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Testimony

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AIR POLLUTION

Air Quality and Respiratory Problems in and Near the Great Smoky Mountains

Statement of David M. Walker
Comptroller General of the United States

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GAO-01-790T

Mr. Chairman and Members of the Subcommittee:

Good afternoon. It is a pleasure to be here in beautiful Asheville today to speak with you about the air we breathe. Western North Carolina has a well-justified reputation for beautiful mountains and diverse species of plants and animals. But air quality remains a concern.

For about the past 6 months, we have been working with Chairman Charles H. Taylor on a study of air quality in this area. Today, we are releasing the results of that study.[1] But, before we get into the results, let me tell you a little bit about who we are. As the Comptroller General, I head the U.S. General Accounting Office or GAO. GAO is part of the legislative branch of government, and we help the Members of Congress carry out their constitutional responsibilities. We perform audits, investigations, evaluations, and policy analyses, and we provide a range of legal services that span the entire scope and reach of the federal government—from Social Security issues to national security issues. Simply stated, our mission is to help the Congress make government work better for all Americans.

For the purposes of our study of air quality in and near Great Smoky Mountains National Park, we were charged with answering four questions: (1) What is the trend in visibility in the park and what are the causes of reduced visibility? It is difficult to appreciate the beauty of the mountains if we cannot see them. (2) What is the trend in ozone in the park and what are its causes? Ozone, specifically ground-level ozone, is a potential threat to human health, (3) What is the trend in lung diseases for the people who live in the North Carolina and Tennessee counties that border the park? and (4) What are the plans of the Tennessee Valley Authority (TVA), the largest electric utility in this area, to reduce its emissions of two key air pollutants? In developing the information for our study, we collected data from five federal agencies—the Environmental Protection Agency, the Forest Service, the National Park Service, Department of Health and Human Services, and the Tennessee Valley Authority. In addition, we gathered information from state agencies in North Carolina and Tennessee, and from other academic, research, and special interest groups.

[1] *Air Pollution: Air Quality and Respiratory Problems in and Near the Great Smoky Mountains* (GAO-01-658, May 25, 2001).

Study Background

To put our study results in context, some background on Great Smoky Mountains National Park and air quality is probably in order. The park encompasses 800 square miles in North Carolina and Tennessee. Designated a national park in 1934, it is 95 percent forested, and elevations in the park extend from 800 to more than 6,600 feet.

Areas adjacent to the park are growing in population and economic activity. Between 1990 and 2000, the nation's population grew 13 percent. During this same period, North Carolina's population grew 21 percent, and Buncombe County—the most populous county in Western North Carolina—grew 18 percent. Moreover, over the past 10 years, annual recreational and non-recreational visits to Smoky Mountains National Park have increased from 18 million to 21 million visitors. Unfortunately, this growth has a cost. More people usually mean higher demand for electricity, more cars, and more goods transported by truck.

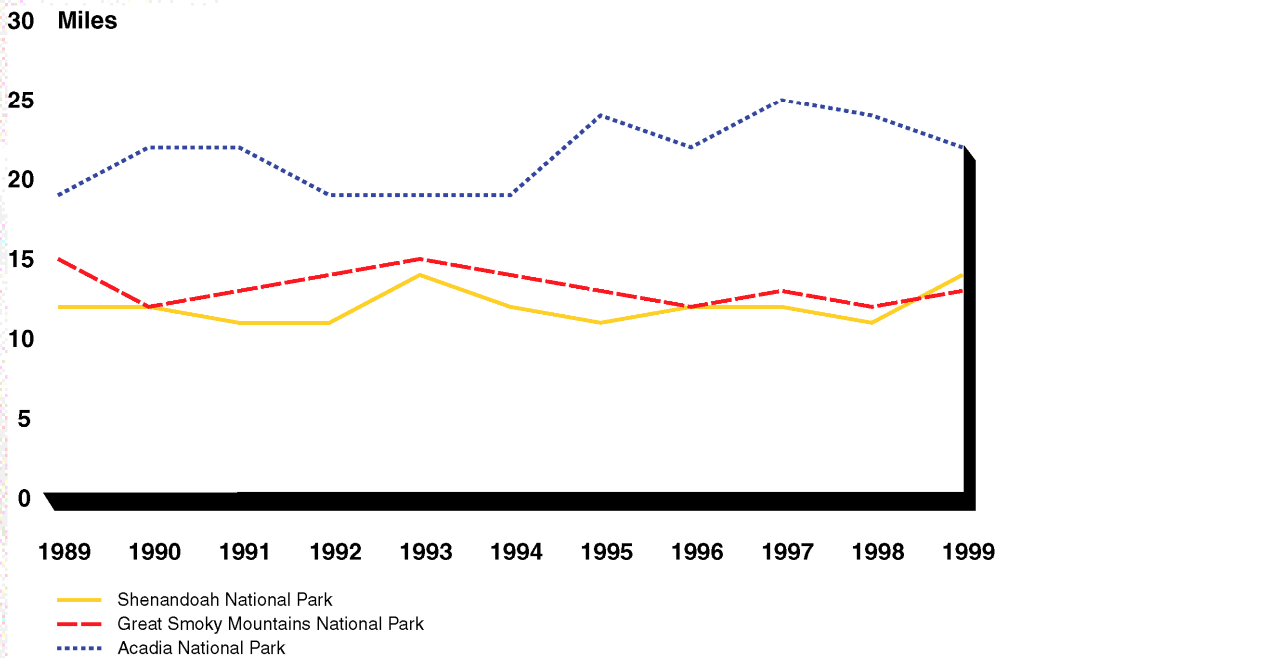
Burning coal to generate electricity and burning gasoline to power our cars and trucks results in emissions of many gases that can harm the environment. This isn't going to be Chemistry 101, but understanding two chemicals is particularly important to our air quality discussion today. First, sulfur dioxide (SO2)—which is generated mostly from coal-fired plants located to the north and west of the park—is closely associated with decreased visibility. Second, nitrogen oxides (NOx)—which come primarily from motor vehicles, but also from power plants—are linked to the formation of potentially health-threatening ozone. Now, for the specifics of our study.

Visibility

Our first question related to visibility trends in the park and the causes of reduced visibility. In general, visibility was poor at the beginning of the 1990s and remained poor through 1999 (the latest data available), according to the National Park Service. For the days with the worst visibility (those ranked in the bottom one-fifth of all days for each year), visibility ranged from between 12 and 15 miles during that decade.

Visibility

Visibility in the Park on the Worst Days Remained Poor During the 1990s



Source: National Park Service

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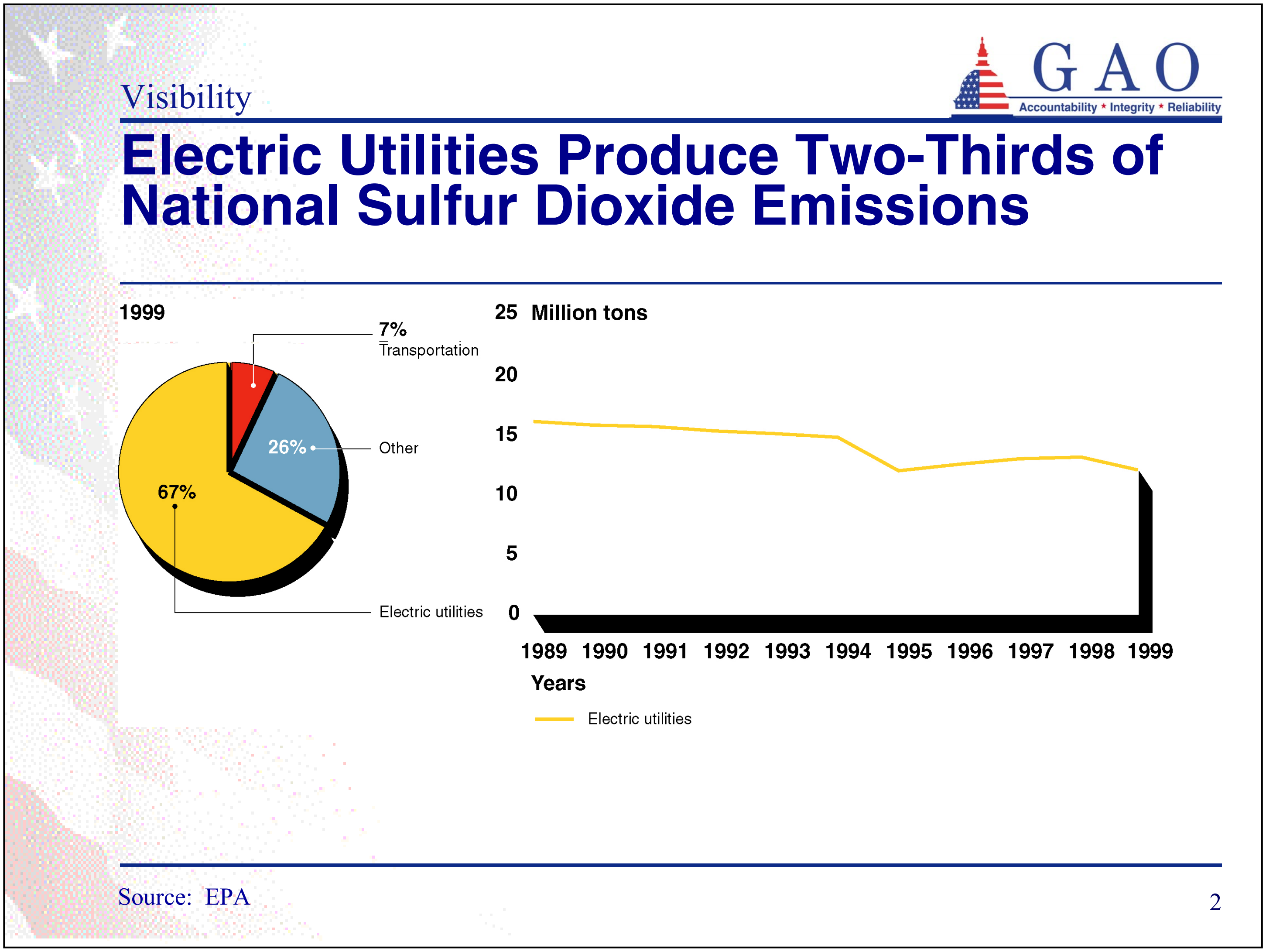
On the best-visibility days in the park, visibility averaged around 51 miles during the 1990s. By contrast, it is estimated that typical visibility in the park—before industrialization—was on the order of 60 to 90 miles. In analyzing visibility, we focused on the worst days—typically hot, humid summer days—because it is on those days that reduced visibility is the most detrimental to enjoyment of the park.

Reduced visibility is caused by small particles in the air that either scatter or absorb light. In the Eastern United States generally, and the park specifically, most of these particles are sulfates. These particles are widely believed to have adverse health effects, and research is underway to more clearly understand how they harm health and which particles are most harmful.

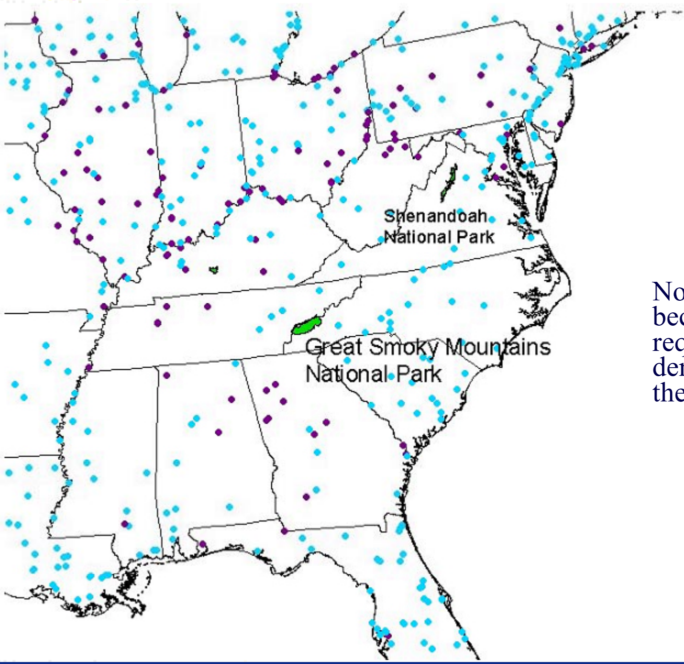
Sulfate particles are formed in the air from emissions of sulfur dioxide gas. Electric utility power plants produce about two-thirds of the nation's sulfur dioxide emissions.



In fact, dozens of power plants are located within the states surrounding the park.

Visibility

Many Power Plants Are Close to the Park



Note: Purple denotes power plants that became subject to new Clean Air Act requirements beginning in 1995. Blue denotes power plants that became subject to these requirements in 2000.

Source: EPA

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We know that many power plants are located in the states near the park, but what do we know about the sources of the sulfates reaching the park? National Park Service analysts recently traced the paths of the air masses that delivered sulfate particles to the park for the 3 days before they reached the park. Their analysis covered May through September in the years 1995 through 1999.

The analysts found that on low-visibility days (that is, days with high levels of particles), the air masses generally started their 3-day journey just a few hundred miles from the park and often followed a roundabout trajectory to get there. The majority of the air masses started over the industrial Midwest, or spent considerable time there, where they could have accumulated substantial quantities of sulfur dioxide from this high-emissions area. A significant minority of high-sulfur air masses arrived from west of the park. Few air masses arrived from the east and south on these low-visibility days.

Ozone

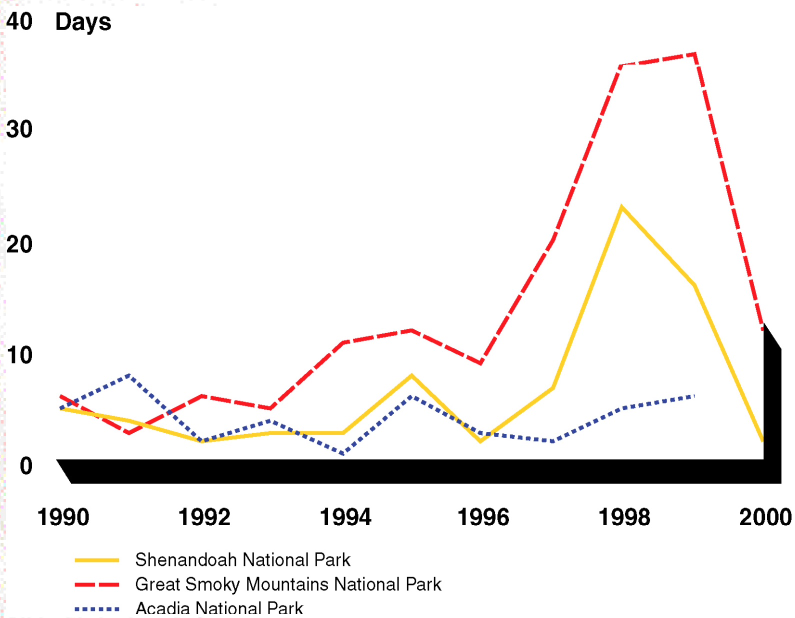
Our second question related to the trend in ozone levels in the park and its causes. Ozone is considered a potential threat to human health, and the Environmental Protection Agency has established a public health standard for the concentration of ozone in the air that we breathe. In addition, exposure to ozone can harm plants, although this was not the focus of our study.

Ozone is not emitted. It is formed from nitrogen oxides and volatile organic compounds in reactions initiated by sunlight. Heat accelerates the chemical processes through which ozone is formed.

We concentrated on days when the ozone level in the park exceeded the federal standard— the standard which is also used by the state of North Carolina. An “exceedance” is recorded on any day when a monitor measures ozone levels that exceed this threshold. The number of “exceedances” in the park varied greatly during the decade.

Ozone

Exceedances of the Ozone Standard in the Park Increased in the 1990s, but Fell Sharply in 2000



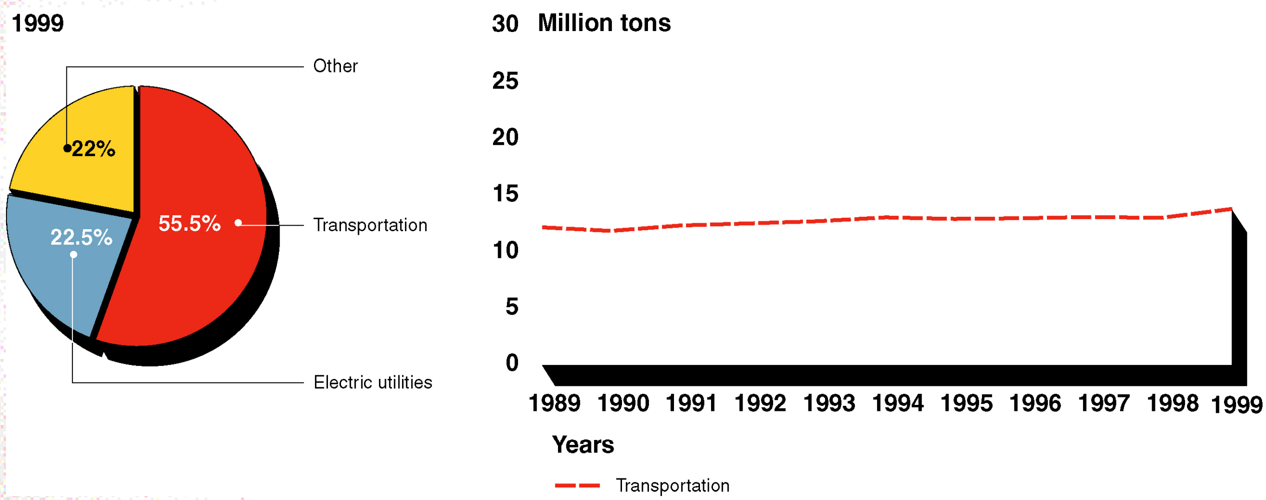
Note: Data for Great Smoky Mountains National Park are for Look Rock

Source: National Park Service for Great Smoky Mountains and Shenandoah for 1999 and 2000; otherwise, EPA 4

During the early 1990s, the number of exceedances in the park gradually rose—to 8 days in 1996. Then there was a strong rise in the number of exceedances to 37 in 1999. Last year, the number fell sharply to 12 days. This decline is believed to be related to last summer's cooler temperatures.

Ozone

The Transportation Sector Produces Over Half of National Nitrogen Oxide Emissions



Source: EPA

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The two chemicals involved in forming ozone stem from diverse sources. More than 50 percent of the nation's nitrogen oxides are produced by the transportation sector—including cars, trucks, farm equipment—and even your gas-powered lawn mower. Nearly another 25 percent come from the electric utility sector.

Volatile organic compounds come from both natural and human sources. Trees release isoprene—the most important natural organic compound for producing ozone in this area—and North Carolina and the other heavily forested southeastern states are particularly rich in isoprene. Human sources of volatile organic compounds include the wide variety of hydrocarbons that result both from fuel evaporating from cars and trucks and from incompletely burned fuel.

According to a recent National Park Service analysis, on high-ozone days, most of the air masses reaching the park arrived from the north and northwest—generally from the industrial Midwest. Fewer air masses arrived from the west and the south, and very few arrived from the east.

Respiratory Illnesses

Our third question related to respiratory health in the areas surrounding the park. We made three choices to keep our analysis manageable:

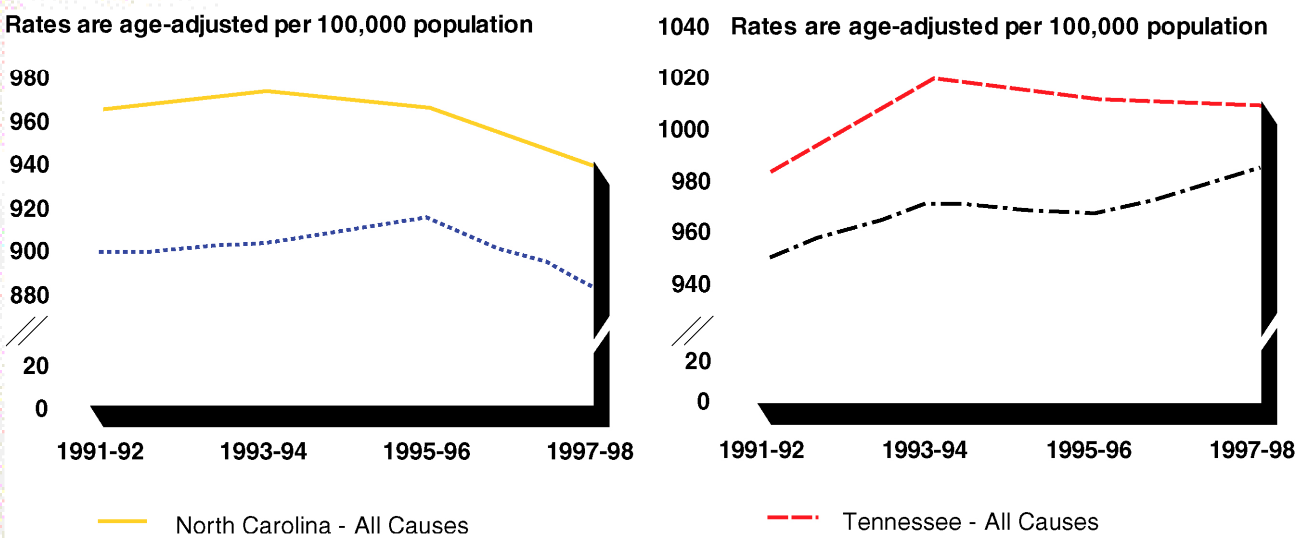
- First, of the many indicators of health conditions, such as hospitalizations, illnesses, and deaths, we chose to focus on deaths because, of all the indicators, only mortality data are available at the county level.
- Second, of the various specific health conditions we could have chosen to analyze, we chose two groups of respiratory illnesses because they have most often been linked to air quality. The two groups are pneumonia/influenza and chronic obstructive pulmonary disease (which we will refer to as chronic lung disease), a term that includes asthma, bronchitis, emphysema, and other chronic lung diseases.
- Third, to specify the areas of North Carolina and Tennessee that are adjacent to the park, we chose the groupings already used by those states. Thus, we used the definition of North Carolina's Department of Environment and Natural Resources for the 19 counties that we label Western North Carolina and Tennessee's Department of Environment and Conservation definition for the 16 counties that we label Eastern Tennessee.

We completed several sets of comparisons, and I'll highlight three of them for you. First, we compared overall death rates for the period from 1991 to 1998 in the states of North Carolina and Tennessee with the overall death rate in the United States as a whole. We found that the rates in each state were somewhat higher than the national rate.

Second, we compared death rates in Western North Carolina and Eastern Tennessee against the comparable rates in each state. For overall deaths, we found that Western North Carolina and Eastern Tennessee had substantially lower rates than their respective states, for the period 1991 through 1998.

Respiratory Illnesses

Death Rates for All Causes Were Lower in Areas Adjacent to the Park Than in Those States as a Whole



Note: Differences in death rates are statistically significant
Source: GAO analysis of unpublished North Carolina and Tennessee data

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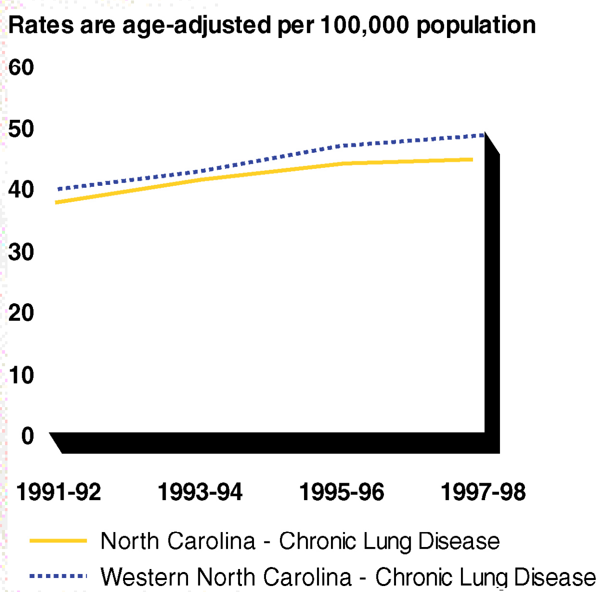
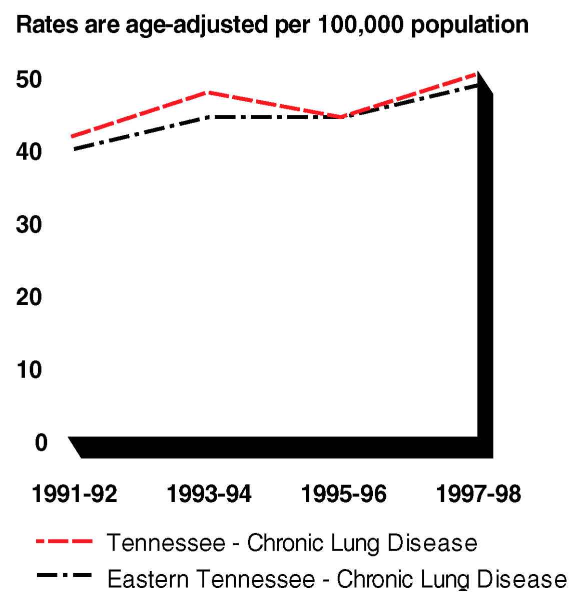
Third, for deaths from respiratory illnesses during the same period, we found that these two regions had slightly higher rates than their respective states.

Respiratory Illnesses

Death Rates for Chronic Lung Disease Increased in North Carolina and Tennessee Between 1991 and 1998





Note: Differences in death rates are statistically significant

Source: GAO analysis of unpublished North Carolina and Tennessee data

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Many factors influence the development and severity of respiratory illnesses, including smoking behavior and exposure to pollutants or allergens. Research is currently ongoing to increase our understanding of the link between exposure to air pollution and respiratory illnesses.

TVA's Plans to Reduce Its Emissions

Our fourth question related to TVA's plans to reduce its emissions of two key air pollutants. As you know, TVA is the largest electric utility in the southeast, serving customers in seven states, including some in North Carolina.

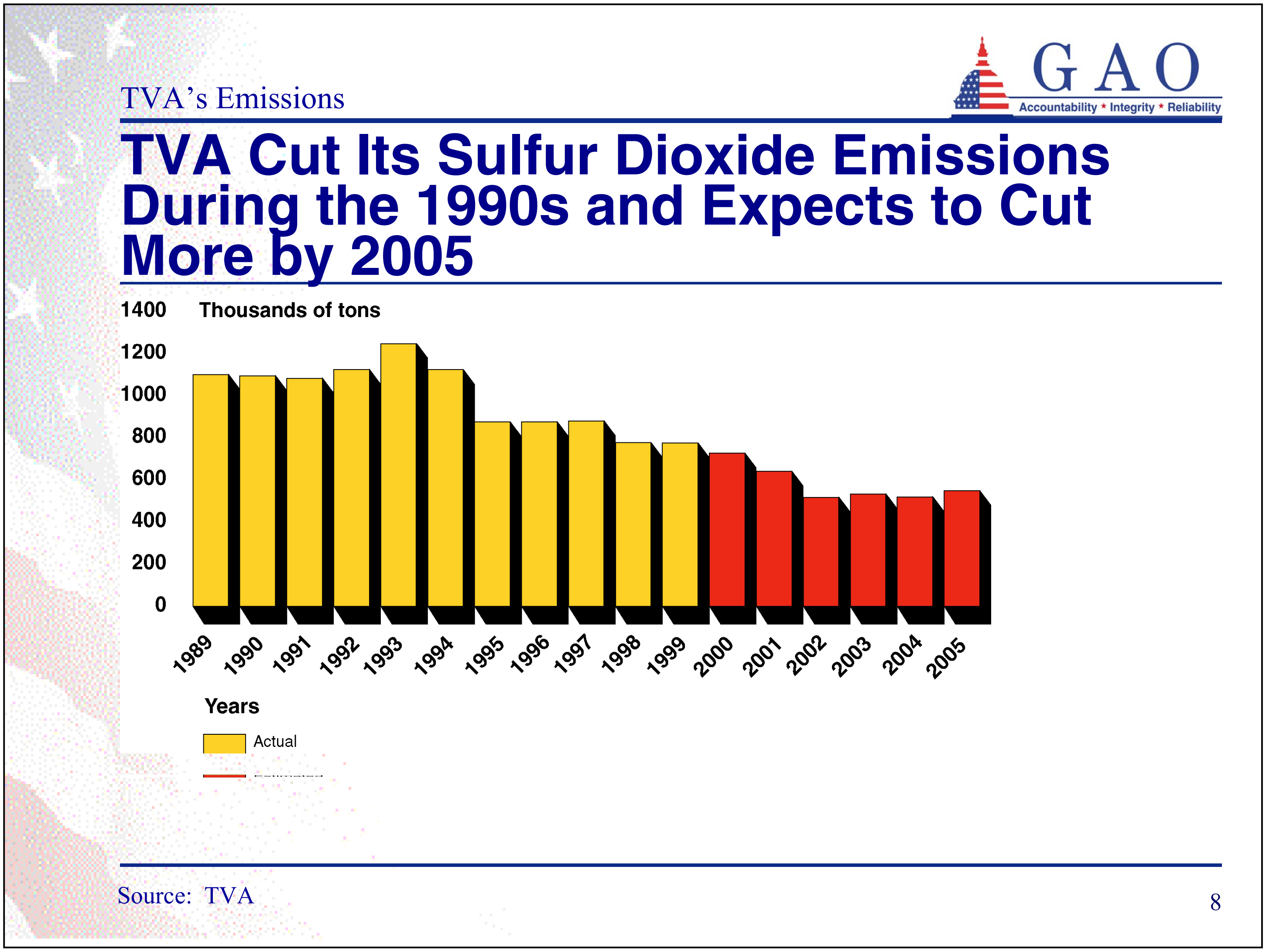
Like other electric utilities, TVA is subject to a range of federal and state laws and regulations. Of particular significance—for TVA and all other utilities that burn coal to generate electricity—is Title IV of the 1990 amendments to the Clean Air Act.

These amendments mandated substantial reductions in emissions of sulfur dioxide (which is linked to reduced visibility, as I discussed earlier) and modest reductions in emissions of nitrogen oxides (which is linked to ozone, as I also discussed).

To generate electricity, TVA relies primarily on burning coal—which accounted for 62 percent of TVA's total generation over the last 5 years. The remaining electricity was generated by nuclear power (28 percent), hydroelectric power (9 percent), and other sources (1 percent).

TVA's total generation of electricity grew about 10 percent between 1992 and 1999. During that period, TVA's consumption of coal increased 18 percent. TVA estimates that the generation trend will continue, with peak generating capacity requirements expected to grow 1.7 percent per year between 1999 and 2010. This is equivalent of adding one new average-sized power plant every year. To meet this challenge, TVA plans to use a combination of strategies, such as purchasing power, constructing new plants, and providing incentives to customers to reduce their peak demand.

TVA's total emissions of sulfur dioxide declined 30 percent between 1989 and 1999. TVA estimates that, as a result of additional steps underway and being planned for the next decade, these emissions will decline an additional 36 percent between 1999 and 2005. Mr. Chairman, your proposed legislation would require a substantially greater reduction in sulfur dioxide emissions by 2005, as shown in the chart.



TVA has taken and plans to take to a number of steps to reduce these emissions. For example,

- TVA will continue to burn coals with lower sulfur content at 51 of its 59 units and
- TVA has installed equipment called "scrubbers" at its three largest plants.

Scrubbers can remove more than 90 percent of the sulfur dioxide from a plant's emissions and are considered the best currently available technology for reducing such emissions.

In looking at TVA's emissions of nitrogen oxides, we focused on the 5-month "ozone season" (May through September) when ozone levels tend to be relatively high and when exceedances tend to occur. TVA's total nitrogen oxide emissions in the 1999 ozone season were about the same as in the 1989 season. TVA projects that its ozone season emissions will decline about 68 percent between 1999 and 2005.

This reduction reflects, among other things, the results of TVA's plans, announced in 1998, to invest nearly $1 billion in pollution-control equipment. Such equipment includes "selective catalytic reduction" devices for nearly one-half of its coal-fired units. These devices transform nitrogen oxide emissions into harmless nitrogen and water vapor. Again, Mr. Chairman, your bill would require a substantial reduction of nitrogen oxides from TVA's current projections for the year 2005.

TVA's Emissions

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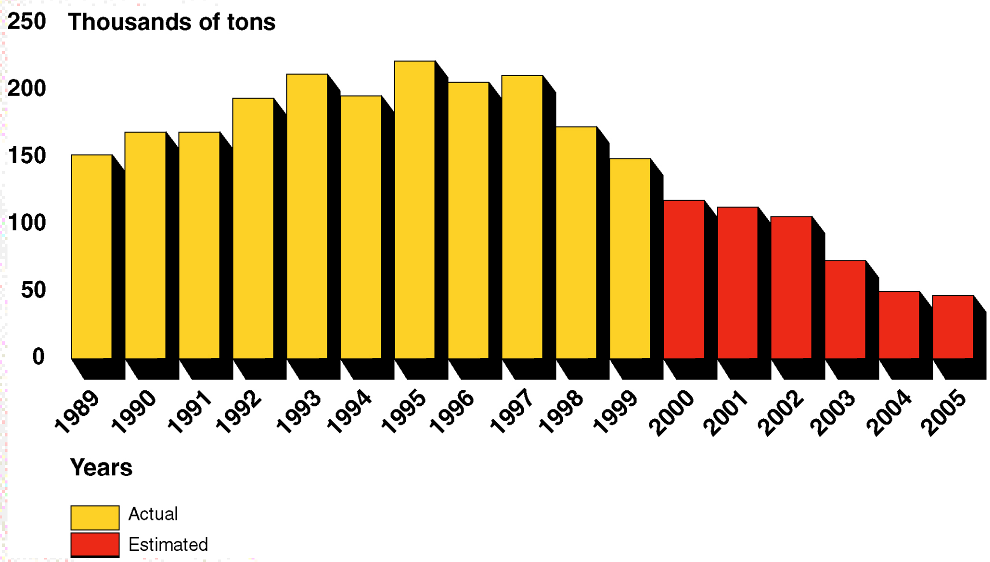
TVA Expects to Cut Its "Ozone-Season" Emissions of Nitrogen Oxides Sharply by 2005



Note: The ozone season is May 1 to September 30
Source: TVA

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In summary, let me just say that you should be commended for your concern about the quality of your air, and for wanting to do something about it. Many Americans in other areas of the country share your concern. The solutions to air pollution, however, are not simple. Balancing our ever-increasing demand for energy with our need to protect the environment for future generations is at the heart of the policy debates now raging in the Congress. We at GAO will continue to work with the Congress to help find solutions for this complex problem.

That concludes my prepared statement, Mr. Chairman. I would be happy to address your questions.