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Limestone and Lime for SO_2 and Pollutant Control in the Ohio Valley

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LIMESTONE AND LIME FOR SO_2 AND POLLUTANT CONTROL IN THE OHIO VALLEY

James C. Cobb and Garland R. Dever, Jr.

General introduction for conference, *Limestone and Lime for SO_2 and Pollutant Control in the Ohio Valley,* held November 29–30 and December 1, 1992, in Lexington, Kentucky

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LIMESTONE AND LIME FOR SO_2 AND POLLUTANT CONTROL IN THE OHIO VALLEY

James C. Cobb and Garland R. Dever, Jr.

The purpose of this conference is to emphasize the importance of limestone resources for controlling SO_2 emissions from coal-fired power plants. We have brought together experts from utilities to describe important factors in limestone performance in scrubbers and from the stone industry to describe important factors in limestone and lime production. Conference speakers include also representatives from research institutes, equipment manufacturers, government agencies, and geological surveys.

The geological surveys of the six Ohio Valley states joined forces with aggregate and crushed-stone associations to organize this conference because each has seen the need for greater research and cooperation in identifying carbonate rocks for scrubbers.

Much attention has been directed toward characterizing the coals that are burned in our power plants, but much less attention has been focused on the carbonate resources that are vital for successful operation of scrubbers.

The impact of the Federal Clean Air Act Amendments of 1990 on the Ohio Valley has brought us to this conference, although the earlier 1970 and 1977 clean air amendments started the use of scrubbers and interest in scrubber limestone.

This introduction is to set the stage for the conference by giving some basic facts about electrical power, coal, and limestone that are important to the Ohio Valley states participating in this conference. The information was compiled from state and federal sources.

Coal-fired power plants are of great importance to the Ohio Valley and the Nation. States in the Ohio Valley have approximately 140 coal-fired power plants and many times that number of coal-fired industrial boilers within their borders (Fig. 1). There are about 37 coal-fired power plants along the Ohio River itself.

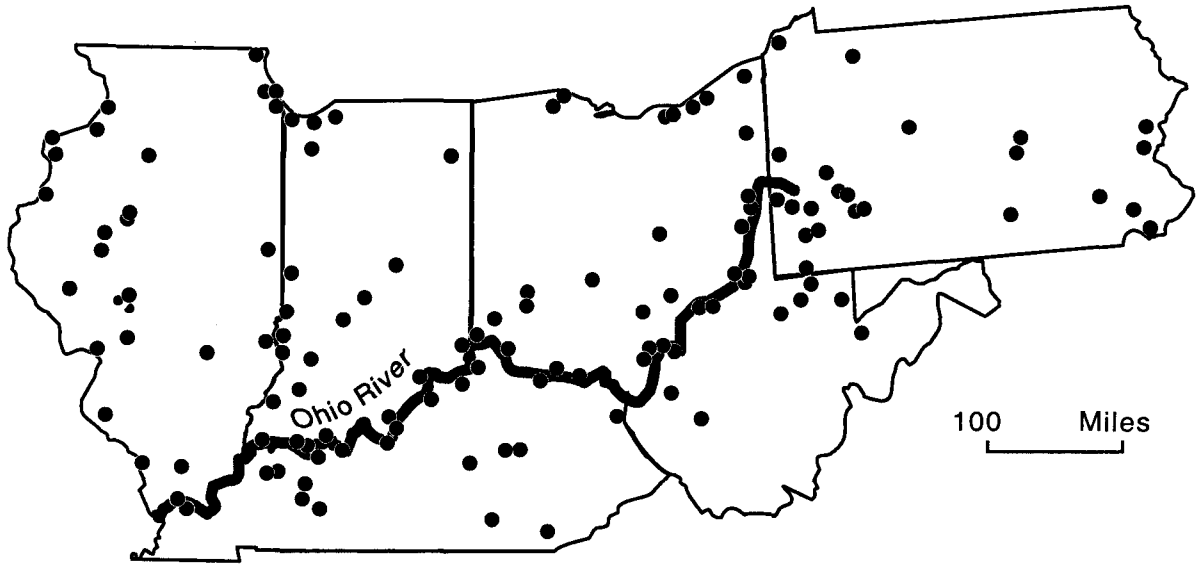

Figure 1. Coal-fired power plants in the Ohio Valley.

Coal-fired plants generate 57 percent of the electrical power produced in the United States. The plants in the Ohio Valley account for a very substantial part of the total.

The reason for the large use of coal in the Ohio Valley is its availability. The Ohio River flows through the two largest coal basins east of the Mississippi River—the Appalachian Basin and the Illinois Basin. Billions of tons of coal have been mined from these basins, and a very substantial reserve of coal remains (Fig. 2). The states of the Ohio Valley produce more than half of all the coal mined in the United States. However, the greatest percentage of remaining coal is high in sulfur content.

Illinois, Indiana, western Kentucky, Ohio, and parts of Pennsylvania and West Virginia all have abundant deposits of coal with sulfur contents in the range of 2.5 to 5.0 percent. Lower sulfur coals occur in some areas of the region but are not as abundant.

The states of the Ohio Valley generate 23,600 megawatts of electricity from coal-fired units with scrubbers (Fig. 3). These states have 50 scrubbers currently in operation (Fig. 4). The growing experience of utilities in using limestone for flue-gas desulfurization will be brought out in this conference. The generating capacity of fluidized bed combusters also is growing. Ohio has 75 megawatts; Kentucky, 160 megawatts; West Virginia, 209 megawatts; Pennsylvania, about 500 megawatts (Fig. 5).

Limestone resources, similar to coal resources, are generously distributed through the Ohio Valley region (Fig. 6). These carbonate resources are of Ordovician, Silurian–Devonian, Mississippian, and Pennsylvanian ages. They are highly varied in chemical content and mineralogy. They include both limestone and dolomite. During the conference, the chemical and physical specifications for carbonate rocks used in scrubbers will be discussed. The six state geological surveys have abundant data on the chemical and physical characteristics of these carbonate resources. However, because of the great areal extent of the resources, characterization data may not be available for all sites of interest.

The crushed stone production from the Ohio Valley region in 1991 was 280.4 million tons, which was 25 percent of the United States total (Fig. 7). This is a measure of the potential for scrubber stone production as well. The limestone consumption for scrubbers in this region was 1.9 million tons in 1991, and for lime it was also 1.9 million tons (Fig. 8).

Limestone is a common rock formed in marine environments, mainly by the activity of animals producing shells composed of calcium carbonate—calcite and aragonite. Over the course of thousands to millions of years these carbonate sediments accumulate on the seafloor, eventually forming limestone.

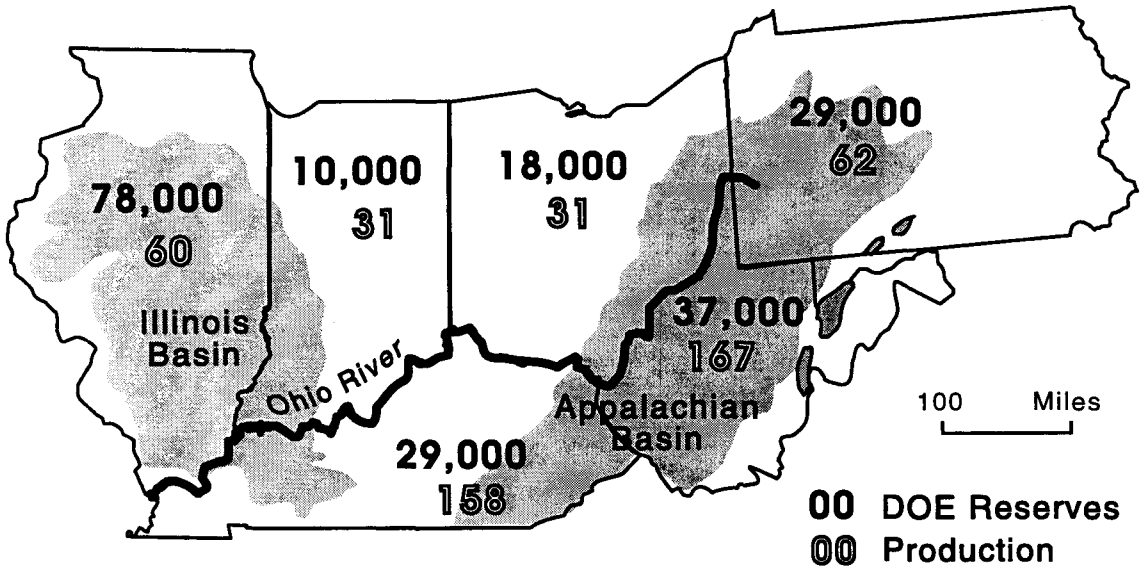

Figure 2. Coal production in the Ohio Valley in 1991 and coal reserves calculated by the U.S. Department of Energy.

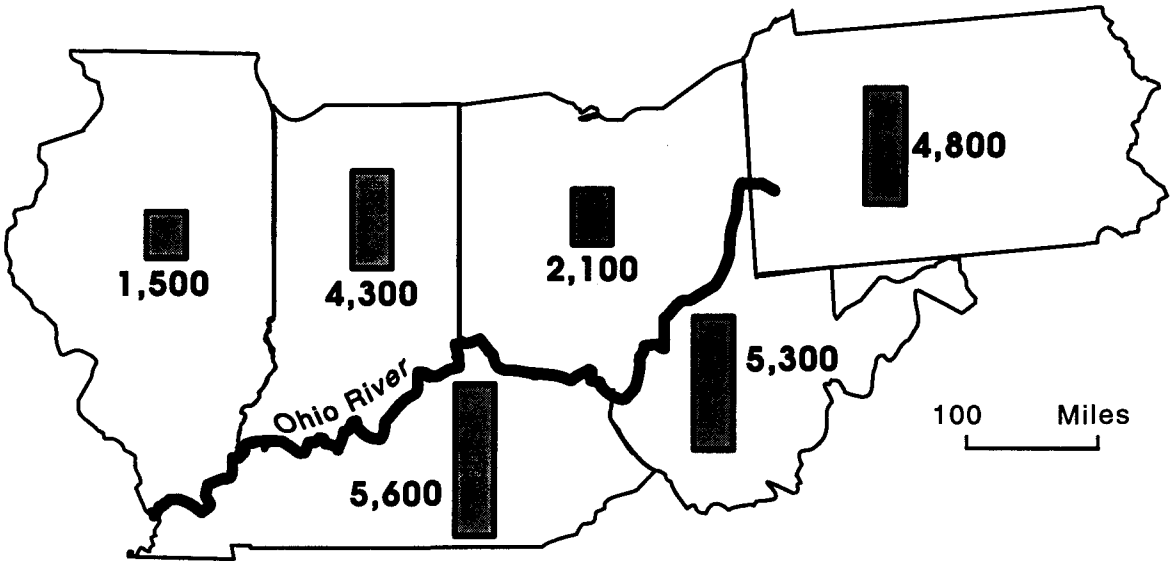

Figure 3. Generating capacity (in megawatts) of coal-fired power plants with scrubbers in the Ohio Valley in 1991.

Geologic models have been created to help locate ore deposits, coal deposits, and petroleum deposits. Similarly, geologic models can be developed to explore for scrubber stone and to aid in the development of deposits already under production, once the specifications are developed.

The Kentucky Geological Survey published its first limestone analysis in 1856. It was also the first year that analyses of coal, including the sulfur contents of coals, were published. Dr. Robert Peter, a medical doctor from Lexington, performed the analyses, becoming the first State Geochemist. He was an assistant to David Dale Owen, Kentucky's second State Geologist. The

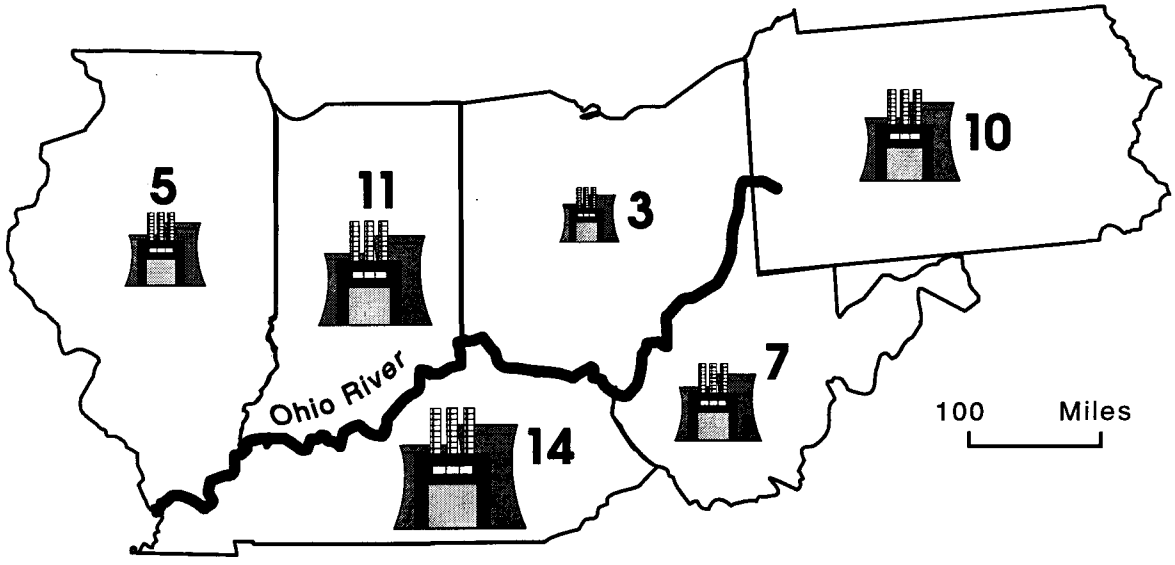

Figure 4. Generating units with scrubbers in the Ohio Valley in 1991.

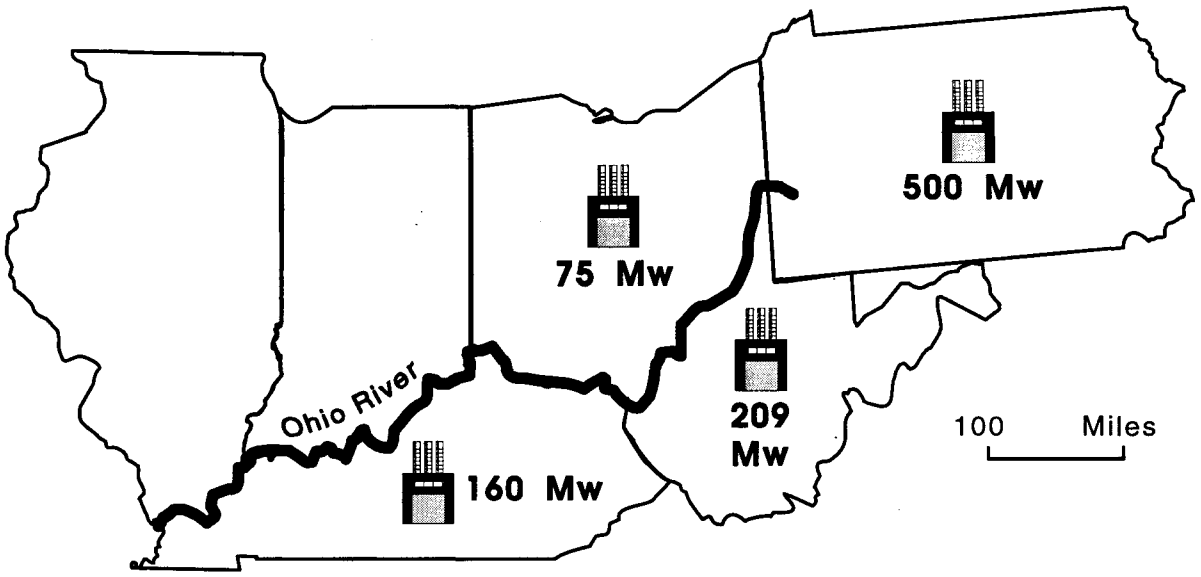

Figure 5. Generating capacity (in megawatts) of fluidized-bed combustion units in the Ohio Valley in 1991.

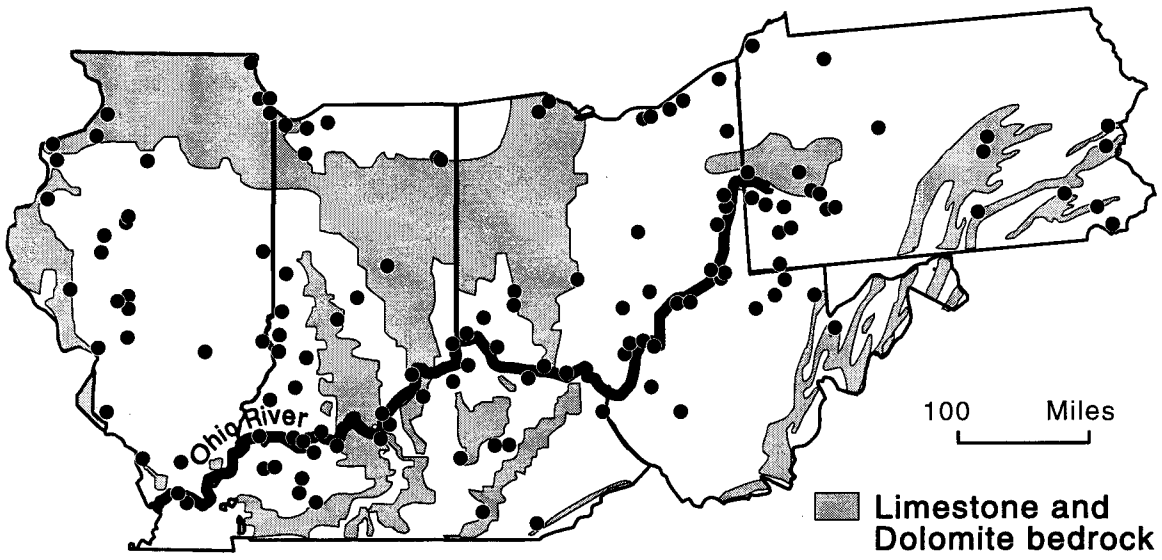

Figure 6. Limestone and dolomite resources and power plants in the Ohio Valley.

histories of resource characterization in other states of the region are similar. Each geological survey in the Ohio Valley has large amounts of data and extensive knowledge about limestone and dolomite resources and should be consulted by industries seeking such information.

This conference is a public-service effort by the geological surveys and stone producers of the six Ohio Valley states to provide a much better understanding of both scrubbing systems and the availability of limestone resources needed for the scrubbers.

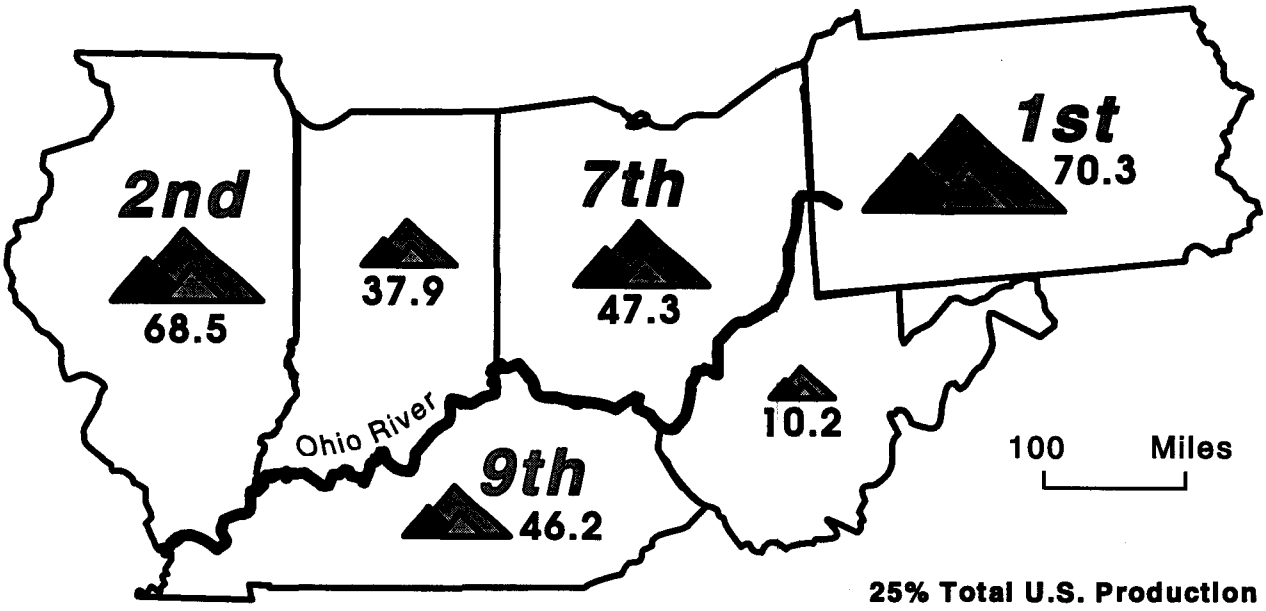

Figure 7. Crushed stone production (in millions of short tons) in the Ohio Valley in 1991, and U.S. rankings.

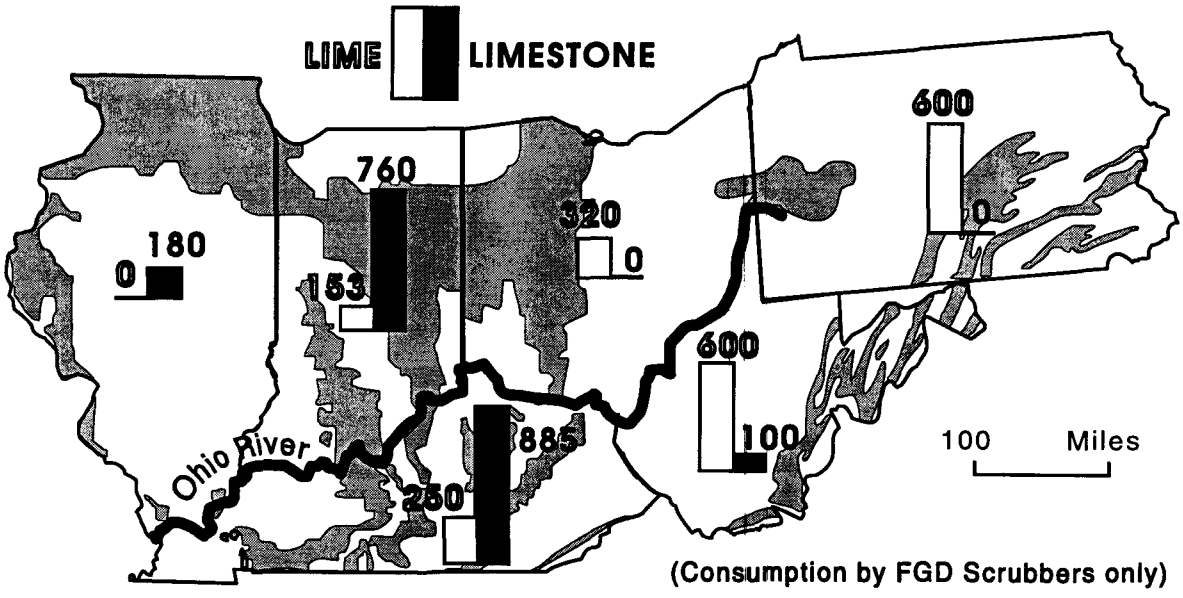

Figure 8. Consumption of limestone and lime sorbents (thousands of tons per year) in the Ohio Valley in 1991.