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THE ENGINEER VS. THE EPIDEMIOLOGIST: THE PLACE OF AIR QUALITY STANDARDS IN THE REGULATION OF AIR POLLUTION

By Philip K. Verleger❖

California has the dubious privilege of being the pioneer in air pollution regulation. It was the first state to feel the pain of the problem on a large scale, and made the first attempts at a solution. Its experiences warrant examination as control of emissions increasingly becomes the subject of national attention. This paper will be concerned with a particular device—the Air Quality Standard—as that instrument was developed in California and adopted nationally.

Modern procedures of air pollution control had their birth with the discovery of “smog” in Los Angeles, during World War II and the years immediately following. Los Angeles smog was initially very much of a mystery. Most air pollution problems observed up until that date were associated either with smoke, or with some sort of heavy industry. While Los Angeles has fog, it does not have much visible air pollution on overcast days. As contrasted with cities like Pittsburgh and St. Louis, which achieved cleaner air by controlling the burning of soft coal, Los Angeles was initially a very clean city, heated in the winter not by coal but by natural gas.

Although “conventional” air pollution was largely absent in Los Angeles, the first efforts to solve the problem attempted to use conventional techniques. The first were local ordinances against smoke and “harmful” air pollution. Enforcement of those ordinances, to the extent practical, did not alleviate the problem.

At that early stage, it was recognized that one problem in combatting air pollution was the lack of a single political jurisdiction with area-wide powers.¹ Although the Basin is inhabited by a

continuous belt of population, Los Angeles consists, not of a single city, but of a number, none of which could legislate outside its own borders. A solution to this problem was found by the adoption of State legislation permitting each County, which did include most of the then relevant area, to constitute itself, an "Air Pollution Control District", in legal theory, an administrative agency of the State, with rule-making powers.² Violation of the rules was made a misdemeanor. The District was authorized to require a permit for the installation or construction of equipment capable of causing air pollution, a power which has been exercised.³

From the beginning, both in its regulations and in the exercise of the permit power, the Los Angeles District has aimed, basically, at getting the maximum of control available, within the limits of available engineering skills, for any operation carried on within the District. It did not attempt first to determine what the level of emission was that caused the problem, and then to adopt regulations directed at bringing emissions down to a level below that. Indeed, since there was no basic theory available in 1947, when the District started, no such approach was possible. Nonetheless, it embarked on a vigorous program of regulation, adopting rules restricting emission of combustion contaminants (soot, dust, and particles of any sort), regulating the sulfur content of fuels burned,⁴ and, with the development of the theory of photochemical smog, restricting the escape of vapors from refining and distribution of gasoline and the use of solvents. With the discovery of that theory, which will shortly be defined, regulatory emphasis in California gradually passed from the County to the State level, and at that point, the concept of "standards" was first developed.

First, a brief description of the photochemical theory itself. It was developed by Dr. Arie Haagen-Smit of California Institute of Technology, between 1950 and 1953.⁵ Generally, it states that gasoline vapors (and other hydrocarbon vapors—from paint thinners, solvents and like products) are stimulated by sunlight to react with oxides of nitrogen and form a family of irritants and a brown haze. The oxides of nitrogen are formed by any process of combustion. Air is roughly 20% oxygen and 80% nitrogen, and in a hot enough flame, the nitrogen oxidizes. The hydrocarbons, it was thought, escape from automobiles, from the refining and

distribution of petroleum, from the use of solvents, and from other sources.

Once the photochemical theory was known, the automobile came to be viewed as a significant source of pollution in California. And, because of the mobility of the automobile, regulatory emphasis shifted from the County to the State level, just as it has now shifted in considerable degree to the national level. And for the first time anywhere, so far as this writer knows, "air quality standards" were provided for as a preliminary to actual regulation in the California legislation then adopted.

Basically, the California Department of Public Health was required to fix standards for air quality, by relating the concentration of particular contaminants to effects on plant life, visibility, and human health.⁶ The State Department of Public Health then reviewed the available literature and fixed standards at the "adverse", "serious", and "emergency" levels. In general, the adverse level was characterized by what might be called "cosmetic effects"—irritation of a minor nature, the effect on visibility, or the like.⁷ The "serious" level was characterized by injury to plants and effects on human functions.⁸ The last category involved definable dangers to health.⁹ Levels were fixed in each category for sulfur dioxide, the "photochemical complex" carbon monoxide, and particulates.¹⁰ The legislature then adopted laws providing for the regulation of exhaust emissions from automobiles, with the object of achieving the reduction of contaminant levels, where they exceeded those permitted by the air quality standards. This was to be accomplished by the certification of devices, and a provision that when new devices were certified, all new automobiles sold in the state must be equipped with them. This is the legal authority under which California first required installation of controls on automobiles.¹¹

Other states became interested in air pollution fairly soon after California. New York has a statute that is similar, although somewhat more complex, than California. It provides for the creation of standards which will vary from area to area depending on whether it is urban, rural, or semi-rural, and standards are prescribed for each set of conditions. But there is a similarity in the broad structure. And, when, with the adoption of the Clean Air Act, the Federal Government passed from an advisory and fund-providing agency to a regulatory one, somewhat similar provisions were used.¹² Under the Clean Air Act, the

Department of Health, Education & Welfare has adopted "criteria" for the quality of air.¹³ States are then required to develop programs, including standards, and regulations aimed at reaching those standards, which will hopefully have the effect of implementing the criteria.¹⁴ In the case of automobiles, the task of implementing the criteria is that of the Federal authority as well, because with certain exceptions applicable to California only, the Federal Government has preempted the automobile field.¹⁵

Many lawyers active in the pollution field initially felt that the basic legislation outlined above was an enormous improvement over prior arrangements for control of air pollution. Up until that time, the tendency was either to be "against" air pollution, or to be essentially indifferent to it. Those who felt that there was a need for control tended to be indiscriminate in their approach. Those who were opposed tended in general terms to minimize the problem. Certainly this author had the feeling that the standards ought to provide a tool for a more precise and discriminating attack on those forms of air pollution which were of consequence. Overall, that expectation has been a disappointment. There is a basic reason for the disappointment. It is the overwhelming tendency to set the standards or criteria at levels which are so low as to make them essentially meaningless.

This stems, at least in part, from the procedure followed, in setting them. In the early years of air pollution control, guidance was obtained primarily from experience in the industrial accident field. The National Association of Industrial Hygienists regularly adopts standards for gases in working areas, which are used as guides by most Industrial Accident Commissions in setting permissible levels for safety. It has been assumed, however, that those standards related to an essentially healthy population, exposed for only eight hours a day, and therefore that they are not a suitable guide for standards which must affect larger populations including the infirm, the very young, and the very old, which might be exposed to a particular gas for 24 hours a day. Therefore, when the California standards were initially adopted, efforts were made to find other guides. However, the basic effort was to find a point at which the material had some effect of perceptible significance on some definable portion of the population, or on some definable form of vegetation.

Paralleling this work at the regulatory level, pathologists, toxicologists, and other medical researchers were more or less

continually attempting to find ways of detecting effects of various gases at lower and lower levels. As an example, the posited effect of carbon monoxide is the impairment of the ability of the blood to transport oxygen. CO is more readily attracted to hemoglobin than oxygen with the result that in an atmosphere containing too much carbon monoxide, a significant portion of the hemoglobin (the oxygen carrying material of the blood) does not reform its function and illness or death may follow.

If one is seeking the lowest level at which there is any effect it is doubtless true that a single molecule of CO would immobilize a single cell of hemoglobin. While measurement of an effect at that level is hardly likely to be possible, there has been a continuous effort to show some impact, however small, which can be detected from particular atmospheres of the gas. And in general, the Department of Health, Education, & Welfare has been fairly consistent, in formulating its criteria, in treating the lowest level at which anyone has claimed the ability to detect such an effect, as critical for criteria purposes. This is fixed as a level which should not be exceeded in the atmosphere, sometimes with a margin as well.¹⁶ The consequence is that the criteria are certain continually to become stricter with the passage of time, because the decisive factor in the formulation of criteria is not the presence of actual harmful effects, but the ingenuity of medical experimenters in finding test methods which show an effect, whether significant or insignificant.

Thus, in the original California standards, the "serious" level for carbon monoxide was set at 30 parts per million for eight hours.¹⁷ There was no "adverse" level. The theoretical basis for fixing it at this level was that such a level would cause an interference with oxygen transportation and, in a person with a bad heart, this might conceivably affect his health.¹⁸

The criteria promulgated by HEW, however, suggest a level of 12 to 17 parts per million for eight hours. This is based, not on assumption of effect on the health of the patient with a heart condition, but rather on some experiments which were claimed to demonstrate an effect in "time interval discrimination."¹⁹

We are not concerned here with the merits or faults of that particular standard. We are concerned with the effect of fixing criteria on a continuously declining basis, resting always on the ingenuity of the latest medical researcher, who, by a new subtlety

of instrumentation or testing technique, finds a difference in measurements where none has been noted before. The consequence is to assure that the "criteria," and therefore, the "standards," will always continue to decline. In turn, this results in an effective guarantee that whatever level of achievement is in fact accomplished, air pollution problems will never be "solved" because as progress in reducing the emission of contaminants is achieved, the target will continuously be moved further away.

With some deference, it is submitted that it will be necessary to depart from the idea of using *any* "effect" as criterion and that some appraisal of the significance of the effect will be needed. Otherwise, industry and other potential polluters will be forced to take expensive measures and perhaps, to reduce their output of goods and services with no actual benefit arising to men or to the environment. Such a level of pollution prevention cannot be considered either valid governmental policy or a sound allocation of resources.



FOOTNOTES

* Member of the California Bar. A. B., University of California, 1940; LL. B. University of California, 1943.

¹ H. W. Kennedy, *The History, Legal And Administrative Aspects Of Air Pollution Control In The County Of Los Angeles*, Report to Board of Supervisors, May 9, 1954, 6-8.

² *Id.*, p. 9.

³ California Health & Safety Code, Sec. 24263.

⁴ Kennedy, *supra*, p. 16.

⁵ See Haagen-Smit, *Chemistry and Physiology of Los Angeles Smog*, 44 *Ind. & Eng. Chem.* 1342 (1952).

⁶ Former California Health & Safety Code, Sec. 426.1. The development of the standards is described by Goldsmith, 4 *Archives of Env. Health*, pp. 151-2 (1962).

⁷ 17 Calif. Admin. Code, Sec. 30501.

⁸ *Ibid.*

⁹ *Ibid.*

¹⁰ *Ibid.*

¹¹ 1961 Cal. Stats., ch. 23, sec. 1 (Former Health & Safety Code, Sections 24389 and 24390).

¹² 42 U.S.C. Sec. 1857, *et seq.*

¹³ 42 U.S.C. Sec. 1857c 2(b).

¹⁴ 42 U.S.C. Sec. 1857d.

¹⁵ 42 U.S.C. Sec. 1857f.

¹⁶ *Air Quality Criteria For Carbon Monoxide*, U.S. Dept. of Health, Education & Welfare, National Air Pollution Control Administration Pub. No. AP-62, p. 10-6 (hereafter *CO Criteria*).

¹⁷ 17 Cal. Adm. Code, Sec. 30501.

¹⁸ *CO Criteria*, p. 106.

¹⁹ *CO Criteria*, p. 8-19, *id.*, 10-6. The tests involved only a few subjects, and results by different investigators appear to conflict.