ILLINOIS POLLUTION CONTROL BOARD
March 30, 1978

IN THE MATTER OF:	)	
	)	
AMENDMENTS TO THE ILLINOIS AIR POLLUTION EPISODE REGULATIONS	)	R75-4

SUPPLEMENTAL OPINION OF THE BOARD (by Mr. Goodman):*

On April 9, 1976 the Illinois Pollution Control Board (Board) adopted an Interim Opinion in this proceeding. 21 PCB 169. In that Opinion the Board stated its reasons in support of the Regulation as adopted, including its reasons for providing that the Regulation take effect without delay. Pursuant to §27(b) of the Illinois Environmental Protection Act (Act), Ch. 111-1/2 Ill.Rev.Stat. §1027(b) (1975), the Board conducted hearings on the economic impact of the new Regulation while the new Regulation continued in effect. These hearings were held August 2, 1977 in Chicago and August 24, 1977 in Springfield.

Most of the testimony given at the August 2 and August 24 hearings dealt with the economic impact study published by the Illinois Institute for Environmental Quality, IIEQ Document No. 77/04, "Cost/Effectiveness of the Illinois Ozone Episode Regulation." This study was prepared pursuant to §6(b), (d) of the Act, Ch. 111-1/2 Ill.Rev.Stat. §1006(b), (d) (1975), and attempted to quantify the social costs and ozone precursor reductions attributable to the instant Regulation (**R.6; Ex. 64, p.1). The author of the study, Dr. Alan Cohen, claimed order-of-magnitude accuracy (R.36; Ex. 64, p.11).

Benefits of the traditional sort were not estimated. For example, a common benefit estimation technique entails using some sort of damage function which relates changes in the ambient concentration of a given pollutant to a given indicator. The indicator may be such a thing as hospital-days, mortality rates, or, most commonly, dollars. This type of analysis is not possible with ozone. Ozone, unlike other pollutants, is formed in the air. Meteorology greatly influences the distribution of ozone, and the fraction of local ambient ozone obtained from local emissions will in part determine the effectiveness of a

* The Board acknowledges the assistance of Ken F. Kirkpatrick, Administrative Assistant to the Board, in the preparation and drafting of this Supplemental Opinion.

** In this Opinion "R" refers to the economic impact hearings; "T" refers to all other hearings.

control action reducing local precursor emissions. Ozone transport is not completely understood and thus the effect on ambient ozone levels in one Air Quality Control Region caused by initiation of control actions in another Region (see Rule 402(f)) would be difficult or impossible to accurately predict. The above illustrate the uncertain nature of the relationship between precursor reductions and ozone levels.

The basic approach used in the economic impact study was to divide the Regulation into 22 separate control actions and perform an analysis of each action. It was emphasized that the 22 actions are not independent and that to estimate costs and precursor reductions of each episode stage required further analysis (R.6; Ex. 64, p.283).

Several key assumptions used in the study should be noted. It was assumed that production and consumption totals would not change (R.11) and that the adjustments made to keep these totals despite episodes are the primary costs attributable to the Regulation (R.11). Full employment was assumed (R.101) and delayed production was assumed to use overtime labor (R.24; Ex. 64, pp.123, 248, 272, 289, 296, 314). Episodes generally were assumed to occur on weekdays and assumed to begin at the start of a workday (Ex. 64, p.11). Certain emission reduction estimates assume otherwise, either implicitly (Ex. 64, p.134) or explicitly (Ex. 64, p.298). The Chicago Standard Metropolitan Statistical Area (SMSA) was used as the study area (Ex. 64, p.7), and it was assumed that results for Illinois could be calculated by scaling up Chicago SMSA results by a factor of 1.48. (Ex. 64, p.5, footnote d; p.301). Voluntary reductions in consumption were viewed as social costs. (Ex. 64, pp.2, 18, 286, 292, 295, 315). The Board also notes the statement of the author of the study, "I tend to overestimate costs and underestimate benefits" (R.115).

As mentioned above, an estimation of the costs and emission reductions of each episode stage required more than a simple summing of the applicable control actions. Such an estimation was made for various episode lengths (Ex. 64, pp.283-298). An ozone Advisory is estimated to have a social cost comprised solely of diverted broadcast time used for public notification. Precursor reductions were assumed to be insignificant.* The social costs of a Yellow Alert were estimated (Ex. 64, pp.284-286). Notification costs and the costs associated with a voluntary reduction in electricity consumption constitute over 90% of the total cost of a Yellow Alert (Ex. 64, p.285, Table 25.2).

*This estimation emphasizes that this study does not estimate benefits in the traditional sense. Notification at the advisory level obviously benefits susceptible individuals despite the fact that there may be no reduction in precursor emissions.

When the ozone concentration reaches 0.3 ppm, the next episode stage, a Red Alert, is reached. This is the level at which the health of the entire population is adversely affected and the level at which emission reductions will affect ozone formation. Both costs and emission reductions are significantly higher than they are for the Yellow Alert (Ex. 64, p.288, Table 25.6). The most significant single cost by far is overtime adjustment, comprising over 70% of the total costs of a one day Red Alert (Ex. 64, p.288, Table 25.6). The overtime adjustment cost is the sum of the costs to the manufacturing, waste collection, and transportation and utilities industries of making up for lost production (Ex. 64, p.291). Large manufacturing firms are assumed to need an additional day after an episode to start up operations (Ex. 64, p.289). The Emergency level of 0.5 ppm will activate all control actions, resulting in the greatest social cost and largest precursor emission reductions. Again the overtime adjustment component is the most significant cost, being over 75% of the total cost of an Emergency episode (Ex. 64, p.296, Table 25.15).

An estimation of the annual costs and emission reductions of the Regulation was made (Ex. 64, pp.298-300). This was done by multiplying the costs and emission reductions of the various episode stages by their expected yearly frequencies (Ex. 64, p.298, Equation 25.8). These frequencies appear to be somewhat higher than past experience would indicate (T.1281; R.119-120; R.19); for this and other reasons the annual cost estimates were termed "...somewhat tenuous..." (R.19) by the study's author, Dr. Cohen, who suggested that the annual estimates "...should not probably be given that much weight in terms of evaluating the Regulations" (R.19).

The efficiency of the Regulation, defined as cost per unit of emission reduction, was examined in a number of contexts (Ex. 64, pp. 302-303; 308-311; 316-320). Due to the interrelated nature of the various control actions, some analyses are severely limited (Ex. 64, p.302). However, it can be seen that "...for small reductions in emissions the cost per ton reduced is relatively small. As the total quantity of emission reductions increases, the cost per ton reduced increases" (Ex. 64, p.316). Those control actions with high emission reduction potential, but at a relatively high cost, are called into play at those higher levels where the health of the entire population is adversely affected. For example, Dr. Cohen's order-of-magnitude estimates of hydrocarbon and NO_x emission reductions in the Chicago SMSA for a one day Yellow Alert are 42.3 tons and 69.3 tons at a total social cost of $108,000; for a one day Red Alert are 925 tons and 492 tons at a total social cost of $9,320,000; and for a one day Emergency are 1490 tons and 953 tons at a total social cost of $36,600,000. The cost/effectiveness ratios, in terms of dollars per ton of precursor emission reduction, grow

from $968/ton (Yellow Alert) to $6580/ton (Red Alert) to $15,000/ton (Emergency) (Ex. 64, p.312, Table 25.23).

The Illinois Manufacturers' Association (IMA) submitted the only comment on the Study. The gist of that comment was that the Study presented "...a gross understatement of the full cost of these regulations to the citizens of Illinois" (P.C. #44, p.1).

The original proposal in this matter, published in Environmental Register #100, sought to include parking lot restrictions among the Yellow Alert control actions. Testimony on behalf of the International Council of Shopping Centers showed this control action to be relatively costly, in terms of cost/effectiveness ratios, when compared to the Red Alert controls on manufacturers (T.905-957). This testimony would appear consistent with the Study, given the accuracy limitations (Ex. 64, p.303, Table 25.20). It should be noted that the regulation as adopted moved parking lot restrictions from the Yellow Alert to the Red Alert control actions.

In conclusion, the Board finds the costs at the Advisory and Yellow Alert levels to be small. The sole social cost estimated for an Advisory was that of diverted broadcast time (Ex. 64, pp.283-4). Notification costs and costs associated with voluntary reductions in electricity consumption are estimated to constitute over 90% of the total cost of a Yellow Alert (Ex. 64, p.285, Table 25.2). At these two levels the Ozone Episode regulation has no adverse economic impact on the people of the State of Illinois. The control actions activated at the Red Alert and Emergency levels are more severe as are the health affects. The control actions at these higher levels generally have the greatest emission reduction potential as well as the greatest cost, both absolute cost as well as cost per ton of emission reduction (Ex. 64, pp.316-320). These more severe control actions at the two higher levels do have some adverse economic impact which is unavoidable if the health of the people of the State of Illinois is to be protected. Despite this adverse economic impact the Board finds the regulation to be economically reasonable in its approach to controlling episodes of what one expert has termed "...the most serious of all pollutants" (T.106).

The Board concluded in its Interim Opinion that "ozone is an extremely dangerous pollutant, not only at high concentrations (that is, above 0.37 ppm) but also at lower levels where symptoms are less pronounced." 21 PCB 172. This conclusion was based on extensive testimony regarding the medical effects of ozone. This testimony indicated that ozone affects human mucus lining and lung tissue; causes chromosomal breaks; is an occular irritant;

causes red blood cell fragility and enzyme modifications; decreases lung capacity; increases cough and chest discomfort rates; acts synergistically with sulfur dioxide; inactivates an enzyme called benzopyrene hydroxylase, which destroys a known carcinogen; affects the release of oxygen from hemoglobin; and may cause premature aging similar to continued exposure to ionizing radiation. 21 PCB 169, 170-172. The ozone episode regulation is intended to reduce the frequency and severity of these and other medical effects. Such reductions are the true benefits of this regulation and these benefits are as necessary today as they were when the Regulation was originally adopted.

Mr. Werner dissents.

I, Christan L. Moffett, Clerk of the Illinois Pollution Control Board, hereby certify the above Supplemental Opinion was adopted on the 30th day of March, 1978 by a vote of 4-1.

Christan L. Moffett, Clerk
Illinois Pollution Control Board