

With respect to question A(1), what should our basic goals and standards be? The standards set by the State, Federal, and local health agencies are based on factors such as effects on plants, animals, humans, and the general sociology of the area.

The Bureau does advise, on the basis of our research, as to whether standards can be met with available resources; preferably at the lowest total cost to the public.

If, for example, the public agency decides from a public health standpoint as to the maximum amount of sulfur compounds it should permit as emissions from fuel-burning appliances, the Bureau can advise them as to the impact of such a regulation on the availability of fuel resources.

Our goal in general is to assure the Nation of an adequate supply of minerals and mineral fuels to support the growth of the national economy while maintaining or improving the quality of our environment.

In response to question 2, and particularly with respect to waste management systems, we doubt very seriously whether new technological developments can proceed without effective systems management development. We have applied this approach to our automobile exhaust studies, and we are convinced the rewards will be great, even though our investigations are concerned with only a small part of the overall problem.

Another example of the systems approach is the strip and surface mine study authorized in the Appalachian Regional Development Act of 1965 where we are studying the entire national problem before deciding on an approach to its solution.

The preliminary interim report of this study is in the Government Printing Office and will be available about September 1.

MR. DADDARIO. Could you go into a little more detail as to how you used your systems management analyses in your automobile exhaust studies and as to why you believe it offers such a favorable prospect?

DR. HIBBARD. This will be discussed a little bit later on in my testimony. In general we believe that the total problem consists of looking at the fuel and the fuel utilization device; that is, the fuel utilization system, and not necessarily confining it say to an internal combustion engine as we know it today. The exhaust is effluent from the system in relation to the function of the device with respect to the transmission of power by conversion from liquid fuel to a mechanical device. In general we look at this total system with all the variables, and there are some 25 of them. For example, if you change the carburetion or change the fuel or change the additives in the fuel, it is probable that there will be interaction between variables, and you can't really look at each one independently. We believe that the second part of this input has to do with a more detailed knowledge of the harmful aspects of the engine exhaust effluent.

We know, for example, that it consists of unburned hydrocarbons which in themselves are evidence of inefficient burning process in the engine and we know that improved efficiency of fuels combustion will help this situation.

We know that we have carbon dioxide, carbon monoxide—carbon dioxide, because it is the product of complete combustion—and nitrogen