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Technological, Economic, and Political Feasibility in OSHA's Air Contaminants Standard

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Abstract. In 1989, after almost two decades of substance-by-substance standard setting, the Occupational Safety and Health Administration (OSHA) promulgated its Air Contaminants Standard, imposing new exposure limits for 376 toxic substances encountered in U.S. industry. In marked contrast to earlier regulations, the Air Contaminants Standard has generated relatively little industry opposition. This paper analyzes the standard in the context of the twenty-year debate over the appropriate role for technological feasibility and economic compliance costs in occupational health policy. The political feasibility of the new standard is traced to OSHA's abandonment of "technology forcing" in favor of reliance on "off-the-shelf" technologies already in use in major firms. While important as an embodiment of OSHA's new "generic" approach to regulation, the Air Contaminants Standard cannot serve as a model for future occupational health policy, due to its reliance on informal, closed-door mechanisms for establishing regulatory priorities and permissible exposure limits.

No issue has proven more divisive in occupational health policy than the technological and economic feasibility of the permissible exposure limits set by the Occupational Safety and Health Administration (OSHA). During the 1970s critics argued that OSHA's standards imposed a major burden on industry: raising costs, reducing productivity growth, and impeding America's ability to compete in world markets. Supporters responded that industry's compliance cost estimates were severely biased and that regulation provided strong incentives for technological innovation, product substitution, and productivity enhancement. The debate was never resolved, but by the end of the decade one

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thing had become clear. Whatever the technological and economic feasibility of its permissible exposure limits, OSHA's regulatory strategy had become politically infeasible. The incoming Reagan administration targeted OSHA's standard-setting process for review with the explicit aim of making economic feasibility a dominant criterion for acceptability.

After an initial period dominated by the weakening or revoking of standards established by the Carter administration, the Reagan administration's OSHA tentatively began to promulgate new standards. Several of these consisted of unfinished business from the 1970s, including standards covering asbestos, cotton dust, and benzene. Surprisingly, however, during the 1980s OSHA gradually developed an alternative regulatory strategy, one potentially more effective than the substance-by-substance approach. Starting with the Hazard Communication Standard in 1983 and with the more recent plans for exposure monitoring and medical surveillance standards, the agency has sought process-oriented regulations that would govern the manner in which employers deal with whole classes of hazardous substances. The most dramatic move to date in this new regulatory approach was the sweeping promulgation in January 1989 of 376 new permissible exposure limits for toxic air contaminants.

What is striking about OSHA's new regulatory strategy in general and the Air Contaminants Standard in particular is the relative lack of opposition they have generated from business interests. This is a dramatic change for OSHA's experiences with substance-specific standards in the 1970s. Major firms and industry associations lined up to testify in support of the Air Contaminants Standard, providing exposure and engineering data to document its technological feasibility and abandoning their earlier insistence that economic feasibility be determined using formal cost-benefit analysis. Labor unions have voiced strong objections to specific features of the Air Contaminants Standard while supporting the principle of generic approaches to standard setting. Given the present strength of industry and the weakness of labor in the legislative and executive arenas, OSHA has developed a politically feasible regulatory strategy.

In this article, we analyze the content and context of the Air Contaminants Standard to see how OSHA managed to promulgate hundreds of new exposure limits without arousing serious industry opposition. We describe first the standard itself, emphasizing its reliance on an industry-oriented private organization and its rejection of public sector institutions, despite OSHA's legislative mandate to rely on those public institutions. Next, we focus on technological feasibility, documenting OSHA's shift from an aggressive "technology-forcing" philosophy to one entailing reliance on "off-the-shelf" technologies. Economic feasibility is covered in the section following, where we study the Air Contaminants Standard in the context of the legal battles over the role of cost-benefit analysis in occupational health policy. In the fourth section, we consider the political feasibility of the standard and highlight the influence of corporate interests in the standard-setting process. We argue that the Air Contaminants

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Standard is a creative regulatory initiative but one that cannot serve as a model for future broad-based efforts to reduce hazard exposure levels in U.S. industry.

The Air Contaminants Standard

The new Air Contaminants Standard¹ essentially updates and expands the interim regulations adopted in 1971 which were based on voluntary standards commonly followed in private industry and used in some federal programs.² The majority of these original standards were adopted directly from the Walsh-Healy Public Contracts Act,³ which was, in turn, based on the threshold limit values recommended in 1968 by the American Conference of Governmental Industrial Hygienists (ACGIH), a private organization of industrial hygienists from various public agencies and departments. Threshold limit values (TLVs) are exposure levels (such as for airborne chemical concentrations) that the ACGIH claims can be maintained over long periods without adverse health effects on any but the most sensitive members of the work force. OSHA had adopted these standards in order to have a core of regulations to enforce, with the understanding that they would be supplemented over time with formal rule making.⁴ The interim standards were never conceived to be authoritative⁵ but were thought to be noncontroversial due to the fact that industry had had considerable input into their formulation.

In the post-Watergate era and through the remainder of the 1970s, OSHA pursued a quite different and much more aggressive standard-setting policy, promulgating strict exposure limits for a number of important toxic substances. This regulatory vigor generated a strong political and legal response by the targeted industries, who contested in court almost every standard. By the end of the decade, OSHA was known among conservatives as the most hated agency in Washington (Mendeloff 1988).

The inauguration of Ronald Reagan heralded a dramatic change in OSHA policy from confrontation to cooperation with industry. The first few years were devoted to the review and subsequent weakening or withdrawal of many of the major standards promulgated by the Carter administration. Partly in response to lawsuits filed by labor unions and public interest groups, OSHA promulgated a handful of substance-specific regulations during the 1980s. More signifi-

1. 29 C.F.R. 1910.1000 as amended (1990).

2. 36 Fed. Reg. 10,466 (1971).

3. Ch. 881, 49 Stat. 2036 (1936) (current version at 41 U.S.C. 35-45 (1982)).

4. The interim standards were adopted under section 6(a) of the 1970 Act [29 U.S.C. 655(a)], while regular standard setting is conducted under section 6(b) [29 U.S.C. 655(b)].

5. 1970 U.S. Code Cong. & Ad. News 5177, 5182. The Senate Committee on Labor and Public Welfare stated that the interim standards "may not be as effective and as up-to-date as desirable" and that they would provide only a "minimum level of health and safety" (cited in Mintz 1984).

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cantly, however, OSHA began to promulgate generic standards, building on a strategy initiated by the Carter administration.

Control of occupation-related disease requires a combination of data gathering through environmental monitoring and medical surveillance, engineering controls to reduce ambient contamination levels, use of respirators and personal protective equipment where engineering controls are infeasible, and educational programs to train workers in the recognition and avoidance of hazards. Rather than include each of these components in substance-specific standards, OSHA has developed standards covering only one element of the overall control strategy but applicable to many substances. The worker-training component was embodied in the 1983 Hazard Communication Standard,⁶ albeit after considerable pressure from organized labor and environmental groups (Shepard 1986). A standard guaranteeing worker access to company medical surveillance and exposure-monitoring records was promulgated by the Carter administration.⁷ OSHA has proposed generic standards for exposure monitoring,⁸ medical surveillance,⁹ use of respirators in lieu of engineering controls for existing OSHA standards,¹⁰ and exposure to bloodborne pathogens.¹¹ In August 1989, it proposed a performance-based approach to requirements that employers provide protective equipment such as eye shields and helmets to employees in high-risk jobs.¹² OSHA has not, however, pursued the Carter administration's generic carcinogen standard, which would have streamlined the classification of chemicals as carcinogens based on animal toxicology studies, and then set permissible exposure limits at the lowest feasible level.¹³

The combination of industry opposition during the 1970s and antiregulatory philosophy during the 1980s limited OSHA's record to a total of thirteen standards covering twenty-six individual substances. The vast majority of permissible exposure limits available to OSHA's enforcement arm continued to be those adopted in 1971 based on the 1968 threshold limit values. This became a matter of increasing embarrassment, particularly in light of the growing disparity between the 1968 TLVs incorporated into law and the newer versions. The ACGIH continued to review existing TLVs, lowering many of them to more protective levels, and issued new TLVs for many substances not previously covered.

The widening gap between the new and old TLVs suggested an obvious regulatory response: updating OSHA's permissible exposure limits based on the

6. 29 C.F.R. 1910.1200 (1990).

7. 45 Fed. Reg. 35,214 (1980).

8. 53 Fed. Reg. 32,591 (1988).

9. 53 Fed. Reg. 32,595 (1988).

10. 54 Fed. Reg. 23,991 (1989).

11. 54 Fed. Reg. 2167 (1989).

12. 54 Fed. Reg. 33,832 (1989).

13. 45 Fed. Reg. 5284 (1980).

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new threshold limit values (Mendeloff 1988). OSHA's authority to adopt directly the TLVs under section 6(a) of the Occupational Safety and Health Act had lapsed. If it wished to adopt the newer TLVs, the agency would have to follow the procedures under section 6(b) of the Act. As interpreted by the courts, this entailed evaluating the significance of the risks to be controlled and the feasibility of the exposure limits. OSHA also needed to pay attention to the recommendations of governmental scientific institutions, which played virtually no role in the 1971 process. Prominent among these institutions were the National Institute for Occupational Safety and Health (NIOSH), created by the 1970 legislation to provide recommendations to OSHA, and the National Toxicology Program (NTP), composed of representatives from a range of governmental bodies with the mandate to coordinate the evaluation of chemical carcinogens.

The conflict between OSHA's desire to adopt the new threshold limit values and its obligation to follow a more rigorous process is evident in the published justification of the Air Contaminants Standard.¹⁴ Rather than admit it focused on the TLVs from the beginning, OSHA asserts that it canvassed the scientific literature for all proposals on how to prioritize chemicals for regulation. OSHA rejected the carcinogen classification schemes developed by the National Toxicology Program and the International Association for Research on Cancer (World Health Organization) on the grounds that they did not recommend specific numerical exposure limits. NIOSH could not be ignored so easily, because it had developed numerical recommended exposure limits that tended to be much more protective than the TLVs. Nevertheless, NIOSH was effectively frozen out of the Air Contaminants Standard process. The institute was not informed of OSHA's interest in updating the exposure limits until November 1987. In the spring of 1988, OSHA presented NIOSH with a list of substances to be covered under the standard, plus proposed exposure limits, and gave it only six weeks to comment. NIOSH hurriedly evaluated the health effects reports for particular substances from various databases (Robinson et al. in press).

Although OSHA subsequently asserted that the Air Contaminants Standard was based in part upon NIOSH recommendations, the public testimony provided by the institute concerning the new regulation reveals the minor role its recommendations played. Forty-two substances were excluded from coverage despite the existence of NIOSH recommended exposure limits because no TLV had been established. NIOSH testified that the exposure limits for ninety-eight of the substances covered by the standard were insufficiently protective (Robinson et al. in press). The treatment of carcinogens by OSHA was particularly at variance with the recommendations of the scientific organizations. The standard excludes from coverage sixty-eight substances designated as carcinogens

14. 54 Fed. Reg. 2332 (1989).

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by NIOSH and/or NTP. The permissible exposure limits for sixty-seven of the substances covered by the standard were based on noncancer effects alone, despite the designation of these substances as carcinogens by NIOSH and/or NTP (Paxman and Robinson 1990).

Technological feasibility

In a major contrast to the precedent set in many of its most prominent regulations, OSHA made an explicit decision in the Air Contaminants Standard to mandate that exposures be reduced to levels achievable using existing technology. In preparing the standard, OSHA went to considerable length to document the availability of engineering technologies and work practice controls capable of bringing firms into compliance with the proposed exposure limits. It conducted a review of the engineering literature and employed several panels of industrial hygienists and engineers to document the technological feasibility of the new standard for each affected industry.¹⁵

Much of the intensity surrounding debate over occupational and environmental health policy has derived from differences over the extent to which regulatory agencies may be "technology-forcing" in the standards they set. Critics of regulation in general and of OSHA regulations in particular have developed high compliance-cost estimates using the (often implicit) assumption that firms will seek to achieve the new lower exposure and pollution levels with existing technologies. Supporters of regulation have replied that compliance costs often tend to decline dramatically after a new regulation has been promulgated, since firms now face powerful incentives to research and develop new methods of production and waste disposal (Ashford et al. 1985).

Several of the epic regulatory battles fought between OSHA and industry during the 1970s concerned the legitimacy or illegitimacy of technology forcing. In its standards governing occupational exposure to vinyl chloride (1974),¹⁶ coke oven emissions (1975),¹⁷ lead (1978),¹⁸ and cotton dust (1978),¹⁹ OSHA adopted an explicitly technology-forcing approach. In the Air Contaminants Standard, by contrast, OSHA's feasibility analysis is "based on what industry is already achieving or what could be achieved with standard 'off-the-shelf'

15. 54 Fed. Reg. 2790 (1989).

16. Occupational Safety and Health Standards Subpart Z—Toxic and Hazardous Substances. 29 C.F.R. 1910.1017, (1989).

17. Occupational Safety and Health Standards Subpart Z—Toxic and Hazardous Substances. 29 C.F.R. 1910.1029, (1989).

18. Occupational Safety and Health Standards Subpart Z—Toxic and Hazardous Substances. 29 C.F.R. 1910.1025, (1989).

19. The original cotton dust regulation was published at 43 Fed. Reg. 27,350 (1978). The final standard was not promulgated until 1984 (Occupational Safety and Health Standards Subpart Z—Toxic and Hazardous Substances. 29 C.F.R. 1910.1043, (1989)).

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technology" and hence there are "few if any cases" where the development of new technology would be forced by the standard.²⁰

The key feature of the new standard-setting approach that guaranteed technological feasibility is the reliance on ACGIH threshold limit values. It could be assumed that these exposure limits corresponded to existing exposure levels in leading firms, either because leading firms had lowered their exposure levels in response to the ACGIH recommendations, or because the ACGIH would not propose an exposure limit below the levels prevalent in industry. After publishing a preliminary version of the Air Contaminants Standard in the *Federal Register* on 7 June 1988, OSHA opened the matter to industry input both through written comments and in several sets of public hearings. As a result of these comments, OSHA raised the permissible exposure limits for twenty-two substances, delayed or eliminated limits for four substances, and lowered limits for three substances. The decisive criterion for establishing feasibility in this process was the presence of exposure-monitoring data at levels below the proposed exposure limit for the particular substance in question. Data suggesting that current exposure often exceeded the proposed limit commonly led to a weakening of the standard for that particular substance. The exposure limit for wood dust, for example, was raised from one milligram per cubic meter of air to five milligrams in the hardwood-using lumber and furniture industries after several industry associations submitted data indicating exposure levels above one milligram but below five.²¹ The permissible exposure level for acetone was raised from 250 to 750 parts per million parts of air after the Chemical Manufacturers Association submitted exposure-monitoring data indicating exposures above 250. According to OSHA, the final acetone standard "is not only technically feasible, but is currently being met."²²

While the Air Contaminants Standard does not force the development of new technology, it does force the diffusion of existing technologies. The most prominent and controversial case in which OSHA mandated technology diffusion is the dry cleaning industry, where many firms have exposure levels to perchloroethylene above the original proposed limit of 50 parts per million and certainly above the final proposed limit of 25. During the hearings, the Amalgamated Clothing and Textile Workers Union submitted exposure monitoring data indicating that, while perchloroethylene levels were at or above 50 parts per million for traditional "transfer" dry cleaning technologies, they averaged 10 and consistently fell below 25 for the new "dry-to-dry" technologies. Based on the trend toward "dry-to-dry" technologies documented by the International Fabricare Institute, OSHA declared that the 25 parts per million limit would be

20. 54 Fed. Reg. 2386 (1989).

21. 54 Fed. Reg. 2793 (1989).

22. 54 Fed. Reg. 2799 (1989).

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feasible by 1992 for the industry as a whole through the normal machinery replacement cycle.²³ It subsequently weakened this position, asserting that it would consider a longer phase-in period for small firms.²⁴

Economic feasibility

The bipartisan congressional support for the original 1970 Occupational Safety and Health Act was founded on the unspoken premise that the economic cost of occupational health regulations would be tolerable to industry. The legislative history of the act includes much testimony and discussion on the economic costs of not regulating: medical care expenses, early disability, lost productivity, tort liability lawsuits, and Worker's Compensation payments (Page and O'Brian 1973; Mintz 1984). This bipartisan support for OSHA splintered in the ensuing decade, as OSHA proposed dramatic reductions in exposure levels for chemicals central to the production processes in major industry sectors.

The Occupational Safety and Health Act contains no explicit statement on how economic considerations are to be balanced against improvements in health status. The key passage is very ambiguous, declaring that the agency:

shall set the standard which most adequately assures, to the extent feasible, on the basis of the best available evidence, that no employee will suffer material impairment of health or functional capacity.²⁵

In this passage, "to the extent feasible" could easily be interpreted in a technological, noneconomic sense and was so interpreted by the labor unions and their supporters in the first major confrontation in the war over OSHA standard setting. In 1972, OSHA promulgated a standard limiting airborne concentrations of asbestos to two fibers per cubic centimeter of air.²⁶ The agency determined, however, that many work operations would have difficulty complying with the new limit, and that in some plants extensive redesign and relocation of equipment might be needed. Therefore it established a four-year delay in the effective date of the new standard, setting an interim limit of five fibers per cubic centimeter.

The four-year delay was challenged in court by the AFL-CIO and the Public Citizen Health Research Group, who objected that OSHA had improperly considered economic factors in addition to technological feasibility in arriving at this decision. OSHA argued in response that economic as well as technological

23. 54 Fed. Reg. 2812 (1989).

24. 54 Fed. Reg. 2888 (1989).

25. 29 U.S.C. 655(b) (5).

26. 29 C.F.R. 1910.1001 (1990).

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feasibility was implied by the original legislation, and was supported in this position by the Court of Appeals.²⁷ In his ruling, the circuit judge argued:

Congress does not appear to have intended to protect employees by putting their employers out of business—either by requiring protective devices unavailable under existing technology or by making financial viability generally impossible.

He then went on to sketch an interpretation of feasibility that provided the framework for the discussion of economics and health at OSHA until the present day:

This qualification [economic feasibility] is not intended to provide a route by which recalcitrant employers or industries may avoid the reforms contemplated by the Act. Standards may be economically feasible even though, from the standpoint of employers, they are financially burdensome and affect profit margins adversely. Nor does the concept of economic feasibility necessarily guarantee the continued existence of individual employers. It would appear to be consistent with the purposes of the Act to envisage the economic demise of an employer who has lagged behind the rest of the industry in protecting the health and safety of employees and is consequently financially unable to comply with new standards as quickly as other employers. As the effect becomes more widespread within an industry, the problem of economic feasibility becomes more pressing.

This interpretation of feasibility as permitting major expenditures up to the limit of massive economic dislocation within a particular industry was adopted by OSHA and applied to its subsequent regulations. In so doing, however, the agency operated at cross-purposes with the new bipartisan concern in Congress and the White House for inflation and regulatory costs. In 1974, President Ford issued Executive Order 11,821, requiring federal agencies to consider the inflationary impact of major regulations.²⁸ In 1978, President Carter issued Executive Order 12,044, mandating agencies to prepare regulatory impact analyses that would discuss regulatory alternatives for dealing with the problem under consideration and explain why the particular action taken was the best among available choices.²⁹ In 1981, President Reagan issued Executive Order 12,291, which required the regulatory impact analyses to quantify the costs and benefits of each major proposed regulation and proceed to promulgation only if the benefits exceed the costs.³⁰

Industry countered OSHA's interpretation of feasibility with a call for cost-benefit analysis, enjoying in this matter the active support of the various reg-

27. *Industrial Union Dep't v. Hodgson*, 499 F.2d 467 (D.C. Cir. 1974).

28. Executive Order No. 11,821, 3 C.F.R. 1971–1975 Comp., p. 926.

29. Executive Order No. 12,044, 3 C.F.R. 1978 Comp., p. 152.

30. Executive Order No. 12,291, 3 C.F.R. 1981 Comp., p. 127.

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ulatory oversight bodies in the executive branch, including the Council on Wage and Price Stability and the Office of Management and Budget. In promulgating the Coke Oven Emissions Standard in 1975, OSHA rejected cost-benefit analysis, arguing that methodological limitations precluded its use for health regulations.³¹ In issuing the Benzene Standard in 1978, OSHA again rejected cost-benefit analysis. In addition to the argument based on methodological limitations, OSHA for the first time argued that the original legislative language prohibits the use of cost-benefit analysis.³² The Benzene Standard was thrown out by the Fifth Circuit Court of Appeals, which insisted that OSHA prove that the "measurable benefits" associated with a regulation bear a "reasonable relationship" to the costs imposed.³³ The Supreme Court supported the circuit court in vacating the Benzene Standard, but on other grounds, and the issue of cost-benefit analysis was not conclusively addressed.³⁴

The role of economics in OSHA rule making came to a head in the legal controversy over the Cotton Dust Standard, originally promulgated in June 1978³⁵ but not finalized until six years later.³⁶ The Court of Appeals upheld OSHA's position.³⁷ The Supreme Court then agreed to review the case. While oral arguments were being presented, Ronald Reagan was inaugurated and promptly issued Executive Order 12,291, mandating cost-benefit analysis for federal agencies. The new OSHA director requested that the Supreme Court not consider the Cotton Dust Standard further, thereby allowing the agency to perform an economic analysis consistent with the executive order. The Supreme Court denied OSHA's motion and proceeded to rule on the standard. It upheld the standard, accepting OSHA's original argument that the 1970 legislation could not be interpreted as requiring cost-benefit analysis, and furthermore that the Cotton Dust Standard as promulgated was feasible under OSHA's criterion of not interfering with "long-term profitability and competitiveness."³⁸

Ironically, therefore, now that OSHA was no longer interested in a massive economic dislocation interpretation of feasibility, it received the judicial support for just such an interpretation. While the Supreme Court did not explicitly rule that the act prohibited cost-benefit analysis, but only that it did not require it, the language of the ruling was sufficiently hostile to cost-benefit analysis that OSHA chose to interpret the ruling as prohibiting the method. Thus, although OSHA's regulatory process was one of the main sources of the fervent advocacy

31. 41 Fed. Reg. 46,742 (1976).

32. 43 Fed. Reg. 4,918 (1978).

33. *American Petroleum Inst. v. OSHA*, 581 F.2d 493 (5th Cir. 1978).

34. *Industrial Union Dep't v. American Petroleum Inst.*, 448 U.S. 607 (1980).

35. 43 Fed. Reg. 27,350 (1978).

36. 29 C.F.R. 1910.1043 (1990).

37. 617 F.2d 636 (D.C. Cir. 1979).

38. *American Textile Manufacturers Inst. v. Donovan*, 452 U.S. 490 (1981).

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by industry and conservative politicians for cost-benefit analysis, it became one of the salient areas of federal activity exempted from the cost-benefit analysis provisions of Executive Order 12,291 (Mintz 1984).

OSHA's approach to evaluating economic feasibility since the cotton dust decision has been to compute two standards of comparison, using different assumptions as to who will bear the costs of compliance. Under the assumption that no part of the costs can be shifted forward to consumers in the form of higher prices, the agency calculates the ratio of annual compliance costs to total profits for each affected industry. Under the assumption that all costs can be shifted to consumers, OSHA then calculates the percentage unit price increases that would be occasioned in each industry and compares these to historical trends in industry-specific price inflation rates.

While not an explicit cost-benefit analysis, this approach to economic feasibility requires that substantial quantities of data be gathered on actual exposure levels and on the costs of reducing exposure levels to the proposed limit in each industry. When combined with the requirements imposed on the agency by the benzene decision to explicitly calculate health benefits (albeit not in dollar terms), this interpretation of economic feasibility ends up by requiring OSHA to generate almost all the separate pieces of a full-blown cost-benefit analysis but then stop short of putting the pieces together. In its major substance-specific standards promulgated in the 1980s, OSHA has in fact performed all the individual tasks required for a cost-benefit analysis (including placing a dollar value on morbidity and mortality) without actually computing net benefits as proposed by Executive Order 12,291.³⁹ OSHA estimates that each substance-specific standard costs approximately one year and \$500,000.⁴⁰ The Air Contaminants Standard proved to be substantially more expensive, costing \$4 million (*Occupational Safety and Health Reporter* 1989b).

Whatever the virtues of this degree of quantification prior to the promulgation of a standard covering one hazardous substance, it is clearly unsuited for generic approaches to standard setting of the type envisaged by OSHA in recent years. One legacy of the legal battles of the 1970s, however, is the requirement that OSHA formally evaluate technological and economic feasibility according to the proven format. The Air Contaminants Standard was therefore forced into the procrustean bed of the established standard-setting process. Compared to the detailed procedures followed in the earlier standards, however, the quantification process could euphemistically be described as streamlined.

In setting its substance-specific standards, OSHA typically commissions one or more contractors to conduct extensive exposure monitoring and to evaluate

39. For examples, see the background regulatory analyses for the ethylene oxide and new benzene standards (JRB Associates 1983 [excerpts in Mintz 1984], and 1984).

40. 54 Fed. Reg. 2363 (1989).

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compliance costs at each of several possible permissible exposure limits. For the Air Contaminants Standard, OSHA limited the evaluation of exposure limits for each substance to the single level incorporated in the ACGIH threshold limit value, or, in a few cases, the NIOSH recommended exposure limit. To evaluate existing exposure levels, the agency began with the 1982 National Occupational Exposure Survey, conducted by NIOSH, that identified which hazardous substances were present in which industries but did not measure actual exposure levels. Actual exposure levels were obtained from the Integrated Management Information System (IMIS) database, which contains substance- and industry-specific measurements taken over the years by OSHA's industrial hygienists. To fill in the gaps in the IMIS, OSHA commissioned a telephone survey of 5,700 establishments in industries suspected to utilize the hazardous substances under consideration. Management respondents to this survey were requested to indicate which voluntary exposure limits the firms sought to comply with and the extent to which they in fact were able to comply. OSHA then convened two panels of industrial hygienists to evaluate the IMIS and survey data and indicate the industries where exposures might occur that would not have been picked up by the IMIS or the survey. Estimates of the total numbers of overexposed workers were obtained by combining overall employment data from the NOES with estimates of the percentage of exposed workers who are exposed at levels above the proposed new limits, derived from the IMIS and the management survey. Panels of engineers and industrial hygienists were then employed to assign compliance costs to each industry, based on the estimated actual exposure levels, the proposed new limits, and an evaluation of the engineering literature for each production process. OSHA also conducted site visits to ninety plants to compare data collected by telephone and in the field.⁴¹

Using this methodology, OSHA estimated that 22 percent of establishments using one or more of the substances governed by the standard would incur compliance costs due to current exposure levels exceeding the proposed limits.⁴² The agency estimated that up to 24.9 million workers were exposed to one or more of the hazardous substances under consideration, and that up to 5.3 million were currently exposed above the proposed new limits. Total annual compliance costs for all covered industries were estimated to be \$788 million in 1985 dollars, approximately \$150 per overexposed worker.

Compliance costs varied substantially across industries but were always small and therefore "feasible" when compared to total annual profits or value of sales. Using the assumption that compliance costs would come completely from potential profits, OSHA estimated a range of profit reductions from a low of 0.0003 percent in the tobacco industry to a high of 2.34 percent in the rubber

41. 54 Fed. Reg. 2841 (1989).

42. 54 Fed. Reg. 2851 (1989).

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and plastics industry, with a mean across covered industries of 0.39 percent.⁴³ Using the assumption that compliance costs would be totally passed on to consumers, OSHA estimated industry price increases ranging from less than 0.0001 percent in tobacco to 0.13 percent in rubber and plastics, with a mean of 0.03 percent.⁴⁴

These compliance costs can usefully be compared to those estimated for OSHA's most prominent recent substance-specific standard. The engineering costs associated with OSHA's 1987 Benzene Standard were estimated to total \$15.3 million per year in 1983 dollars. With 9,954 overexposed workers in six covered industries (out of a total of 237,812 workers with any level of benzene exposure), this comes down to \$1,537 per overexposed worker, ten times the per-worker costs estimated for the Air Contaminants Standard. Whether the differences between the Benzene and Air Contaminants Standards in per-worker risk reductions are of comparable magnitude to the differences in the per-worker costs depends on how the risk of leukemia associated with the Benzene Standard are weighed next to the mix of illness risks associated with the Air Contaminants Standard.

Political feasibility

In contrast to previous permissible exposure limits, OSHA's Air Contaminants Standard obtained widespread support from industry. Individual firms and industry associations testified in favor both of the generic approach to rule-making and, with some exceptions, of the proposed exposure reductions for particular substances. Some firms and industry groups did object to particular limits of direct concern to them. OSHA evaluated these comments and, in the final standard, raised the exposure limits for twenty-two substances and eliminated or delayed limits for four additional substances. In a few cases, OSHA stuck with its original proposed limit in the face of substantial opposition and was duly sued in court (*Occupational Safety and Health Reporter* 1989a).

While generating relatively favorable response from industry, the Air Contaminants Standard elicited intense opposition from the AFL-CIO and the more politically active labor unions. While supportive of generic approaches to regulation, the unions were highly critical of both the process followed in developing the Air Contaminants Standard and the specific features of the final standard (AFL-CIO 1988). The AFL-CIO argued that the standard should apply to more substances, that the permissible exposure limits should be stricter for a number of substances, that requirements for exposure monitoring and medical surveillance be included, and that the coverage of the standard be extended to the agriculture, construction, and maritime sectors.

43. 54 Fed. Reg. 2885 (1989).

44. 54 Fed. Reg. 2886 (1989).

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What drew the greatest ire from the labor unions, however, was the process used by OSHA to prioritize hazardous substances for regulation and decide which parts of the health literature to consult in setting exposure limits. In relying upon the ACGIH threshold limit values to prioritize substances and establish exposure limits, OSHA was reverting to a reliance upon private sector approaches to industrial hygiene of a type not seen since 1970. The Occupational Safety and Health Act was consciously designed by its supporters to be a break with the tradition of control over occupational health information and standard setting by large corporate interests. Nothing has characterized public debate over occupational health since 1970 more than the oft-proclaimed need for information, public participation, and procedural openness. Now OSHA, in search for a shortcut to promulgating exposure limits, was wagering its authority on the reliability of the main private sector organization in the field.

The prominent role played by the threshold limit values in industry practice and public policy eventually focussed attention on the process by which TLVs were established. The characteristic flaws of the approach adopted by the ACGIH were soon apparent. Castleman and Ziem (1988) reviewed the documentation for the hundreds of TLVs and the minutes of the ACGIH TLV Committee since the 1940s and focused on the extensive role played by unpublished and unverifiable input from corporate personnel concerning putative experiences with particular substances. Of the approximately 600 substances covered by the TLVs, fully 104 were supported totally or mainly by the unpublished statements of corporate personnel. This count is in many ways an underestimate of the role of unpublished evidence in the TLVs, since it uses a generous definition of what constitutes publication. The documentation for particular substances was counted by Castleman and Ziem as published even if it consisted solely of the manufacturer's safety data sheet or unsupported statements published in a text by a corporate health professional. The prominent role played by corporate personnel in setting exposure limits for their own products evoked the image of the fox guarding the chicken coop.

Roach and Rappaport (1990) went a step further and reread the scientific papers referenced by the ACGIH for those substances whose TLVs did have some published scientific support. While the ACGIH claimed that its TLVs constituted safe exposure levels, many of them were set at levels where the supporting studies clearly report widespread adverse health effects. No strong correlation across substances was found by Roach and Rappaport between the TLV and the exposure level at which no adverse effects were reported. An excellent correlation was observed, however, between the TLV and the exposure levels reported as prevalent in industrial practice.

Together, the Castleman and Ziem and Roach and Rappaport analyses explain the political feasibility of the Air Contaminants Standard. The ACGIH threshold limit values upon which the standard is based already have technological and economic feasibility built into them. Leading firms in each industry had not

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much to lose and much to gain from OSHA's adoption of the ACGIH recommendations. Compliance costs would be manageable, since many large firms already used the TLVs as their internal guidelines. Their plants were already in compliance or could be brought into compliance without undue expense.

The benefits of the Air Contaminants Standard were potentially substantial for the large firms most active in occupational health politics. Small firms that did not use the ACGIH guidelines as internal standards would face relatively steep compliance costs. These small firms may have found an industrial niche in part by exposing their workers to much more substantial health hazards. Second, large firms could now present their existing exposure levels as consistent with governmental science and policy, not an insignificant matter in a world where the outcome of personal injury lawsuits often hinged on juror perceptions of industry as a good or a bad citizen.

Conclusions

In its tortuous twenty-year history, OSHA has been bedeviled by three successive images of policy failure. In its first years, as a result of the hasty adoption of industry's voluntary standards, OSHA was ridiculed as the enforcer of trivial regulations largely irrelevant to the problems of toxics-related illness. Under the Carter administration, OSHA successfully shifted focus to the major causes of cancer and other occupational diseases but became known as the most hated agency in Washington due to the stringency of its exposure limits. Under the Reagan administration, OSHA sought so strenuously to avoid burdening industry that it gained the reputation of an impotent, do-nothing agency headed by political appointees who lacked the expertise and will to fulfill its legislative mandate.

Given this discouraging history, OSHA's achievement in promulgating the Air Contaminants Standard should be acknowledged. In one fell swoop, the agency has increased the number of permissible exposure limits established under regular rule making procedures from 26 to 402. The new exposure limits cover many of the toxic substances most commonly used in the service, transportation, and utilities industries, as well as in manufacturing.

While successful in the short run, the strategy adopted by OSHA in promulgating the Air Contaminants Standard will ultimately prove self-defeating. The closed-door, informal fashion in which the ACGIH evaluates health effects, control technology, and potential compliance costs is not something a public agency can rely on. The history of the ACGIH reveals that, as the TLVs became more widely adopted on a voluntary basis, industry became increasingly interested in influencing the process by which they are established (Castleman and Ziem 1988).

Were OSHA to continue to rely on the ACGIH, the importance of influencing the conference's deliberations would increase dramatically. Groups that had

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heretofore ignored the organization would suddenly demand to participate. In particular, representatives of small business would work to slow the lowering of TLVs. The political acrimony that has characterized OSHA's standard-setting in the public arena would invade and ultimately destroy the much more fragile ACGIH just as it almost destroyed OSHA.

The current model for occupational health standard setting at the federal level is for NIOSH to keep abreast of the health literature and to develop recommendations based on this information alone. OSHA is required to evaluate the technological and economic feasibility of any proposed exposure limits, a task it accomplishes largely by commissioning elaborate studies by private consultants. In prioritizing hazards for regulation, OSHA acts partially in response to new information on health effects and engineering technologies, but mostly in response to political pressure.

What is needed is a process for the continuous evaluation of technological and economic feasibility equivalent to the continuous evaluation of health effects provided (in principle) by NIOSH. OSHA does not possess the engineering staff to do the job and, in any case, is too subject to day-to-day political pressures. The obvious candidate is NIOSH itself. NIOSH has engineers on staff and could, in principle, further develop its capability to keep up with the evolving engineering literature and commission or conduct new studies as necessary. Its health-based evaluations of particular toxic substances could include an evaluation of technological alternatives and economic costs of reducing exposure levels. Nothing would require OSHA to promulgate a standard for every substance evaluated by NIOSH, and OSHA would continue to be obliged by the courts to make its own determination of the significance of risk and economic feasibility. But OSHA would have an ongoing, publicly responsible mechanism for updating existing standards and for prioritizing new standards.

An institutionalized evaluation of feasibility would support an alternative approach to standard setting. Shapiro and McGarity (1989) have proposed that OSHA adopt a "best available technology" approach, borrowing from the Environmental Protection Agency's experiences under the Clean Water Act.⁴⁵ Technology-based regulatory strategies provide no guarantee of the acceptability of the risk level remaining after the "best available" control technologies are applied, and they generate some disincentives for technological innovation (McGarity 1983; Goldberg 1988). Nevertheless, they have proven their enforceability and effectiveness in a number of settings as a first step towards reducing risks and have achieved new prominence in the proposed revisions to the Clean Air Act (Robinson and Pease 1991).

OSHA's Air Contaminants Standard is a step down the path to generic rule-making for occupational health hazards. It has the potential to improve working

45. 33 U.S. Congress 307 (1977).

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conditions in thousands of small firms that have been externalizing the medical and economic costs of hazardous exposures onto society at large. In conjunction with the existing Hazard Communication Standard and the proposed exposure monitoring and medical surveillance standards, it suggests the possibility of a coherent approach to the occupational health problem as a whole.

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