Federal Regulation of Motor Vehicle Emissions Under The Clean Air Amendments of 1970

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While current harmful levels of air pollution are attributable to population growth, increasing affluence, and pathological developments in technology, intensified technological development does not inevitably raise pollution levels. On the contrary, pollution can be reduced in spite of increased population, affluence, and technological development.1 Realizing this, Congress enacted the Clean Air Amendments of 19702 to direct technological change so as to reduce motor vehicle air pollution.

Automotive regulation embodied in the Clean Air Act is by no means a new concept, however. Legal process has long been used to define the interface between society and transportation technology. Successful tort suits have caused motor vehicle manufacturers to observe certain minimal safety standards or practices in the manufacture of vehicles. The Highway Trust Fund has long subsidized the private passenger automobile as the primary means of transportation in this country. Regulation of automobile exhaust emissions under the Clean Air Act is merely the most recent attempt to direct motor vehicle technology.

When the 1970 Amendments were passed, there was widespread public expectation that the auto industry would begin a good faith effort to protect society from the dangers associated with exposure to motor vehicle air pollution by reducing emissions to the low levels re-


1. Motor vehicle technology is exemplary. At the end of the 1967 model year, there were 81.8 million vehicles with total emissions of 145 million tons. By the end of the 1977 model year there will be 124.9 million vehicles emitting 70.2 million tons. An increase of 41% in motor vehicles (due to combined growth of population and per capita number of motor vehicles) will be accompanied by a 52% emission reduction. ENVIRONMENTAL PROTECTION AGENCY, THE ECONOMICS OF CLEAN AIR, S. DOC. NO. 92-6, 92ND CONG., 2D. Sess., 3-3 to 3-7 (1972).


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quired for 1975 and 1976. Instead, misallocated research efforts have resulted in the domestic auto manufacturers' seeming inability to develop a low-polluting, automobile propulsion system; these same misallocations have brought into question the continued vitality of the Clean Air Act.

I

LEGAL PROCESS AND TECHNOLOGICAL CHANGE

A. The Theoretical Framework

Before one can evaluate the effectiveness of the 1970 Amendments as a means of directing motor vehicle technology, one must first establish principles for directing technology as a whole in socially useful ways. The leading principle ought to be that the law operate so as to optimize technology's impact on society. Since technology is a source of immensely socially useful activity, ceasing technological activity through the legal process is certainly not a desirable goal. Rather, selected legal methods must channel technological development in more socially useful directions. Only then can the legal process maximize net technological benefits to society.

Four legal approaches may be followed in directing technology: specific directives, market incentive modifications, criminal prohibitions, and changes in decisionmaking structures. Specific directives involve a governmental identification of one or more parameters controlling research, development, or implementation of a given technology. Directive affecting such parameters may vary from administrative regulation of private activity to government ownership of a technological operation. Market incentive modifications are simply deliberate alterations of the market within which the private sector makes technological development and implementation decisions. Modifications may consist of: taxation to cover the social costs of a given technology; granting public subsidies to pay for social benefits of a technology; creation of prior rights of action to enjoin certain technological development; or easing procedural rules to enable the recovery of damages to compensate for harm caused by destructive technological activity. Criminal prohibitions may modify technological activity in areas impinging on fundamental social values, or they may modify human behavior likely to result from technological applications—for example, deactivation of automotive pollution control devices in order to improve vehicle performance. Alteration of decisionmaking structures includes all possible modifications in the authority, construction, or responsibility

3. This categorization is suggested in L. Tribe, Legal Frameworks for the Assessment and Control of Technology (1971).
of all private and public entities deciding questions of technological development and implementation. Modifications include such devices as creating public interest corporate board members, statutorily imposed duties on governmental decisionmakers, or extensions of warranties in response to consumer action.

Effective use of these methods to control technology depends upon whether or not the goal of regulation is the optimal allocation of resources. Where the object is optimal resource allocation, that combination of legal methods should be used that yields an allocation most closely resembling that which would result if bargaining were costless—that is, where all external costs not monetarily accounted for were internalized in the classic welfare-economics scenario.⁴

Air pollution from motor vehicles imposes external costs on all those exposed to it,⁵ in the form of soiling, materials damage, and disease;⁶ these externalities result from failure to place a price on air, thus making it a free good, common to all.⁷ Externalities lead to non-optimal resource allocation wherever there are bargaining costs because the private net product and the social net product of market activity are not often identical. Were bargaining costless (no transaction costs and no legal impediments to bargaining), all externalities would be internalized because transactions would occur until bargains could no longer improve the situation, thus giving an optimal allocation of resources.⁸

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4. See Calabresi, Transaction Costs, Resource Allocation and Liability Rules—A Comment, 11 J. LAW & ECON. 67 (1968); Coase, The Problem of Social Cost, 3 J. LAW & ECON. 1 (1960). Optimal resource allocation cannot occur through the unmodified market system because some costs and benefits accrue to those outside the market and because bargaining is not costless. The former problem is simply that of externalities, first recognized by Pigou as hindering optimal resource allocation.

5. See A. Pigou, THE ECONOMICS OF WELFARE (4th ed. 1932). A divergence between social and private net products occurs because one person A, in the course of rendering some service, for which payment is made, to a second person B, incidentally also renders services or disservices to other persons (not producers of like services), of such a sort that payment cannot be extracted from the benefited parties or compensation enforced on behalf of the injured parties.

Id. at 183.


7. Without other regulation, the absence of cost on a replenishable common resource dooms the resource to exhaustion because growing demand untempered by cost will inevitably exceed the ability of the resource to replenish itself. See Hardin, The Tragedy of the Commons, 162 SCIENCE 1244 (1968).

8. This was first established by Coase in his rejection of Pigou's position that externalities should be internalized by government or liability imposed in order to maximize net social product. Coase, The Problem of Social Cost, 3 J. LAW & ECON. 1 (1960). Further analysis has supported this proposition. Calabresi, Transaction Costs, Resource Allocation and Liability Rules—A Comment, 11 J. LAW & ECON. 67 (1968). But see Note, The Cost-Internalization Case for Class Actions, 21 STAN. L. REV. 383,
B. Pollution Control—A Specific Example

Consider the relevance of this to pollution producing technology. In an ideal market, an industry will reach that resource allocation where the cost of an additional unit of pollution control equals the cost of pollution abated by that unit. Stated more loosely, industry will spend just enough on pollution control to offset the costs which pollution imposes on it. While industry seeks only to minimize its own abatement costs, government seeks to minimize, through the legal process, total pollution costs including these externalities not borne by industry. Neither government nor industry fully considers the costs the other is seeking to minimize, so that optimal resource allocation can only be reached fortuitously through their independent actions.

A variety of legal methods could be used to impose additional costs on industry to cause it to account for externalities. The government could restructure market incentives through effluent charges, taxation, creation of rights of action, or other measures that would impose upon industry the total cost of pollution. Assuming industry could pass on its externality costs, it would spend precisely that amount on pollution control, thereby reducing the total cost to society in like amount. The government could reach the same end by issuing specific directives requiring some standardized treatment or setting emission levels sufficient to cause the industry to spend the proper amount on control. This process requires government knowledge of the optimal resource allocation before the correct specific directives could be issued. Criminal prohibitions would function in a manner similar to

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386-98 (1968). Bargaining costs are quite extensive. They arise from determining the parties affected by a resource allocation, assembling the parties for bargaining, showing causation, calculating the degree of harm or benefit to each, actual bargaining, and so on. Whatever the form of the bargaining costs, they prevent externalities from being internalized. External costs could be internalized by imposing them on the party creating them. But, as shown by Coase, this is not always correct from a purely economic standpoint, as maximum net production is achieved by placing the external costs on the cheapest cost avoider. Coase, The Problem of Social Cost, at 39-44. Coase uses the example of a factory emitting smoke which causes $100 damage per year. Taxation of $100 per year causes the factory to install an antipollution device costing $90 per year, thus increasing the value of production by $10. But if those suffering the damage could avoid it by moving or taking other measures costing $40 per year, then there would be an increase in production of $60 per year. Coase suggests a double tax system to determine who in fact is the cheapest cost avoider. Id. at 41. If politically feasible, this would answer the criticism that Coase assumes residents can bear pollution costs more cheaply than the polluter. See Note, The Cost-Internalization Case for Class Actions, 21 STAN. L. REV. 383, 391 (1968). Since we seek resource allocation most closely resembling that of the costless bargaining situation, no regulatory means could be used whose cost would exceed the net production gain resulting from a shift to the optimal resource allocation. Of course, the optimal allocation in an adjusted market is not likely to be the same as that of a costless bargaining market if the costs of the adjustment means are considered.
emission standards or required treatment but would allow stronger sanctions. Assuming that the foregoing methods could force the desired resource reallocation, the preferred method would be that which best reduced the total of pollution and abatement costs.9

With this background in mind, we may now assess those methods that have been employed in an attempt to direct motor vehicle technology.

II

THEORY PUT TO PRACTICE

A. Early Attempts at Regulation

Following the usual technological crisis-reaction pattern, the federal response to California's acute motor vehicle air pollution problem10 was to require a study of motor vehicle emissions to determine an emission level for each pollutant that was safe from the standpoint of human health.11 By limiting the study to human health standards, the assessment could not examine the lesser effects of motor vehicle pollution such as property damage or aesthetic harm. Any subsequent governmental measures based on this study that attempted to direct motor vehicle technology would thus necessarily overlook these secondary consequences and hence reach a sub-optimal resource allocation.

The government attempted to correct this oversight in the Clean Air Act of 196312 which "encouraged" motor vehicle industries to develop pollution control devices13 and required progress reports on pollution control technology development, criteria on emissions, and recommendations for regulatory emission legislation.14 Reliance on mo-

9. These costs are composed of: (1) primary pollution costs—actual cost of pollution damage and cost of abatement including foregone opportunity costs such as locating power plants and users closer together; (2) secondary pollution costs—social and economic dislocation costs; and (3) tertiary pollution costs—administrative costs of pollution abatement systems. See Calabresi, Does the Fault System Optimally Control Primary Accident Costs?, 33 Law & Contemp. Prob. 429, 429-30 (1968).
13. The Secretary shall encourage the continued efforts on the part of the automotive and fuel industries to develop devices and fuels to prevent pollutants from being discharged from the exhaust of automotive vehicles, and to this end shall maintain liaison with automotive vehicle, exhaust control device, and fuel manufacturers.
14. Id. § 6(a).
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tor vehicle manufacturers to develop pollution control devices was apparently rather misplaced as the Automobile Manufacturers Association, American Motors Corporation, Chrysler Corporation, Ford Motor Company, and General Motors Corporation were defendants in a Justice Department antitrust suit alleging a conspiracy formed as early as 1953 to delay and obstruct development of motor vehicle pollution control equipment.\textsuperscript{15} The federal antitrust suit was an inefficient technology directing method, both because it only forbade conspiracy to restrain pollution control without giving any incentive or directive to develop it and because it came 15 years after the fact. If the Department of Justice had brought criminal charges against the motor vehicle manufacturers as its staff attorneys had recommended,\textsuperscript{16} this strategy would have been far more effective.

The market having thus failed to develop pollution control technologies, Congress prescribed an emission-standard regulatory mechanism in the Motor Vehicle Air Pollution Control Act of 1965\textsuperscript{17} directing development of motor vehicle technology.

The Secretary shall by regulation, giving appropriate consideration to technological feasibility and economic costs, prescribe as soon as practicable standards, applicable to the emission of any kind of substance, from any class or classes of new motor vehicles or new motor vehicle engines, which in his judgment cause or contribute to, or are likely to cause or to contribute to, air pollution which endangers the health or welfare of any persons, and such standards shall apply to such vehicles or engines whether they are designed as complete systems or incorporate other devices to prevent or control such pollution.\textsuperscript{18}

Language basing the emission standards on "technological feasibility and economic cost" and air pollution endangering "health or welfare of any persons" indicated that the primary goal of this regulatory mechanism was optimal resource allocation with the cost of abatement balanced against the cost of pollution to reduce total cost. The quali-


\textsuperscript{16} Confidential Department of Justice memorandum urging criminal prosecution, placed in the Congressional Record by Congressman Burton. 117 Cong. Rec. 4063-74 (1971).

\textsuperscript{17} Pub. L. No. 89-272, 79 Stat. 992 (1965).

\textsuperscript{18} \textit{Id.} § 202(a).
fying phrase "likely to cause or contribute" indicates a secondary goal, preserving health and welfare, to swing the balance to applying pollution control technology where the effect on total cost is uncertain. Before substantial regulations could be promulgated under the 1965 Act, Congress passed the Air Quality Act of 1967 which retained the regulatory provisions of 1965 Act while adding specific language preempting state regulation of emissions standards and providing for regulation of fuel additives. Regulatory authority under both Acts was limited to motor vehicles used for transportation on streets or highways.

B. Some Disappointing Results

The first regulation developed under the 1967 Act required the complete elimination of crankcase emissions through the positive crankcase ventilation (PCV) valve system on all 1966 and later models. This rule had little practical effect, however, because a complying system had been standard equipment on all U.S. models since 1963. Exhaust emission standards were not set until the 1968 model year and then only for hydrocarbon (HC) and carbon monoxide (CO) emissions from cars and light-duty trucks. The resulting engine technology modifications not only reduced pollution, however, but also reduced operating costs for small cars manufactured in compliance with emission standards. This cost difference represented an internalized

19. The costs of "air pollution which endangers the health or welfare of any persons" cannot be given a narrow interpretation because § 101 of the Act applied the 1963 Act definition that:

All language referring to adverse effects on welfare shall include but not be limited to injury to agricultural crops and livestock, damage to and deterioration of property, and hazards to transportation.

Clean Air Act of 1963 § 9(g), Pub. L. No. 88-206, 77 Stat. 400 (1963). In addition, Congress specifically found that air pollution from motor vehicles was one of the causes of the adverse effects on public welfare listed in § 9(g).


external benefit that would not have been achieved in an unregulated market. The pollution control gain was decreased by three factors, however: (1) the continually increasing number of vehicles each year lessened the total drop in emissions; (2) oxides of nitrogen (NOx) emissions increased by HC and CO abatement technology;27 and (3) production vehicles neither achieved nor maintained required emission performance.28

Recognizing the need for more comprehensive emission standards both to further reduce pollutant levels and to regulate additional types of pollutants, HEW issued HC and CO emission standards for 1970 light-duty vehicles requiring reductions in HC and CO emissions of 78 and 70 percent respectively from pre-controlled levels.29 Standards were also set for 1970 model-year heavy-duty vehicles.30 Increasingly stringent emission standards were set for 1972 through 1974 model-year light-duty vehicles,31 and emission standards for 1975 light-duty vehicles required HC and CO emission reduction from pre-controlled levels of 95 and 86 percent, respectively.32

No-driven at 25 mpg and 40 cents/gallon) due to carburetor changes to control emissions. The gain in fuel economy for small cars was more than offset by fuel penalties up to 18% for cars over 3500 pounds. ENVIRONMENTAL PROTECTION AGENCY, A REPORT ON AUTOMOTIVE FUEL ECONOMY 4, 22-24 (1973). Yet the carburetor changes cost only about 3 dollars. NATIONAL ACADEMY OF SCIENCES, THE SOCIAL AND ECONOMIC COSTS AND BENEFITS OF COMPLIANCE WITH THE AUTO EMISSION STANDARDS ESTABLISHED BY THE CLEAN AIR AMENDMENTS OF 1970, S. Doc. No. 93-16, 93rd Cong., 1st Sess. 11-13 (1973) [hereinafter cited as NAS COST-BENEFIT STUDY].

27. NOx emissions were 3% greater than what they would have been without the HC and CO controls. EPA REPORT, supra note 24, at 3-21.


29. Exhaust emission standards were 2.2 grams per vehicle mile (g/vm) for HC and 23 g/vm for CO. Evaporative fuel standards were also set. 45 C.F.R. §§ 85.21-22 (1970).

30. Exhaust emissions for gasoline engine heavy-duty vehicles were set at 275 parts per million (ppm) for HC and 1.5% by volume for CO. Id. § 85.31. Smoke emissions from diesel engine heavy duty vehicles were not to exceed 40% opacity during the engine acceleration mode and 20% opacity during the engine lugging mode. Id. § 85.41.


32. HC levels were to be 0.5 g/vm and CO levels were to be 11.0 g/vm. 35 Fed. Reg. 11339 (1970).
MOTOR VEHICLE EMISSIONS

...tice was given that standards were being suggested for NO\textsubscript{x} emissions for 1973 through 1975 model-year light-duty vehicles and for particulate emissions for 1975 models that would require reductions of NO\textsubscript{x} and particulate emissions by 83 and 67 percent respectively.\textsuperscript{33} Despite this spate of stricter regulations culminating in the 1975 standards, total emission levels were projected to rise again in the mid 1980's because of the expected increase in the motor vehicle population.\textsuperscript{34}

While the stricter standards were being set by HEW, information gathered on health effects of various pollutants indicated that even extremely low ambient pollutant levels were health hazards\textsuperscript{35} and that the stricter standards would not attain an air quality level safe for human health. Reaching safe ambient air quality levels in urban areas by 1990 required 1980 emission standards that would reduce pre-controlled emissions as follows: CO, 92.5 percent; NO\textsubscript{x}, 93.6 percent; and HC, 99.0 percent.\textsuperscript{36}

\textsuperscript{33} NO\textsubscript{x} emissions would be limited to 3.0 g/vm for 1973 and 1974 models and 0.9 g/vm for 1975 models, while particulates would be limited to 0.1 g/vm. 35 Fed. Reg. 2791 (1970). These suggested standards were never proposed as regulations under the 1967 Act.

\textsuperscript{34} 1 CEQ Ann. Rep., supra note 28, at 77-79.

\textsuperscript{35} Ambient CO levels as low as 10 parts per million (ppm) for eight hours were found to produce adverse health effects. Dep't of Health, Education and Welfare, Air Quality Criteria for Carbon Monoxide, at 10-6 (1970). Chicago recorded the highest 8-hour CO concentration at 44 ppm. Id. at 6-16. It has been suggested that these measurements are not reflective of actual commuter exposure since they are taken at street side; actual street concentrations may be several times higher. Dep't of Health, Education, and Welfare, Calculating Future Carbon Monoxide Emissions and Concentrations from Urban Traffic Data 27 (1967). Ambient NO\textsubscript{2} levels greater than 0.1 ppm likewise produce adverse health effects. Environmental Protection Agency, Air Quality Criteria for Nitrogen Oxides, at 11-10 to 11-11 (1971). The safe human health level for photochemical oxidants was found to be only 0.06 ppm. National Air Pollution Control Administration, Federal Motor Vehicle Emission Goals for CO, HC, and NO\textsubscript{x} Based on Desired Air Quality Levels (1970), in 1970 Air Pollution Hearings, pt. 5, at 1643 [hereinafter cited as National Air Pollution Control Administration]. Harmful levels of photochemical oxidants are formed from HC and NO\textsubscript{x} when HC levels reach 0.15 ppm. HC emissions by themselves, however, produce no proven adverse health effects. Dep't of Health, Education and Welfare, Air Quality Criteria for Hydrocarbons, at 8-5 (1970). Nevertheless, benzo(a)pyrene (BaP), a known carcinogen, is one of several polynuclear hydrocarbon pollutants emitted into the atmosphere. Annual BaP emission totals of 481 tons include about 20.6 tons emitted from motor vehicles. Dep't of Health, Education, and Welfare, Sources of Polynuclear Hydrocarbons in the Atmosphere, 38 (1967). The health effects of BaP emissions have not yet been established.

\textsuperscript{36} Actual emission standards would be CO—6.16 g/vm, HC—0.14 g/vm and NO\textsubscript{x}—0.40 g/vm. National Air Pollution Control Administration, supra note 35, at 1643. The calculations were based on two additional assumptions—(1) that vehicles would continue to exceed standards by percentages shown in the past and (2) that pre-controlled pollution equaled the worst existing pollutant levels, NO\textsubscript{x} and HC in Los Angeles and CO in Chicago. Id. at 1642.
C. Reasons for Failure

The failure of emission standards under the 1965 and 1967 Acts to direct technology sufficiently so as to control automotive air pollution stems from four factors: (1) placing on the regulator the burden of proving pollutant harm; (2) requiring consideration of "technological feasibility and economic costs" of control; (3) insufficient testing and compliance of vehicles subject to emission standards; and (4) insufficient scope of regulation.

Burden of proof problems greatly delayed and increased the administrative costs of the regulatory program. Emission standards could be established only on a pollutant-by-pollutant basis, since an adverse health or welfare effect had to be established for each pollutant before regulations could be issued. Consequently, standards were delayed pending proof of harm even though potentially more dangerous pollutants—such as asbestos from brake linings—may remain unregulated for long periods of time.87

Because the government had conditioned implementation of standards on technological feasibility and economic costs, it required itself to prove matters about which industry was far better informed and over which industry had almost absolute control. Were industry to drag its feet, and there is no reason to believe that it has not,88 the government would have to show that control was technologically and economically feasible. The 1967 Act did provide for testing of vehicles submitted by the manufacturer and also required certification of all other vehicles of substantially the same construction,89 but the Act did not specifically provide for testing of subsequent production vehicles or for certification revocation. HEW interpreted the Act to permit testing only of pre-production prototypes.40 When subsequent production models did not perform as well as did the prototypes, HEW felt it could do nothing to require that these vehicles comply with applicable emission standards, even though certification could have been conditioned upon such terms as the Secretary prescribed.41 The Act's

38. See generally R. NADER, UNSAFE AT ANY SPEED (1965).
40. 1970 Air Pollution Hearings, supra note 15, pt. 1, at 137 (statement of Secretary Finch).
grant of authority was narrowly drawn and even more narrowly interpreted.

The regulations were also limited in scope, as they failed to deal with other factors affecting mobile source pollution, thus preventing adoption of more cost-effective regulations. Authority to regulate used motor vehicles was assumed not to exist, despite an expected 10-year vehicle life with significantly greater emission levels occurring on uncontrolled vehicles, and despite the availability of low-unit-cost control devices. Installing devices on uncontrolled used cars that would remove up to 50 percent of all emissions would have resulted in more cost-effective regulation and hence in better resource allocation than would installing additional controls on new vehicles to eliminate the remaining 40 to 50 percent of all emissions. Ultimately, virtually pollution-free vehicles will be required, but total costs to society would have been reduced until such time was reached. The additional time would have permitted greater development of alternative motor vehicle power sources rather than the present development of add-on technology for internal combustion engines.

Other transportation forms emitting pollutants similar to those of motor vehicles were not subject to regulation. Indeed, HEW preferred to rely upon these other transportation industries to produce the same type of voluntary efforts that the motor vehicle industry had failed to produce. Nor was the motor vehicle program coordinated with other governmental programs dealing with technologies that have an impact on mobile source air pollution. This lack of coordination was so pronounced that the Department of Transportation was not even aware that highway design could affect urban air pollution significantly. To the extent that the requirements of section 102 of the National Environmental Policy Act are implemented by agencies

42. Ford Motor Company produces a control device that reduces emissions by 30 to 50 percent at an investment cost of less than 10 dollars and one hour's labor to install. 1970 Air Pollution Hearings, supra note 15, pt. 5, at 1614 (statement of L. Iacocca, Vice-President, Ford Motor Company).

43. For a discussion of the add-on approach to controlling motor vehicle emissions see Comment, IV: The Automobile Controversy—Federal Control of Vehicular Emissions, 4 ECOLOGY L.Q. 661 (1975).

44. See notes 12-16 supra and accompanying text. HEW Undersecretary Vene-

engaged in air pollution decisionmaking, their programs necessarily will be coordinated with the air pollution regulatory program. But HEW had narrowed regulatory authority by restrictively interpreting its vehicle certification authority and by failing to implement applicable provision allowing regulation of fuel additives.

III

CLEAN AIR AMENDMENTS OF 1970

A. An Important Departure

The Clean Air Amendments of 1970 elevated the goal of public health over economic and technological feasibility considerations because "tests of economic and technological feasibility applied to those [emission] standards compromise the health of our people and lead to inadequate standards." Under the 1970 Amendments, emission standards were to become "a function of the degree of control required, not the degree of technology available today." If technology was unable to meet the emission standards, then the pollution source was to be closed down regardless of its economic value or total production as compared to the cost of pollution it produces. Even though the motor vehicle industry employs 800,000 people and generates 10 percent of all tax revenues, the industry was to cease manufacture of motor vehicles if the vehicles could not meet applicable emission standards.

Relying on the National Air Pollution Control Administration's report of emission reductions necessary to achieve health-related air quality goals, Congress enacted standards requiring that 1975-model

46. In major actions § 102(2)(C) requires consultation with agencies having jurisdiction by law or special expertise in regard to any environmental impact involved. 42 U.S.C. § 4332(2)(C) (Supp. V, 1970). The agency having jurisdiction by law with regard to air pollution from mobile sources was HEW when the 1967 Act was enacted. Subsequent to Reorganization Plan No. 3 of 1970, the functions of HEW in regard to air pollution under 42 U.S.C. § 1857 were transferred to the Environmental Protection Agency. 3 U.S. CODE CONG. & AD. NEWS 6322 (1971).

47. See notes 39-41 supra and accompanying text.

48. See note 22 supra.


50. The committee, recognizing the paramount interest in achieving ambient air quality necessary to protect the health of its citizens proposes to establish emission standards for automobiles based upon requirements related to ambient air quality rather than technological or economic feasibility. 116 CONG. REC. 33117 (1970) (remarks of Senator Cooper).


53. Id. at 3.


light-duty vehicles emit 90 percent less HC and CO than their 1970 counterparts and required a similar percentage reduction in NO\textsubscript{x} emissions over 1971 pre-controlled levels.\textsuperscript{56} Despite a clear congressional intent to safeguard public health by requiring drastic emission reductions by 1975-76,\textsuperscript{57} EPA set motor vehicle emission standards which do not permit attainment of the health-related primary ambient air quality standards in major urban areas.\textsuperscript{58} Since these standards were set without regard to either cost or optimal resource allocation, however, the 1975 emission standards are utterly unjustifiable under our scheme since they will not attain the higher societal goal of safeguarding public health.

B. Additional Requirements

To improve monitoring and compliance, the 1970 Amendments substantially tighten vehicle certification procedures by providing for both testing of production-line vehicles\textsuperscript{59} and for suspension or certification revocation for subsequent vehicles where all or some production-line vehicles tested do not conform to the standards.\textsuperscript{60} However, increased testing creates potentially high administrative costs if one

\textsuperscript{56.} Clean Air Amendments § 202, 42 U.S.C. § 1857f-1 (1970). The Environmental Protection Agency has established the following standards to achieve required reductions: HC—0.41 g/vm, CO—3.4 g/vm for the 1975 model year. 40 C.F.R. § 85.21 (1972). The NO\textsubscript{x} standard for the 1973 through the model year is 3.0 g/vm. 36 Fed. Reg. 3825-26 (1971).


\textsuperscript{58.} Romanovsky, General Assessment of the Air Pollution Problem and Philosophy Underlying Automotive Emission Controls (1971), in Office of Science and Technology, Cumulative Regulatory Effects on the Cost of Automotive Transportation (RECAT), app. I-F (1972). A Natural Resources Defense Council mandamus action to require more stringent EPA HC standards was dismissed; the present standards were held “to be a reasonable exercise of the discretion necessary to correlate a fixed directive of the statute with evolving test procedures in a new technological area of governmental regulation.” Memorandum Opinion and Order, at 2, Natural Resources Defense Council v. Ruckelshaus, No. 2598-71 (D.D.C. May 5, 1972).

\textsuperscript{59.} In order to determine whether new motor vehicles or new motor vehicle engines being manufactured by a manufacturer do in fact conform with the regulations with respect to which the certificate of conformity was issued, the Administrator is authorized to test such vehicles or engines. Such tests may be conducted by the Administrator directly or, in accordance with conditions specified by the Administrator, by the manufacturer. Id § 206(b)(1), 42 U.S.C. § 1857f-5(b)(1) (1970).

\textsuperscript{60.} If, based on tests . . . the Administrator determines that all or part of the vehicles or engines . . . do not conform with the regulations with respect to which the certificate of conformity was issued, he may suspend or revoke such certificate in whole or in part. . . .

wishes to be certain testing is performed accurately and honestly. Illustrative is Ford Motor Company's May 1972 withdrawal of its application for certification of its 1973 models. Although Ford was subsequently fined $7 million (roughly 50 cents per 1973 vehicle), the net result allowed Ford Motor Company officials to avoid personal criminal liability by coughing up shareholders' money. Only prompt application of criminal sanctions under Section 113(c)(2) of the Clean Air Act will ensure both valid testing and low administrative costs.

Additional compliance provisions of the Act require manufacturers to warrant the materials and workmanship of control devices. Upon development of testing procedures determined by the Administrator, the manufacturers must also warrant compliance where the vehicle is maintained according to furnished instructions. Even if the performance warranty is ineffective because suitable testing procedures are lacking, the Administrator may require the manufacturer to remedy nonconforming vehicles if he determines that a substantial number of any class or category of vehicles do not comply with applicable standards. Unless a manufacturer is willing to admit a defect, however, this remedial provision is likely to go unused because it is difficult to prove that an emissions defect exists in a substantial number of any given class of vehicles. Undoubtedly, this is why to date there has been only one large-scale emission-related vehicle recall.

The 1970 Amendments extend the federal mobile-source regulatory program to non-automotive mobile sources. Aircraft emissions are subject to regulation, and aviation fuel standards may be set. Automotive provisions of the Act have been expanded allowing ex-

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61. The General Accounting Office investigated EPA's capacity to oversee the automotive industry's certification testing as a result of Ford's improper certification. Administrative costs were found to be too high for EPA to either do all the certification testing itself or to continually monitor industry's testing activities. Letter from Deputy Comptroller General Keller to Senator Edmund S. Muskie, June 12, 1972.


64. Id. § 207(b), 42 U.S.C. § 1857f-5b (1970). The warranty extends for the first 5 years or 50,000 miles. Id. § 202(d), 42 U.S.C. § 1857f-1(d) (1970).

65. If the Administrator determines that a substantial number of any class or category of vehicles or engines, although properly maintained and used, do not conform to the regulations... when in actual use throughout their useful life... he shall require the manufacturer to submit a plan for remedying the nonconformity of the vehicles or engines...


tensive regulation of motor vehicle fuels and fuel additives, including a requirement of manufacturer testing for potential health hazards.\(^69\)

The Administrator may regulate or prohibit use of any motor vehicle fuel or fuel additive whose emission products endanger public health or welfare or significantly impair emission control in general use or impending general use.\(^70\)

The Act improves coordination of EPA air pollution control programs with other federal activities affecting air quality by requiring the EPA Administrator to review and comment on the environmental impact of both federal actions subject to section 102(2)(C) of the National Environmental Policy Act and of legislation and regulations proposed by other agencies.\(^71\) The legislative intent of the Amendments clearly states that changes in areas other than motor vehicle emission regulation are necessary to reduce the impact of air pollution from motor vehicles. The Senate stated:

Transportation policies must be developed or improved to assure that the impact of pollution from existing moving sources is reduced to the minimum compatible with the needs of each region. Construction of urban highways and freeways may be required to take second place to rapid and mass transit and other public transportation systems. Central city use of motor vehicles may have to be restricted.\(^72\)

Where necessary, such changes should be undertaken in part pursuant to state implementation plans for achieving national ambient air quality standards,\(^73\) but such a course appears unlikely in view of polit-

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70. The Administrator may . . . control or prohibit the manufacture, introduction into commerce, offering for sale, or sale of any fuel or fuel additive for use in a motor vehicle or motor vehicle engine (A) if any emission products of such fuel or fuel additive will endanger the public health or welfare, or (B) if emission products of such fuel or fuel additive will impair to a significant degree the performance of any emission control device or system which is in general use, or . . . in a reasonable time it would be in general use. . . .

71. Id. § 308, 42 U.S.C. § 1857h-6 (1970). One of the first actions pursuant to this section was Administrator Ruckelshaus’ criticism of the Trans-Alaska Pipeline under study by the Department of Interior. N.Y. Times, Mar. 15, 1970, at 1, col. 6.
ical machinations which have undermined implementation plans as a regulatory device. At the behest of the Office of Management and Budget (OMB), EPA removed mandatory transportation controls and stiff criminal penalties from the promulgated requirements for implementation plans.\(^\text{74}\) Contrary to the spirit, if not the letter of the Clean Air Act, the regulations encouraged consideration of economic costs in prescribing control measures. As a means for attaining public health goals, implementation plans were weakened throughout.\(^\text{75}\) Nor can the modifications be justified on resource-allocation grounds. Transportation controls are highly cost-effective, but they are exceedingly difficult to enact at the local level without federal mandate.

In addition to regulatory means to control development of mobile source technology, the 1970 Amendments provide a broadened base for assessment and direction of such technology. Incentives are established for development of low-emission motor vehicles through mandatory federal purchase of low-emission motor vehicles for the federal fleet, provided the low-emission vehicles cost no more than twice the price of comparable standard production vehicles.\(^\text{76}\) This incentive is coupled with an expanded federally-financed research program to develop low-polluting motor vehicle technologies, including alternatives to the internal combustion engine.\(^\text{77}\) These market modification techniques have accomplished little, however; only three al-

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74. 40 C.F.R. § 51 (1972).
75. See Hearings on Implementation of the Clean Air Act Amendments of 1970 Before the Subcomm. on Air and Water Pollution of the Senate Comm. on Public Works, 92d Cong., 2d Sess. 3-131, 166-338 passim (1972).
76. A vehicle which emits any pollutant in amounts substantially below the applicable emission standard and which meets all other applicable standards will be purchased if procurement costs are no greater than 150 percent of the vehicle for which it is a certified substitute. Clean Air Amendments §§ 212(a)(4), (e)(1), 42 U.S.C. §§ 1857f-6(e)(a)(4), (e)(1) (1970). If the vehicle propulsion system is found to be inherently low-polluting, then the procurement premium is raised to 200 percent. Id. § 212(e)(2), 42 U.S.C. § 1857f-6(e)(2) (1970). Although this creates a potential market of 325,000 vehicles, high entry costs would prevent any new entrant from using this as a springboard into the general vehicle market. Due to annual style changes and the need of 300,000 units per year to achieve economies of scale, the investment needed to enter the general automobile market has been estimated at $779 million of which $724 million represents annual style change capacity. Note, Annual Style Changes in the Automobile Industry as an Unfair Method of Competition, 80 Yale L.J. 567, 571 n.22, 588 (1971). The note suggests that annual style changes on the part of the automobile manufacturers constitute a violation of § 5 of the Federal Trade Commission Act. The subsidy in § 212 of the Clean Air Act is insufficient to support a new entrant because only a fraction of the 325,000 government vehicles are replaced each year, because the number of vehicle types involved precludes a new entrant from producing each type, and because the maximum appropriation would be only $25 million each year for the additional costs.
ternative engines have been funded, and no low-emission vehicles have been purchased.\textsuperscript{78}

The Act assures public participation in the regulatory process by providing a cause of action in which anyone may file suit against any person alleged to be in violation of an emission standard or order of the Administrator, where the Administrator is not seeking compliance.\textsuperscript{79} If the Administrator fails to perform a non-discretionary duty under the Act, any person may bring suit to require its performance.\textsuperscript{80} Suits under the Act are encouraged by granting jurisdiction to the district courts without regard either to the amount in controversy or to the citizenship of the parties, but frivolous suits are discouraged because damages are denied.\textsuperscript{81}

\textbf{C. Failure of the Chosen Strategies}

\textbf{1. Used-Car Emissions}

Despite the remedial provisions of the 1970 Amendments regulation of mobile-source technology either to promote optimal resource allocation or to safeguard public health remains deficient. Failure to include regulatory power over used vehicles as provided in the Senate bill\textsuperscript{82} left a large gap in directing motor vehicle technology toward abatement of pollution because used vehicles manufactured under the more lenient pre-1975 standards will be a major emissions source. Even beyond the 1975 model year, used vehicles with more than 50,000 miles of service will in effect become uncontrolled and will be permitted to exceed the standards, since both the emission standards and the warranty of compliance for each vehicle apply only for the first 50,000 miles. Yet, because each vehicle has an expected useful life of 100,000 miles, the vehicle is left uncontrolled for half its life. A similar omission rendered the more stringent 1975-76 emission standards inapplicable to heavy-duty gasoline-powered motor vehicles. These omissions are examples of hindsight in technology assessment; technology was allowed to produce a problem before any

\textsuperscript{78} \textsc{Environmental Protection Agency, Progress in the Prevention and Control of Air Pollution} I-2 (1972).


\textsuperscript{81} \textit{Id. § 304(d), 42 U.S.C. § 1857h-2(d) (1970).}

\textit{The bill makes no provision for damages to the individual. It therefore provides no incentives to suit other than to protect the health and welfare of those suing and others similarly situated.}


\textsuperscript{82} \textsc{S. 4358, 91st Cong., 2d Sess. § 211 (1970).}
regulation took place. A more appropriate course would have sought to direct technology in advance so as to avoid subsequent problems.

2. New-Car Certification

Regulation of new-car technology has not fared much better. The Act allows a single one-year suspension of the 1975-76 new-car standards to be granted\(^3\) where an applying manufacturer demonstrates: 1) that control technology is unavailable or has been unavailable for a period of time required to achieve mass production; 2) that the suspension is in the public interest; and 3) that the manufacturer has made all good faith efforts to comply.\(^4\) Interim CO, HC, and NO\(_x\) standards are to be based on the greatest degree of emission control available giving appropriate consideration to the cost of applying such technology within the available time.\(^5\)

On May 12, 1972, EPA Administrator Ruckelshaus rejected the applications of five motor vehicle manufacturers including Ford, Chrysler, and General Motors for a one-year suspension of the 1975 HC and CO emission standards.\(^6\) In essence the Administrator found the manufacturers had failed to sustain their burden of proving that control technology to meet the standards was unavailable. The simple shift in the burden of proof was the decisive factor in this decision.

On February 12, 1973, the Court of Appeals for the District of Columbia reversed the Administrator, holding in part that he had applied too strict a standard in finding the manufacturers' presentation insufficient on the technology issue.\(^7\) The Court held the Administrator had required proof "beyond a reasonable doubt," rather than merely requiring the manufacturers to come forward with all available data. The Court held the proper standard of proof was a mere preponderance of the evidence.\(^8\) In this decision, the Court of Appeals put back into the Clean Air Act what Congress had so carefully legislated out with the 1970 Amendments—considerations of economic

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85. Id.
86. In re Applications For Suspension of 1975 Motor Vehicle Emission Standards, Decision of the Administrator 1 (May 12, 1972) [hereinafter cited as HC and CO Initial Decision]. The Administrator relied primarily on requirement (iii) that: the applicant has established that effective control technology, processes, operating methods, or other alternatives are not available or have not been available for a sufficient period of time to achieve compliance prior to the effective date of such standards. . .
88. Id. at 642, 648, 4 ERC at 2056, 2060.
costs. The economic costs which the Court relied on included
the risks of grave maladjustments for the technological leader
from the eleventh-hour grant of a suspension, and the impact on
jobs and the economy from a decision which is only partially ac-
curate, allowing companies to provide cars but at a significantly re-
duced level of output.

Against these costs which the auto manufacturers copiously docu-
dmented, the Court could find only relatively modest environmental gains. Indeed, the Court speculated that environmental gains from
a suspension denial could be turned into losses if 1975 model cars
performed so poorly that consumers were deterred from buying new
cars and instead continued to drive their older high polluters.

Upon remand, Administrator Ruckelshaus, utilizing the judicially
imposed economic considerations, suspended the statutory 1975 stan-
dards and set interim standards (shown in Table I) for California and
the rest of the United States requiring the use of catalytic converters
only on those vehicles sold in California. The decision was based
on a record heavily flavored with auto industry testimony of techno-
logical infeasibility and catastrophic economic dislocation.

89. See notes 49-54 supra and accompanying text. The Court noted:
On the issue of burden of proof, the standard adopted must take into account
the nature and consequences of risk of error. . . . This view of the standard
of proof dictates the standard normally adopted in civil matters, a prepond-
erance of the evidence.

Our approach relates considerations of ecological and economic costs,
dealt with above, to the legal issue of burden and standard of proof.
478 F.2d at 642-43, 4 ERC at 2056.
90. Id. at 641, 4 ERC at 2055.
91. Id. at 633-36, 4 ERC at 2049-51. The Court failed to consider the effects of
a suspension on a large urban area having a high vehicle replacement rate such as that
found in New York City.
92. Id. at 634, 4 ERC at 2050. The record contained no information on consumer
purchasing practices or projections for the 1975 model year on which the Court could
base its opinion. Indeed, in further supposing that the cost of new-car emission con-
trols would also defer purchases, the Court overlooked the consumer cost of retrofitting
older cars; up to $175 is required in major urban areas under state implementation
plans. ENVIRONMENTAL PROTECTION AGENCY, THE CLEAN AIR ACT AND TRANSPORTA-
TION CONTROLS: AN EPA WHITE PAPER 12 (1972).
93. In re Applications For Suspension of 1975 Motor Vehicle Emission Stan-
dards, Decision of the Administrator On Remand From the United States Court of Ap-
peals For The District of Columbia Circuit (April 11, 1973) [hereinafter cited as Re-
mand Decision]. The decision is reprinted in Hearings on Decision of the Administra-
or of the Environmental Protection Agency Regarding Suspension of the 1975 Auto
Emission Standards Before the Subcomm. on Air and Water Pollution of the Senate
94. Ford claimed suspension denial would cause it to shut down and would result in:
(1) reduction of gross national product by $17 billion; (2) increased unemploy-
ment of 800,000; and (3) decreased tax receipts of $5 billion at all levels of govern-
ment so that some local governments would become insolvent. Ford Motor Co., Ap-

TABLE 1
EMISSION REDUCTION FROM UNCONTROLLED LEVELS ACHIEVED THROUGH IMPOSITION OF FEDERAL STANDARD (IN TERMS OF 1975 FTP)

<table>
<thead>
<tr>
<th></th>
<th>Hydrocarbons Level (gpm)</th>
<th>% Reduction</th>
<th>Carbon Monoxide Level (gpm)</th>
<th>% Reduction</th>
<th>Oxides of Nitrogen Level (gpm)</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-1968 Vehicles</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Uncontrolled)</td>
<td>8.7</td>
<td></td>
<td>87</td>
<td></td>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>1970/71 Standards</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*(NO_x Uncontrolled)</td>
<td>4.1</td>
<td>53%</td>
<td>34</td>
<td>61%</td>
<td>*(4.0)</td>
<td></td>
</tr>
<tr>
<td>1973/74 Standards</td>
<td>3.0</td>
<td>66%</td>
<td>28</td>
<td>68%</td>
<td>3.1</td>
<td>11%</td>
</tr>
<tr>
<td>National Interim</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standards (1975)</td>
<td>1.5</td>
<td>83%</td>
<td>15</td>
<td>83%</td>
<td>3.1</td>
<td>11%</td>
</tr>
<tr>
<td>California</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interim Standards</td>
<td>.9</td>
<td>90%</td>
<td>9.0</td>
<td>90%</td>
<td>2.0</td>
<td>43%</td>
</tr>
<tr>
<td>(1975)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>National Interim</td>
<td>.41</td>
<td>95%</td>
<td>3.4</td>
<td>96%</td>
<td>2.0</td>
<td>43%</td>
</tr>
<tr>
<td>Standards (1976)</td>
<td>(all states)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statutory Standards</td>
<td>.41</td>
<td>95%</td>
<td>3.4</td>
<td>96%</td>
<td>0.4</td>
<td>89%</td>
</tr>
<tr>
<td>(1977) (all states)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Uncontrolled NO_x emissions for 1970/71 vehicles are higher than those for pre-1968 vehicles due to increased NO_x emissions caused by HC and CO emission controls.

amination of the domestic industry's claims of technological inability to meet the 1975 standards strongly suggests the manufacturers engaged in environmental blackmail to obtain their suspension while purportedly addressing the Court of Appeals' economic considerations. In granting the one-year suspension, Administrator Ruckelshaus apparently believed the industry was right; he would not wreak economic havoc by denying industry requests.95 The Administrator referred

5-3, April 5, 1972. Such economic costs were a cornerstone of Ford's contentions on remand:

Denial of suspension would shut down a major portion of the automotive industry and wreak havoc upon the American economy. The Court of Appeals recognized that the principal purpose of the suspension provision was to avoid economic dislocation from a premature application of the statutory standards. (Slip opinion at 33, 43-44.) It would be wholly anomalous and unwarranted to deny suspension on public interest grounds in the face of such an eventuality.


95. The most compelling factor in my decision to require phase-in of catalysts in 1975 has been the possibility raised by the evidence that if the automobile industry attempts to install catalytic converters on its entire product line, without a scale-up period of limited mass production in which to gain experience, difficulties such as a shortage of vital parts or materials, inaccurate machining tolerances, or defects in assembly techniques will arise, and
specifically to GM's opposition which is characterized by the following dire prediction of General Motors Vice-President Ernest S. Starkman:

[I]f GM is forced to introduce catalytic converter systems across-the-board on 1975 models, the prospect of an unreasonable risk of business catastrophe and massive difficulties with these vehicles in the hands of the public must be faced.

It is conceivable that complete stoppage of the entire production could occur, with the obvious tremendous loss to the company, shareholders, employees, suppliers, and communities. Short of that ultimate risk, there is a distinct possibility of varying degrees of interruption, with sizable dislocations.

Less than two months after defeating the catalyst requirement, General Motors, the primary opponent of mandatory catalysts, announced it would install catalysts across-the-board in 1975. Where did the production problems go—the risk of business catastrophe and the entire stoppage of production? Perhaps they were never there in the first instance but were merely conjured up for the purpose of obtaining a suspension from EPA. In any event, the prophecies of economic doom were replaced by claims of fuel economy gains up to 20 percent and catalyst durability not for 25,000 or for 50,000 miles, but rather for the life of the car. Preliminary EPA certification may well be severe enough to cause significant economic disruption.

Remand Decision at 8.

96. Id. at 17. Administrator Ruckelshaus elaborated on this point:

In its opening statement, GM testified that it had drastically compressed "the normal procedures for procuring and testing machinery," and had pushed its manufacturing plans "in parallel with the development program." They added, "Since neither component development nor process development will have had the benefit of the usual testing procedure, our experience tells us serious unforeseen production problems are very probable."

Id. at 17-18.


99. Former General Motors Vice-President John Z. DeLorean wanted General Motors to stress its willingness to try to meet the 1975 standards by equipping the 1975 cars with catalytic converters in the remand proceedings before the Environmental Protection Agency but was overruled as General Motors strenuously argued for the one year suspension. Loving, The Automobile Industry Has Lost Its Masculinity, FORTUNE 187, 268 (Sept. 1973).

100. Statement of General Motors President Edward N. Cole, Hearings on Compliance with Title II (Auto Emissions Standards) of the Clean Air Act, Before the Senate Comm. on Public Works, 93d Cong., 1st Sess. 120-210 (1973); Statement of Gen-
test data obtained from 1975 General Motors vehicles indicate that if anything GM understate\(ed\) the fuel economy gains; some models show a 30 percent gain in fuel economy.\(^{101}\)

Having granted the one-year suspension of the 1975 HC and CO emission standards, EPA could do little else but suspend the 1976 NO\(_x\) emission standard three months later in July 1973,\(^{102}\) for if imposition of the 1975 HC and CO standards on schedule would cause significant economic disruption, then imposition one year later of those standards in addition to the original 1976 NO\(_x\) standard would cause even greater disruption.\(^{103}\) NO\(_x\) control technology, however, has now developed to the point where good fuel economy, performance, and driveability can be attained at reasonable cost. EPA has indicated in its NO\(_x\) suspension decision that the standards can be met if research and development continue.\(^{104}\)

Certain sections of the Amendments impose administrative costs, however, which render effective regulation nearly impossible. Particularly burdensome is section 211(c)(2)(B) which requires the Ad-

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\(^{101}\) Telephone interview with Thomas Austin, Certification and Surveillance Division, Environmental Protection Agency, Mar. 30, 1974.

\(^{102}\) In re Applications For Suspension of 1976 Motor Vehicle Exhaust Emission Standards, Decision of the Administrator, July 30, 1973 [hereinafter cited as NO\(_x\) Decision].

\(^{103}\) The NO\(_x\) suspension hearing record establishes that state-of-the-art NO\(_x\) control in June 1973 was similar to the state-of-the-art HC and CO control in April 1972 when the auto manufacturers initially applied for suspension of the 1975 HC and CO standards. Emission control suppliers indicated significant progress had been made in meeting the standards at extended mileage with good fuel economy, while the auto manufacturers indicated high emissions along with poor durability and fuel economy. NO\(_x\) Decision at 5, 13-15, 24. This same scenario was developed during the HC and CO suspension hearings. The only significantly uninterested party, the New York State Department of Environmental Conservation, presented vehicle test data showing fuel economy gains of up to 20% from 1972 vehicle levels while still meeting the original 1975-76 emission standards at extended mileage. Letter from Henry Diamond, Commissioner of New York State Department of Environmental Conservation, to Robert W. Fri, Acting EPA Administrator, July 13, 1973. New York equipped a 1972 American Motors Matador with a dual catalyst system and ran it 25,000 miles under the original 1975-76 emission standards with fuel economy of 16 mpg as compared to 13 mpg for unmodified 1972 Matadors in the New York State fleet on the same driving schedule. Statement of Dr. William D. Balgord, Senior Research Scientist of New York State Department of Environmental Conservation Before the Subcomm. on Public Health and Environment of the House Comm. on Interstate and Foreign Commerce, Dec. 6, 1973.

\(^{104}\) The record of this Hearing indicates that the technology to achieve '76 statutory emission standards without sacrificing economy of operation, performance and driveability will probably be available in the short term provided research and development continues. NO\(_x\) Decision, Technical Appendix, at 63.
ministrator to consider scientific and economic data including a cost-benefit analysis where any fuel or fuel-additive regulation is contemplated. The burden of proof placed on the Administrator by this section exceeds even that in § 202 under the 1967 Act.

3. Technological Problems

Emission standards for pollutants other than CO, HC and NOX will continue to be set one at a time and only after the Administrator determines that those pollutants are likely to endanger public health or welfare. The manufacturer does not yet bear the burden of proof on the public health issue, although he is in a superior position to know the kind and quantity of emissions from his own prototype and production vehicles. The Administrator may compel disclosure of only such data as the manufacturer has developed as to how emissions affect pollution control systems. There is no duty to test for health effects of emissions as is the case with fuels and fuel additives.

Failure to shift the emission safety burden of proof has resulted in a growing air pollution crisis. Emission standards are based on mass measurements of grams per vehicle mile or micrograms per cubic meter. Particle size and distribution are not considered. Ignored is the fact that one billion one-tenth micron diameter particles weigh only as much a single 100 micron diameter particle of the same density. Thus, emission reductions on a mass basis may be achieved while the actual number of particles in the ambient air increases. By the time

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105. No fuel or fuel additive may be controlled or prohibited . . . except after consideration of available scientific and economic data, including a cost-benefit analysis comparing emission control devices or systems which are or will be in general use and do not require the proposed control or prohibition.


106. See notes 18-20 supra and accompanying text.


108. For the purpose of registration of fuels and fuel additives, the Administrator may also require the manufacturer of any fuel or fuel additive—

(A) to conduct tests to determine potential health effects of such fuel or additive (including, but not limited to, carcinogenic, teratogenic, or mutagenic effects) . . . .


109. Fine particulates (particles with diameters from 0.01 to 2 microns) increasingly are considered to be active mechanisms in health damage from air pollution. Midwest Research Institute, Particulate Pollutant System Study, vol. II, at 15-17, app. B (Adverse Effects of Particulates on Human Health) (1971); Amdur, Toxicologic Appraisal of Particulate Matter, Oxides of Sulfur, and Sulfuric Acid, 19 J. AIR POLLUTION CONTROL ASS'N 638, 640-42 (1969). Yet fine particulate emissions are permitted to increase. Mobile source technology alone annually contributes 1.2 million tons of
the government gathers data on ambient air particle size distribution and its relation to public health, however, current mass-based standards will have channeled control technology development so that subsequent fine particulate controls could be established only at excessive cost.

A closely related but wholly unregulated pollutant is sulfuric acid or sulfates resulting from the oxidation of contaminant sulfur in gasoline as it is burned in internal combustion engines. Oxidation of sulfur to sulfur dioxide and sulfur trioxide in the automotive combustion process has been studied since at least as early as 1950.\textsuperscript{110} Even if contaminant sulfur in gasoline is not sufficiently oxidized to form sulfates during combustion, sulfates will be produced eventually through atmospheric oxidation of the partially oxidized sulfur compounds emitted in the exhaust.\textsuperscript{111} Critics of statutory vehicle emission standards have used this issue to attack current standards, noting that the catalytic converter converts from 5 to 30 percent of gasoline sulfur into sulfates.\textsuperscript{112} This criticism ignores the fact that the worst sulfur culprit is the otherwise clean diesel engine which has the highest sulfate conversion efficiency (up to 90 percent) and which usually burns high-sulfur diesel fuel.\textsuperscript{113}

Regulation of gasoline sulfur content under § 211 of the Clean Air Act appears to be a particularly attractive solution to the atmospheric sulfate problem. EPA disclaims any imminent vehicle sulfate emission hazard, but has stated it may regulate gasoline sulfur content if it finds an associated sulfate emission health hazard.\textsuperscript{114} Unfortunately EPA has chosen not to place even part of this health cost burden on the oil industry pursuant to its authority under section 211(c)(3)(A)

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\textsuperscript{110} Van der Zijden, van Hinte, van den Ende, \textit{SO\textsubscript{2} and SO\textsubscript{3} in Exhaust Gases of Internal-Combustion Engines}, 36 J. Inst. of Petroleum 561-74 (1950).

\textsuperscript{111} Although suspended sulfates which are formed from sulfuric acid are thought to be the most harmful of the sulfur oxides, there is no ambient air quality standard for suspended sulfates nor will there be one for the next two to three years. \textit{Environmental Protection Agency, Health Consequences of Sulfur Oxides: Summary and Conclusions Based Upon CHESS Studies of 1970-71}, Aug. 15, 1973.

\textsuperscript{112} Statement of Dr. Raymond J. Campion, Research Associate, Esso Research and Engineering Co., \textit{Hearings on Compliance with Title II (Auto Emission Standards) of the Clean Air Act, Before the Senate Comm. on Public Works}, 93d Cong., 1st Sess. 3, Nov. 6, 1973.


\textsuperscript{114} Statement of Russell Train, EPA Administrator, \textit{Hearings on Compliance with Title II (Auto Emissions Standards) of the Clean Air Act Before the Senate Comm. on Public Works}, 93d Cong., 1st Sess. 8, Nov. 6, 1973.
of the Clean Air Act which allows the Administrator to require fuel-manufacturer determination of potential health effects of fuels and fuel additives.\textsuperscript{116}

CONCLUSION

To date, regulation of mobile source technology has been erratic and ineffective. Modification of market incentives has been virtually non-existent. No criminal sanctions have been applied. Although the National Environmental Policy Act changed federal decisionmaking structures by imposing consideration of environmental values in agency decisionmaking, almost all significant mobile source technological change has occurred in response to specific government directives. Throughout the regulatory process, three dominant trends have appeared: (1) response to technological effects after the fact rather than pre-planning and then only in the form of specific directives, (2) governmental acceptance of the burden of proving harm from private technology and (3) failure to coordinate technology-directing mobile source programs.

The government consistently responded to developed technology only \textit{after} harmful effects were clearly evident. The specific-directive response consistently chosen, whether by Congress or by HEW in promulgating stronger motor vehicle emission standards, led to suboptimal resource allocation both because the government's response was tardy and because it was naive to the extent that the regulatory means chosen bore excessive administrative costs.

Technologies such as mass transit with external benefits which will not accrue to an entrepreneur may not have been developed precisely because their external effects never surfaced to provide a governmental opportunity to respond. There is strong indication that the auto industry, aided by the oil industry, actually conspired to eliminate mass transit systems to proliferate private passenger automobiles. Through holding companies, General Motors replaced more than 100 electric mass transit systems with GM buses in 45 cities.\textsuperscript{116} General Motors, Standard Oil of California, and Firestone also dismantled the 3,000 electric train Pacific Electric system that served 56 communities in a 75-mile radius around Los Angeles.\textsuperscript{117} This conversion from electric transit to diesel buses resulted in higher operating costs and decreased patronage such that many of the transit systems failed.\textsuperscript{118}

\footnotesize
\begin{itemize}
\item 115. See note 108 \textit{supra}.
\item 117. Id. at 31.
\item 118. Id. at 37-38. For 50 years of electrified operation prior to conversion to
Government acceptance of the burden of proving harmful effects prior to regulation invariably led to more disruptive government action than would have been necessary at the outset. The internal combustion engine and the privately owned motor vehicle became so firmly entrenched that more efficient alternative power plants and mass transit systems appeared unattractive. More costly accommodations and modifications of the private-passenger vehicle and its support systems became the only available short-term health solution to the motor vehicle emissions problem.

Various federal agency programs affecting mobile source technologies were frequently at cross-purposes with one another. Department of Transportation provisions for interstate highways connecting major urban areas conflicted with EPA measures to reduce motor vehicle air pollution in the same urban areas. A more complete implementation of the National Environmental Policy Act should eliminate such conflicts.

The 1975-76 vehicle emission standards are a valid attempt to meet the health-related primary air quality standards. Although industry has attacked the ambient air quality standards, available evidence evaluated for the Senate Public Works Committee by the National Academy of Sciences and by EPA affirms the standards' scientific validity. Even the statutory 1976 standard of 0.4 gram per mile for oxides of nitrogen, whose threat to public health was openly questioned by EPA in April 1973, is now being reconsidered as necessary in view of recent health effects studies of nitrates in the United States and of nitrogen dioxide in Japan.

General Motors diesel locomotives, the New Haven railroad had always had an annual operating profit. Within 7 years after conversion, it was losing money; within 9 years, it was declared bankrupt. Id. at 41.

119. The available evidence from the Environmental Protection Agency, the National Academy of Sciences and from other independent sources indicates that public health-related air quality standards are no more stringent than needed to protect the health of sensitive groups in our population from the adverse impact of air pollution.


121. The Japanese results may also be interpreted, from the viewpoint of protecting public health, as a warning against any relaxation of NO₂ [NOₓ] emission standards. If the Japanese data can be scientifically accepted and if additional studies support the chronic bronchitis-NO₂ association, the 0.4 gram/mile NO₂ emission standard may be fully supportable. Given our uncertainty, I believe that further reductions in NO₂ emission rates (below current 3.0 gram/mile levels) are both sensible and highly desirable from a public health standpoint.

Memorandum of Dr. Carl M. Shy, Director of the Human Studies Laboratory of the
The primary objection to meeting emission standards on time is that the domestic manufacturers plan to meet them with a catalyst-equipped engine more expensive and less durable than low-polluting alternatives such as the stratified-charge engine. Since the domestic manufacturers rejected the stratified-charge engine at least 15 years ago according to the Justice Department,122 there is little reason to have faith in the present auto industry and oil industry request to suspend the statutory standards to permit a shift to the stratified-charge engine. The major problem with industry's proposal, however, is that the public will pay for any suspension in terms of health or welfare damages or increased transportation controls. The manufacturers condition any development of alternative technologies upon meeting their own design, performance, and production goals based on their own evaluation of their own data, thus foreclosing alternative technological development within the decade.

If Congress wants alternative technologies it must strengthen, not weaken, Title II of the Clean Air Act. First, emission control systems should be required to remain effective throughout the vehicle's 100,000-mile useful life. Second, the recall and warranty provisions of the Clean Air Act should be strengthened so as to place at economic disadvantage those manufacturers who produce less durable emission control mechanisms. Mechanical failure of certain parts such as valves at any point within the useful life of the vehicle should be considered per se warranty violations.

These changes would put more efficient, low-polluting alternatives in a better competitive position. Already consumers, for economic reasons, are preferring smaller cars with better gas mileage. Domestic auto manufacturers have responded by producing more small cars and fewer large cars to meet the new demand. Improving the

Environmental Protection Agency, to Dr. John Finklea, Director of the National Environmental Research Center of the Environmental Protection Agency, at 3, Nov. 15, 1973.

122. For instance, in the late 1950's Ralph Heintz, inventor, developed and patented a stratified charge engine . . . which reduced hydrocarbon, carbon monoxide, and oxides of nitrogen emissions, while at the same time effecting a savings in gasoline consumption. . . . Moreover, the stratified charge engine would replace the conventional engine with little or no additional cost to the consumer. . . . The development of this engine was publicized generally so that the automobile manufacturers knew of its existence and what it would do. . . . In fact, Victor G. Raviole, former executive director of the Ford engineering staff, stated on several occasions in the early 1960's that the major automobile companies were investigating such an engine and on one occasion predicted that it might be ready for production before 1965. . . . However, the automobile manufacturers have evidenced little faith in this approach and no such engine has been produced by any of them. . . . Confidential Department of Justice memorandum urging criminal prosecution of the automobile manufacturers. 117 Cong. Rec. H 4063, H 4072 (daily ed. May 18, 1971).
competitive position of low-polluting alternatives will cause similar market response. At the same time, vehicles will be produced with sufficiently low emissions to meet the health and welfare standards of the Clean Air Act.