

fully developed methods of bridging the gap between air quality standards and source emission standards.

Our methods are particularly deficient for that very situation in which air pollution is most critical—the multiple source or urban situation. For suspended particulate matter we can approximate the transition using emission inventory techniques. The particulate matter emitted from each source in an area can be estimated, and from a comparison between the overall estimate and the air quality standard a percentage reduction can be calculated. For some gases and fine particles computer programs have been written to accommodate a large number of sources of different categories, to take into account varying times of maximum emissions, and to take into account varying meteorological conditions. However, these programs require a wealth of data, and they have not been developed to the point where they will accommodate reactions between pollutants after they leave the source, such as the reactions which result in photochemical smog, and they will not accommodate particulate matter that falls out, or nuisances, such as odors, which usually emanate from a single source.

Mr. Chairman, this concludes my review of some of the problems associated with our present technology for controlling air pollution. I would like finally to briefly describe for you some of the forms and the extent of Federal Government efforts to advance that technology.

The functions of conducting and supporting research have been an integral part of our Department's air pollution activities ever since the establishment of the Federal air pollution program in 1955. In fiscal year 1966, which ended on June 30, about \$14 million was invested in research activities. This sum represented some 55 percent of the funds appropriated for the air pollution program. For the current fiscal year, our budget requests includes about \$18 million for research activities.

Of the total for fiscal 1966, about 30 percent was allocated for research in our own facilities, mostly at the Robert A. Taft Sanitary Engineering Center in Cincinnati. About 10 percent was used to support research by other Federal agencies—the Environmental Sciences Services Administration and the National Bureau of Standards of the Department of Commerce, the Bureau of Mines of the Department of the Interior, and the Tennessee Valley Authority. Contracts with non-Federal institutions and agencies, including industrial firms, account for 20 percent. The largest single portion, about 40 percent, was awarded to nonprofit institutions, mostly universities, to support needed research projects.

This research effort includes a broad range of investigations of the nature, extent, sources, effects, and control of air pollution, and the scientific disciplines involved include many branches of the physical and biological sciences. Among the more important elements of the program are laboratory studies of the adverse effects of air pollutants on animals and clinical studies of effects on man, epidemiological and statistical studies of the occurrence of illness and death in relation to various measurements of air pollution, field investigations of the effects of pollutants on materials and structures, engineering investigations of the nature and control of pollution from such major sources as motor vehicles, fuel combustion, and manufacturing activities, and studies in the social sciences.