANICS:</strong></td>
<td></td>
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<tr>
<td>Energy Expenditures</td>
<td>0.8%</td>
<td>2.7%</td>
</tr>
<tr>
<td>Electricity Consumption</td>
<td>-0.2%</td>
<td>-0.7%</td>
</tr>
<tr>
<td>Energy Expenditures</td>
<td>0.8%</td>
<td>2.7%</td>
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Based on this analysis it does not appear that minority groups will be differentially impacted by the acid precipitation provisions of the Clean Air Act Amendments. Overall the differences in impacts are less than one percent. Not only are these differences minimal, but the impact of the provisions on energy expenditures is insignificant for the population as a whole. In the East Northcentral Region, which is among the most highly dependent on high-sulfur coal, electricity prices are expected to rise four percent by 2005. The effects of this projected increase are likely to be mitigated by the special emission allowances granted to Illinois, Indiana, and Ohio as well as by emissions trading. Thus the impacts in even the most affected region would still fall within the range of uncertainty inherent in the modeling exercise.
While we project minimal subgroup differences in the impacts of the Clean Air Act Amendments on energy expenditures, or electricity consumption or expenditures, this finding may be due in part to the limitations of the analysis. As utility responses to the emission control requirements and emissions trading provisions of the Amendments become clearer, greater differences in electricity price impacts between regions could develop. Since minority population concentrations vary greatly across regions, differential impacts on population subgroups are possible. Analysis of the potential for such impacts is recommended for the future, as more definitive information regarding compliance with the Acid Precipitation provisions becomes available.
REFERENCES


ICF Resources Inc., 1990, *Comparison of the Economic Impacts of the Acid Rain Provision of the Senate Bill (S. 1630) and the House Bill (H.R. 3030)*, July.


Figure 1. Energy Expenditures by Households (1990$)
Figure 2. Electricity Consumption by Households
Figure 3. Electricity Expenditures by Households (1990$)