Washington and Lee Law Review

Volume 55 | Issue 2 Article 2

Spring 3-1-1998

Is Emissions Trading an Economic Incentive Program?: Replacing the Command and Control/Economic Incentive Dichotomy

David M. Driesen

Is Emissions Trading an Economic Incentive Program?: Replacing the Command and Control/Economic Incentive Dichotomy

David M. Driesen*

Table of Contents

* Assistant Professor of Law, Syracuse University College of Law; J.D., Yale University, 1989. I would like to thank the Syracuse College of Law and Dean Braveman for research support and Professors William Buzbee, William Banks, Errol Meidinger, Nicholas Ashford, and Robert Adler for helpful suggestions.

I. Introduction

Is an emissions trading program[1] an economic incentive program? Emissions trading programs allow polluters to avoid pollution reductions at a regulated pollution source, if they provide an equivalent reduction elsewhere.[2] Most scholars, government officials, and practitioners equate emissions trading with economic incentives, but they do not define "economic incentives."

This failure to define economic incentives leaves unsupported the suggestion that emissions trading realizes environmental goals through economic incentives, but that traditional regulations (rules that limit discharges of pollutants into the environment without allowing trading) do not. Both traditional regulation and emissions trading rely upon the threat of a monetary penalty to secure compliance with government commands setting emission limitations.[3] Perhaps neither traditional regulation nor emissions trading should be considered economic incentive programs, because both rely upon government commands.[4] Or perhaps both should be considered economic incentive programs, because monetary penalties provide a crucial economic incentive in both systems.

Rather than define economic incentives, scholars employ a conventional dichotomy that contrasts "command and control" regulations (rules that dictate

1. *See* J.H. DALES, POLLUTION PROPERTY AND PRICES 92-100 (1968).

2. *See infra* p. 325 (discussing emissions trading programs). Polluters can provide reductions either by making them at another pollution source they control or through purchase from another facility that has made "additional" reductions.

3. *See infra* pp. 323 & 333.

4. *See* Samuel P. Hays, *The Future of Environmental Regulation*, 15 J.L. & COM. 549, 565-66 (1996) (noting that traditional standards constitute most significant "market force" in environmental protection).

precisely how a polluter must clean-up) with economic incentives.[5] They claim that command and control regulations work inefficiently, discourage innovation, and fail to provide continuous incentives to reduce pollution, but that emissions trading and other economic incentive programs overcome these problems.[6]

The dichotomy between command and control regulations and economic incentives has had a powerful influence upon policy.[7] On October 22, 1997, President Clinton outlined his plans to address global climate change, an increase in global mean surface temperatures that emissions of carbon dioxide and other "greenhouse gases" cause.[8] The President's speech stressed the issue's importance by referring to some possible consequences of climate change including "disruptive weather events" (such as droughts and floods), the spread of "disease bearing insects," and receding glaciers (which might cause inundation of coastal areas).[9] President Clinton did not mention a single new traditional regulatory program or propose any specific cuts in greenhouse gas emissions, such as carbon dioxide, below 1990 levels to combat this potential menace. Instead, he announced a "package of strong market incen-

5. *See, e.g.*, Daniel J. Dudek & John Palmisano, *Emissions Trading: Why Is This Thoroughbred Hobbled?*, 13 COLUM. J. ENVTL. L. 217, 218-19 (1988); Robert W. Hahn & Gordon L. Hester, *Where Did All the Markets Go? An Analysis of EPA's Emissions Trading Program*, 6 YALE J. ON REG. 109, 109-10 (1989); Robert W. Hahn & Robert N. Stavins, *Incentive-Based Environmental Regulation: A New Era from an Old Idea?*, 18 ECOLOGY L.Q. 1, 3 (1991); Richard B. Stewart, *Controlling Environmental Risks Through Economic Incentives*, 13 COLUM. J. ENVTL. L. 153, 153-54 (1988) [hereinafter Stewart, *Risks*]; Richard B. Stewart, *United States Environmental Regulation: A Failing Paradigm*, 15 J.L. & COM. 585, 585-87 (1996); *see also* Andrew McFee Thompson, Comment, *Free Market Environmentalism and the Common Law: Confusion, Nostalgia and Inconsistency*, 45 EMORY L.J. 1329, 1336 (1996).

6. *See* Bruce A. Ackerman & Richard B. Stewart, *Reforming Environmental Law: The Democratic Case for Market Incentives*, 13 COLUM. J. ENVTL. L. 171, 171-72 (1988); Dudek & Palmisano, *supra* note 5, at 219-23; Hahn & Stavins, *supra* note 5, at 5-15.

7. *See* Open Market Trading Rule for Ozone Smog Precursors, 60 Fed. Reg. 39,668, 39,668-70 (1995) (proposed Aug. 3, 1995) (expressing EPA's "strong support" for emissions trading in light of President Clinton and Vice President Gore's decision to make emissions trading program number one initiative for regulatory "reinvention" at EPA).

8. Remarks at the National Geographic Society, 33 WEEKLY COMP. PRES. DOC. 1629 (Oct. 22, 1997) (President William J. Clinton).

9. *Id.* at 2. President Clinton stated that "glacial formations are receding." *Id.* Scientists have predicted that the glaciers will recede because a changing climate melts them to some degree. *See* CLIMATE CHANGE 1995: THE SCIENCE OF CLIMATE CHANGE 6 (J.T. Houghton et al. eds., 1996). This melting could cause rises in sea levels that could flood low lying coastal areas. *Id.* at 359-406. Climate change could also spread infectious diseases, such as malaria. *See* SUMMARY FOR POLICYMAKERS: THE REGIONAL IMPACTS OF CLIMATE CHANGE: AN ASSESSMENT OF VULNERABILITY 5 (Robert T. Watson et al. eds., 1997) [hereinafter SUMMARY]. Malaria has, in fact, become more common and widespread in recent years. *See* Ellen Ruppel Shell, *Resurgence of a Deadly Disease*, ATL. MONTHLY, Aug. 1997, at 45.

tives, tax cuts and cooperative efforts with industry."[10] The President's package included emissions trading, which is the "economic incentive program" most often implemented. His proposal would allow polluters in one country to avoid greenhouse gas reductions at home in exchange for pollution reductions abroad.[11] Not surprisingly, emissions trading became an important element of the subsequently negotiated Kyoto Protocol on climate change, in which the developed countries apparently agreed to modest cuts in greenhouse gas emissions.[12]

A few days prior to Clinton's speech on climate change, the Environmental Protection Agency (EPA) released its proposal to address interstate pollution, an important impediment to delivering healthful air under the 1990 Amendments to the Clean Air Act.[13] The EPA, predictably, called for an interstate emissions trading program.[14]

---

10. *See* SUMMARY, *supra* note 9, at 4. Subsequently, negotiators accepted modest cuts in greenhouse gases below 1990 levels. *See* William K. Stevens, *Tentative Accord Is Reached to Cut Greenhouse Gases*, N.Y. TIMES, Dec. 11, 1997, at A1. The emissions trading proposal proved very controversial at Kyoto. *Id.*

11. *See Establishing an International System for Trading Pollution Rights*, 15 Int'l Env't Rep. (BNA) 80, 80 (Feb. 12, 1992); Jeffrey C. Fort & Cynthia A. Faur, *Can Emissions Trading Work Beyond a National Program?: Some Practical Observations on the Available Tools*, 18 U. PA. J. INT'L ECON. L. 463, 463-64 (1997). Although President Clinton referred to his proposal as an emissions trading proposal, the United States has actually supported conceptually similar, but more amorphous, environmental benefit trading. This would allow credits for conserving rainforests, which sequester carbon dioxide, to justify failing to reduce emissions. *See* Kyoto Protocol to the United National Climate Change Convention, Dec. 10, 1997, art. 6, § 1, *reprinted in* 28 Env't Rep. (BNA) 1596 (Dec. 12, 1997); *Last-Minute Move by U.S. Led to Pact, Some Delegates to Negotiations Assert*, 28 Env't Rep. (BNA) 1567, 1567 (Dec. 12, 1997) [hereinafter *Last-Minute Move*] (reporting that "joint implementation" and greenhouse gas "sinks," both United States ideas that are closely linked to emissions trading, were retained in final text).

12. *See* Kyoto Protocol to the United Nations Climate Change Convention, Dec. 10, 1997, art. 3, §§ 1, 3-4, 10-13, art. 4, § 1, art. 6, §§ 1-4, *reprinted in* 28 Env't Rep. (BNA)1596, 1596-1605 (Dec. 12, 1997); *Negotiators in Japan Reach Agreement for 6 Percent Emission Cut by 2008-2012*, 28 Env't Rep. (BNA) 1565, 1565 (Dec. 12, 1997); *Last-Minute Move*, *supra* note 11, at 1567; *Kyoto Meeting Ends With Agreement, Leaving Details for 1998 in Buenos Aires*, 28 Env't Rep. (BNA) 1567, 1567 (Dec. 12, 1997). Because the emissions trading provisions cited above leave open the possibility that developed countries may fund forestry projects abroad in lieu of emission reductions, a theoretical possibility exists that no actual emission reductions will take place. *See* Kyoto Protocol to the United Nations Climate Change Convention, Dec. 10, 1997, art. 6, § 1, *reprinted in* 28 Env't Rep. (BNA) 1596 (Dec. 12, 1997) (referring to use of "emission reduction" credits for "enhancing anthropogenic removals by sinks").

13. *See Implementation of Ozone, PM Standards to Dominate EPA Air Agenda in 1998*, 28 Env't Rep. (BNA) S-7, S-8 (Jan. 16, 1998).

14. Although the northeastern States have sued EPA to force a more vigorous response to the interstate pollution issue, both the States and EPA agree that emissions trading should be a means of addressing the issue. *See States, EPA Still Differ on Plan to Cut Ozone; Negotia-*

This Article develops a theory of economic incentives. Any program to regulate or to deregulate creates economic incentives.[15] The programs referred to as "economic incentive" programs all envision a substantial governmental role of some kind. That is why lawyers, experts in law, write about them.[16]

Moreover, traditional environmental law creates free markets. Law performs a fundamental role in creating markets generally,[17] and environmental law is no different. For example, laws requiring businesses to keep promises to customers and suppliers (contract) make commercial transactions possible.[18] Laws allowing owners to forbid nonowners from using "their" property create a need for nonowners to buy or rent property from owners.[19] Traditional environmental law creates markets, just as surely as contract and property law create markets.[20] It establishes obligations that cause a polluter to hire people (or pay contractors) to clean-up dirty facilities.[21] This creates markets in pollution control technology, techniques, and cleaner processes, just as obligations to fulfill contractual promises and refrain from appropriating private property create markets in goods consumers wish to have.

Any meaningful theory of economic incentives must address several key questions. What precisely does a proposed program provide incentives to do? Who will create the incentives? A theory that focuses on these questions helps analyze claims that emissions trading offers free market-like dynamic advantages – inducement of innovation and continuous environmental improvement – central to its attractiveness.[22] It clarifies the advantages and

---

tions Will Continue Over Next Month, 28 Env't Rep. (BNA) 1244, 1244 (Oct. 24, 1997); *EPA Proposal Calls on 22 States to Cut NOx Emissions by 1.6 Million Tons Per Year*, 66 U.S.L.W. 2250, 2250-51 (Oct. 28, 1997).

15. *See* Terry L. Anderson & Donald R. Leal, *Free Market Versus Political Environmentalism*, 15 HARV. J.L. & PUB. POL'Y 297, 302 (1992).

16. *See* James E. Krier, *The Tragedy of the Commons, Part Two*, 15 HARV. J.L. & PUB. POL'Y 325, 332-33 (1992) (stating that even system based entirely on property rights requires governmental role).

17. *See* Robert E. Hudec, *Differences in National Environmental Standards: The Level-Playing-Field Dimension*, 5 MINN. J. GLOBAL TRADE 1, 8 (1996).

18. *See* 1 JOSEPH M. PERILLO, CORBIN ON CONTRACTS § 1.1 (4th ed. 1993).

19. *See* J.E. Penner, *The "Bundle of Rights" Picture of Property*, 43 UCLA L. REV. 711, 814-15 (1996); *cf.* Tamar Frankel, *The Legal Infrastructure of Markets: The Role of Contract and Property Law*, 73 B.U. L. REV. 389, 392 & n.13 (1993).

20. *See* Hays, *supra* note 4, at 565-66.

21. *See* David M. Driesen, *The Societal Cost of Environmental Regulation: Beyond Administrative Cost-Benefit Analysis*, 24 ECOLOGY L.Q. 545, 573-74 (1997) (noting that regulatory requirements can force polluters to hire personnel).

22. This article will focus on the claims of economic incentive proponents and, therefore, the values they seek to promote. This focus does not diminish other perspectives or values. For example, some object to use of economic incentives because they believe that pollution should

disadvantages of traditional regulation. It shows that much more useful things can be done with the concept of economic incentives than trade emission reduction obligations. A theory of economic incentives may help create more dynamic and effective environmental law.

Part II of this Article reviews the conventional critique of traditional regulation that motivates calls to adopt economic incentives.[23] It shows that the command and control epithet does not properly apply to most traditional environmental regulation and provides a more balanced description of traditional regulation's advantages and disadvantages.[24] It then explains that the history of emissions trading raises some questions about using emissions trading to remedy traditional regulation's defects.[25] Ironically, the conventional dichotomy may encourage application of emissions trading where it will not function well.[26] Where emissions trading can provide benefits, the dichotomy may hinder efforts to design programs properly.

Part III questions the assumption that a sharp dichotomy divides economic incentives from command and control regulation.[27] It compares emissions trading's economic dynamics to those of traditional regulation.[28] Emissions trading does not rely more heavily upon economic incentives to reduce emissions than traditional regulation does.[29] Emissions trading does not provide incentives for continuous environmental improvement and may spur less emission reducing innovation, even in theory, than comparable traditional regulation.[30]

Part IV develops a true economic incentives theory to describe the requisites for programs that will actually induce more innovation and continu-

---

bear a stigma. *See generally* STEVE KELMAN, WHAT PRICE INCENTIVES: ECONOMISTS AND THE ENVIRONMENT (1981).

23. *See infra* Part II.A.

24. *See infra* Part II.A.

25. *See infra* Part II.B.

26. *See infra* Part II.B.

27. *See infra* Part III.

28. *See infra* Part III.

29. *See infra* Part III.

30. Technological change involves securing diffusion of existing techniques and the invention of new techniques. *See* D. Bruce La Pierre, *Technology-Forcing and Federal Environmental Protection Statutes*, 62 IOWA L. REV. 771, 772-73 (1977); Richard B. Stewart, *Regulation, Innovation, and Administrative Law: A Conceptual Framework*, 69 CAL. L. REV. 1259, 1282-83 (1981). For the purpose of this Article, innovation is defined according to its conventional meaning, i.e. to involve invention of something new (or at least use of something not yet well understood). Sophisticated critics generally recognize that command and control regulation promotes diffusion of technology, but still criticize it for discouraging innovation. *See* LOUIS G. TORNATZKY & MITCHELL FLEISCHER, THE PROCESSES OF TECHNOLOGICAL INNOVATION 9-25 (1990); Stewart, *supra*, at 1282-83.

ous improvement than traditional regulation or emissions trading.[31] Pollution taxes may provide continuous incentives for innovation in theory, but taxes rely upon government decision making as the stimulant for reductions.[32] Making economic competition to reduce pollution the source of economic incentives, rather than the magnitude of politically-determined fees may do more to stimulate innovation and continuous improvement.[33] Emissions trading has limited utility, because it makes little use of economic incentives, suffers from many of the impediments that frustrate the traditional regulatory system, and creates new enforcement and design difficulties.[34]

We should replace the command and control/economic incentive dichotomy with a more nuanced analytical approach to both traditional regulation and economic incentive programs. Quasi-religious faith in programs labeled economic incentives and demonization of traditional regulation will not suffice.

II. The Command and Control/Economic Incentive Dichotomy

This Part evaluates the conventional critique of traditional regulation as command and control regulation.[35] An account of the claims made for emissions trading and some of its history follow.

---

31. *See infra* Part IV.

32. *See infra* Part IV.

33. *See infra* Part IV.

34. *See infra* Part IV.

35. This Part focuses on the arguments most central to the conventional critique and to a theory of economic incentives, but other criticisms have also maligned traditional regulation. For example, Professors Stewart and Ackerman argue that a "Best Available Technology" (BAT) strategy is inconsistent with intelligent priority setting. *See* Ackerman & Stewart, *supra* note 6, at 174-75. BAT strategy (or emissions trading), however, can be employed to achieve either well or poorly chosen priorities.

Many environmental statutes do not use BAT to establish priorities, but as a strategy to meet priorities established in other ways. For example, under the Clean Air Act, Congress, EPA, and the states prioritize when they choose which pollutants to regulate and which pollution sources to regulate first. *See, e.g.*, 42 U.S.C. § 7412(b), (c), (e) (1994).

Professors Stewart and Ackerman's argument aimed at "prioritizing" resembles an argument for weakening environmental protection. They argue against "regulating to the hilt whatever pollutants or problems happen to get on the regulatory agenda." Ackerman & Stewart, *supra* note 6, at 174-75. They may be suggesting that we ought not to pursue chosen priorities vigorously, or that we need to leave more items off of the regulatory agenda. In any case, BAT statutory provisions do not require regulation "to the hilt." *Id.* at 172. They only require limitations reflecting what available technology can achieve and, as actually implemented, often demand less than that. *Id.*

Because we lack a clear definition of prioritizing, it is difficult to separate arguments for weakened or less extensive regulation from arguments about prioritizing. The whole issue of prioritizing requires more extended treatment than this Article can provide.

A. Traditional Regulation: Commanding and Controlling?

Below, several conventional criticisms of traditional regulation are examined. First, critics claim that traditional regulation is excessively rigid and consequently discourages innovation.[36] Second, critics argue that traditional regulation provides no incentive for continuous environmental improvement.[37] Third, critics argue that the process of establishing technology-based regulations involves inordinate complexity and delay.[38] Fourth, critics state that uniform standards are inefficient.[39] These criticisms contain some truths, but they also include distortions that unfairly disparage traditional regulation and misinform discussion of economic incentives.

1. The Rigidity Critique: The Myth of Pervasive "Command and Control" Regulation

Proponents of economic incentives advance a rigidity critique of traditional regulation. The rigidity critique holds that command and control regulation generates unnecessarily high compliance costs because the regulator,

---

36. *See* Dudek & Palmisano, *supra* note 5, at 220; Hahn & Hester, *supra* note 5, at 109 (stating that "'command and control' regulations . . . specify the methods and technologies [that] firms must use to control pollution"); *see also* Stewart, *Risks*, *supra* note 5, at 158. Professor Stewart, offering an additional critique, states that "centralized regulation" tends to discourage innovation because of a reluctance to shut down old plants and a willingness to impose disproportionate burdens on "new pollutants." *Id.*

The problem identified by Professor Stewart can exist or can be eliminated whether one employs "centralized" regulation, "decentralized" regulation, or emissions trading. *Id.* As Professor Stewart recognizes, some existing environmental statutes, even those that authorize decentralized permitting, reflect a policy decision to impose stricter requirements on new sources than on existing sources of pollution because designing new equipment with pollution control in mind often costs less then retrofitting existing plants. *See* Stewart, *supra* note 30, at 1270-71. One can reject or accept this policy choice with or without centralized regulation. A decision to adopt emissions trading still leaves open choices about whether to adopt differential treatment of new and existing pollution sources. Indeed, Professor Stewart notes that "[t]he possibility of 'grandfathering' existing sources enhances . . . [emissions trading's] political acceptability." *Id.* at 1337. If permits are auctioned, as Professor Stewart recommends, then permits may be scarce and expensive (or even unavailable) for new plants. If they are not auctioned, then the program designer must decide how initially to allocate emission allowances, just as in "centralized regulation." Political forces will tend to favor allocations favoring existing sources. *See Developing a Market in Emissions Credits Incrementally: An "Open Market" Paradigm for Market-Based Pollution Control*, 25 Env't Rep. (BNA) 1522, 1525 (Dec. 2, 1994) (explaining that "closed market system," like acid rain control program, raises barriers to newer, cleaner competitors by giving pollution rights to existing sources).

37. *See* Stewart, *supra* note 30, at 1326 (stating that "command and control regulation . . . provide[s] no incentive for superior performance").

38. *See* Ackerman & Stewart, *supra* note 6, at 174; Stewart, *supra* note 30, at 1273-77.

39. *See* Stewart, *Risks*, *supra* note 5, at 158.

instead of deciding only how much pollution reduction to demand, also specifies the technologies and methods firms must use to control pollution.[40] This may prove inefficient because the polluter knows its facility better than the regulator and can determine how to deliver any given decrease in pollution more efficiently than the regulator.[41] Hence, command and control regulation involves unnecessary expense and discourages innovation because the wrong decision maker decides how to reduce emissions.

Analyzing the degree of rigidity requires some understanding of existing environmental law. When the government establishes rules governing pollution sources it must make decisions about both a standard's stringency (e.g., the amount of allowable pollution) and its form. These two determinations are conceptually distinct.[42]

The degree of freedom that a regulation gives an operator to innovate to meet a standard depends upon decisions about its form – a question of regulatory technique. These decisions may be independent of decisions regarding the stringency of a standard.[43] The term "command and control" regulation describes a certain form of a regulation. The term connotes a regulation that specifies a precise compliance method rather than simply an emissions level.[44]

Environmental law, however, does not require true command and control regulation, except in very limited circumstances. Environmental statutes specifically encourage performance standards[45] – a form of a standard that specifies a level of environmental performance,[46] rather than the use of a

---

40. *See* Hahn & Hester, *supra* note 5, at 109 (stating that "'command and control' regulations... specify the methods and technologies that firms must use to control pollution"); *see also* Dudek & Palmisano, *supra* note 5, at 220.

41. *See* RICHARD A. LIROFF, REFORMING AIR POLLUTION REGULATION: THE TOIL AND TROUBLE OF EPA'S BUBBLE 4 (1986).

42. *See* Nathaniel O. Keohane et al., The Positive Political Economy of Instrument Choice in Environment Policy 3 (1997) (unpublished manuscript, on file with author) (describing choice to pursue emissions trading as "choice among the instruments" and decision about pollution levels as separable issue).

43. *Id.*

44. *See* Stewart, *supra* note 30, at 1264, 1326 (identifying "prescription of the precise conduct required of each person subject to regulation" as a distinguishing feature of "command-and-control regulation"). Scholarly definitions of command and control regulation vary. *See* Hahn & Stavins, *supra* note 5, at 5 (defining command and control regulation to include both commands to use particular pollution controls and performance standards). The prescription of conduct definition enjoys widespread use and certainly captures what the words "command-and-control" connote. The connotation of the words may be more important than the precise (but varying) definitions in scholarly journals, because the term has become part of political discourse.

45. *See, e.g.*, Chevron USA, Inc. v. Natural Resources Defense Council, Inc., 467 U.S. 837, 845 (1984).

46. *See, e.g.*, United States v. Ethyl Corp., 761 F.2d 1153, 1157 (5th Cir. 1985). The technology-based standards for air emissions from new automobiles are also performance

particular technique.[47] Performance standards encourage innovation by allowing polluters to choose how to comply.[48]

Many statutory provisions severely restrict EPA's authority to specify mandatory compliance methods.[49] Several provisions require a performance standard unless EPA finds that one cannot measure emissions directly to determine compliance.[50] Even when the statutes permit work practice standards or other types of standards that *do* command specific control techniques,[51] the statutes often require EPA to approve adequately demonstrated

---

standards. They dictate a precise limitation, not a precise method for achieving the limitation. *See* 42 U.S.C. § 7521(g) (1994).

The technology-based regulations that states with dirty air must promulgate may also be performance standards. The Clean Air Act requires state plans to "provide for the implementation of all reasonably available control measures," but not through "command and control" mandates. 42 U.S.C. § 7502(c)(1) (1994). Rather, it requires "reductions in emissions from existing sources . . . as may be obtained through the adoption, at a minimum, of reasonably available control technology." *Id.* EPA and the courts have interpreted this statutory language as authorizing promulgation of numerical emission limitations that do not dictate the precise compliance method. *See* Michigan v. Thomas, 805 F.2d 176, 184-85 (6th Cir. 1986).

47. *See* Hahn & Stavins, *supra* note 5, at 5-6 ("A performance standard typically identifies a specific goal . . . and gives firms some latitude in meeting this target. These standards do not specify the means, and therefore, provide greater flexibility . . . ."); Stewart, *supra* note 30, at 1268 ("Performance standards allow regulated firms flexibility to select the least costly or least burdensome means of achieving compliance."); *cf.* Stewart, *Risks*, *supra* note 5, at 158 ("Regulatory commands dictate specific behavior by each plant, facility, or product manufacturer.").

48. TORNATSZY & FLEISCHER, *supra* note 30, at 101.

49. *See* American Petroleum Inst. v. EPA, 52 F.3d 1113, 1119 (D.C. Cir. 1995) (stating that EPA may not limit use of ethanol in reformulated gasoline because Clean Air Act mandates performance standards); PPG Indus., Inc. v. Harrison, 660 F.2d 628, 636 (5th Cir. 1981) (stating that authority to set performance standards does not include authority to specify fuels).

50. For example, Section 112(d) of the Clean Air Act requires that EPA set "emission standards" for hazardous air pollutants. *See* 42 U.S.C. § 7412(d)(2) (1994). These standards require the maximum degree of reductions achievable taking various considerations into account (including cost). *Id.* In determining what is achievable EPA may consider a list of techniques available to a polluter "including, but not limited to . . . process changes," material substitution, enclosure of systems, or end-of-pipe controls. *Id.* But if the administrator wishes to use a design, equipment, work practice, or operational standard, which really does command and control specific techniques, she must find that it is not practical to prescribe or enforce an emissions standard. *See* 42 U.S.C. § 7412(d)(2)(D), (h)(1)-(2), (h)(4) (1994).

Section 111 of the Clean Air Act requires a "standard of performance," which "means a standard for emissions of air pollutants which reflects" (not commands) the application of best available technology. *See* 42 U.S.C. § 7411(a)(1), (b) (1994). Section 111, like Section 112, only authorizes design, equipment, work practice or operational standards, when a "standard of performance" cannot be designed or enforced. 42 U.S.C. § 7411(h)(1) (1994).

51. *See* Adamo Wrecking Co. v. United States, 434 U.S. 275, 287, 294-95 (1978) (discussing work practice standard for asbestos). Congress subsequently overruled *Adamo*'s holding that EPA cannot enforce a work practice standard in a criminal proceeding. *See* United States

alternatives.[52] True command and control regulations are the exception rather than the rule.[53]

The traditional critique states that all technology-based standards involve agency decisions specifying compliance mechanisms.[54] This critique confuses criteria for making stringency determinations with decisions about the form of standards. Statutory provisions requiring technology-based standards instruct implementing agencies to set standards that are achievable with either existing or, in some cases, future technology.[55] Hence, agency views concerning the capability of technology help determine the stringency of the standard.[56]

The point that environmental law generally favors performance standards rather than command and control regulation applies fully to technology-based standards. Pollution sources may generally use any adequate technology they choose to comply with the performance standards that an agency has developed through the evaluation of a reference technology.[57]

---

v. Ethyl Corp., 576 F. Supp. 80, 82 (M.D. La. 1983), *rev'd on other grounds*, 761 F.2d 1153 (5th Cir. 1985). The Clean Air Act still distinguishes work practice standards from emissions levels in regulations. *See* 42 U.S.C. §§ 7411(h), 7412(h) (1994).

52. *See* 42 U.S.C. §§ 7411(h)(3); 7412(h)(3) (1994).

53. *See* Hays, *supra* note 4, at 564; Alan S. Miller, *Environmental Regulation, Technological Innovation, and Technology-Forcing*, 10 NAT. RESOURCES & ENV'T 64, 65 (1995) ("The automobile emission standards are typical in that they specify performance but not technology."); Keohane et al., *supra* note 42, at 1 (noting that performance standards are more common than "design standards" that require specific technologies); *see also* Nicholas A. Ashford et al., *Using Regulation To Change the Market for Innovation*, 9 HARV. ENVTL. L. REV. 419, 425 (1985) (noting that "detailed specification" standards may prompt rapid diffusion of state-of-the-art technology, even though they discourage innovation).

54. *See* Dudek & Palmisano, *supra* note 5, at 220; Hahn & Stavins, *supra* note 5, at 5 ("Technology-based standards identify particular equipment that must be used to comply with a regulation").

55. *See, e.g.*, 42 U.S.C. § 7412(d)(2) (1994); Michigan v. Thomas, 805 F.2d 176, 180 (6th Cir. 1986); International Harvester Co. v. Ruckelshaus, 478 F.2d 615, 628-29 (D.C. Cir. 1973).

56. *See, e.g.*, Sierra Club v. Costle, 657 F.2d 298, 360-69 (D.C. Cir. 1981). Statutory provisions usually allow EPA to take cost and some other factors into consideration. *See, e.g., id.* at 319-36. The courts may reverse EPA if its view about the level technology can achieve is arbitrary and capricious. *See id.* (upholding standard as achievable and consistent with statute); National Lime Ass'n v. EPA, 627 F.2d 416, 416 (D.C. Cir. 1980) (remanding to collect additional data because record had inadequate support with respect to "achievability" of performance standards).

57. *See supra* notes 45, 49-51, 55-56 (providing examples under Clean Air Act). The Clean Water Act's technology-based standards (such as the Best Available Technology (BAT) standards) also require performance standards that a polluter may satisfy through her own choice of techniques. For example, Section 304(b)(1)(A) of the Act requires EPA to "identify, *in terms of amounts . . . the degree of effluent reduction* attainable through the application of

Professor Ackerman's detailed study of a particularly controversial New Source Performance Standard (NSPS) under the 1977 Clean Air Act Amendments may have indirectly contributed to this characterization of technology-based standards as command and control regulation.[58] However, one should not base the characterization of an entire body of regulation on one solitary example. The 1977 NSPS reflected strong Congressional pressure, illustrated by statutory language and legislative history aimed squarely at this one regulation, to avoid writing standards encouraging massive fuel switching that might threaten coal miners' jobs.[59] Even this unusually constrained NSPS allowed utilities to meet their emission limitations through innovative means, although it precluded complete reliance upon techniques that could not meet the emission limitations.[60] Hence, identification of rigidity with technology-

---

the best practicable control technology." *See* 33 U.S.C. § 1314(b)(1)(A) (1994) (emphasis added). Similarly, Section 304(b)(2)(A) requires a quantitative limit using almost identical language. *See* 33 U.S.C. § 1314(b)(2)(A) (1994). The actual BAT regulations and other technology-based standards under the Clean Water Act generally require that the operator meet a quantitative limit, and the standards do not forbid the use of technologies different from those the agency considered when writing the regulation. *See, e.g.*, E.I. du Pont de Nemours v. Train, 430 U.S. 112, 122 & n.9 (1977); American Petroleum Inst. v. EPA, 787 F.2d 965, 972 (5th Cir. 1986); Association of Pac. Fisheries v. EPA, 615 F.2d 794, 802 (9th Cir. 1980); American Paper Inst. v. Train, 543 F.2d 328, 340-42 (D.C. Cir. 1976); American Iron & Steel Inst. v. EPA, 526 F.2d 1027, 1045 (3d Cir. 1975), *modified*, 560 F.2d 589 (3d Cir. 1977).

58. *Compare* Hahn & Stavins, *supra* note 5, at 5 (citing mandates to install flue gas scrubbers to illustrate claim that "technology-based standards identify particular equipment that must be used to comply with the regulation"), *with* BRUCE A. ACKERMAN & WILLIAM T. HASSLER, CLEAN COAL/DIRTY AIR, 15-21 (1981) (discussing NSPS that allegedly mandated flue gas scrubbing), *and* Bruce A. Ackerman & William T. Hassler, *Beyond the New Deal: Coal and the Clean Air Act*, 89 YALE L.J. 1466, 1481-88 (1980) (same).

59. *See* Ackerman & Hassler, *supra* note 58, at 1494-95, 1504-05, 1508-11. Professors Ackerman and Hassler argue that the special legislative materials directed at this particular NSPS did not require forced scrubbing and urged a judicial remand on that ground. *Id.* at 1559. The D.C. Circuit upheld the standards as consistent with these same legislative materials. *See Sierra Club*, 657 F.2d at 318; *see also* Howard Latin, *Ideal Versus Real Regulatory Efficiency: Implementation of Uniform Standards and "Fine-Tuning" Regulatory Reforms*, 37 STAN. L. REV. 1267, 1284-88 (1985) (criticizing Ackerman and Hassler's failure to consider Congressional goals for this particular regulation).

60. This NSPS limited sulfur dioxide emissions to 1.2 pounds (lbs.) per Million British Thermal Units (MBtu). *Sierra Club*, 657 F.2d at 312. It also required a ninety percent reduction from uncontrolled levels except for plants emitting less than 0.6 lbs./MBtu. *Id.* These cleaner plants needed only to meet a seventy percent reduction requirement. *Id.* Nothing in the regulation specifically required any particular technology, such as wet scrubbing. Indeed, the regulation was specifically designed to leave open opportunities for plants to meet the standards through dry scrubbing and other alternatives that were regarded as somewhat experimental. *Id.* at 324, 327-28, 340-43, 346-47; *see also* William C. Banks, *EPA Bends to Industry Pressure on Coal NSPS – and Breaks*, 9 ECOLOGY L.Q. 67, 114-16 (1980) (arguing that provisions that did this are too lenient). Hence, if a plant operator developed some completely new approach

based limitations or with all traditional regulation seems inappropriate. Use of the term "command and control" to describe either technology-based regulation or all traditional regulation misleads government officials, students, and some scholars.[61]

---

that met these standards, the utility could use it.

Operators probably could not meet this standard solely through the use of coal washing, because coal washing, which was not a new innovation at the time, probably could not produce a seventy percent reduction by itself. *See Sierra Club*, 657 F.2d at 368-73; Ackerman & Hassler, *supra* note 58, at 1481; Bruce A. Ackerman & William T. Hassler, *Beyond the New Deal: Reply*, 90 YALE L.J. 1412, 1421-22 n.43 (1981); *cf.* Latin, *supra* note 59, at 1277 n.41 (noting that standard allows using coal washing as offset, decreasing percentage reduction needed from scrubbing); ACKERMAN & HASSLER, *supra* note 58, at 15, 66-68 (noting that coal washing reduces any given emissions base by only twenty to forty percent, but replacing new source standards with less stringent reduction requirement that also applies to existing sources would produce better results).

Reading Professor Ackerman's reference to the NSPS as a standard based on "full scrubbing" to indicate that the NSPS precluded subsequent innovations meeting the numerical standards would involve technical misunderstanding of the regulation. *See Sierra Club*, 657 F.2d at 316 (stating that "*given the present state of pollution control technology*, utilities will have to employ some form of . . . scrubbing" (emphasis added)); *see also* Latin, *supra* note 59, at 1276-78 & nn.39-47 (criticizing "full scrubbing" characterization as inaccurate, but stating that "*given the current state of control technology*" some form of scrubbing will be required) (emphasis added).

61. Congress sometimes directs implementing agencies to establish effects-based emission limitations. This means that the implementing agency must set an emission limitation at a level adequate to protect human health (health-based standards) and/or the environment. *See* Natural Resources Defense Council, Inc. v. EPA, 824 F.2d 1146, 1163 (D.C. Cir. 1987) (en banc) (discussing effects based limitations for hazardous air pollutants). Some statutory provisions direct agencies to regulate based on some kind of weighing of costs and benefits. *See* Corrosion Proof Fittings v. EPA, 947 F.2d 1201, 1217 (5th Cir. 1991) (striking down partial asbestos ban as inconsistent with Toxic Substances Control Act's (TSCA's) cost-benefit standard); John S. Applegate, *The Perils of Unreasonable Risk: Information Regulatory Policy, and Toxic Substances Control*, 91 COLUM. L. REV. 261, 269 (1991) (noting that Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and TSCA use language authorizing action to prevent "unreasonable" adverse effects and have legislative history calling for balancing of costs and benefits); Alon Rosenthal et al., *Legislating Acceptable Cancer Risk from Exposure to Toxic Chemicals*, 19 ECOLOGY L.Q. 269, 304-09 (1990) (stating that FIFRA and TSCA are risk-balancing statutes).

The cost-benefit, effects-based, and technology-based limitations evaluate costs and benefits, environmental and/or health effects, and technology respectively in order to arrive at the level of reductions required. *See, e.g.*, *Corrosion Proof Fittings*, 947 F.2d at 1217 (limit based upon cost-benefit criterion); *Natural Resources Defense Council*, 824 F.2d at 1147 (limit based upon health effects); Sierra Club v. Costle, 657 F.2d 298, 316-17 n.38 (D.C. Cir. 1981) (limit based upon technology). These criteria determine the stringency of standards, not their form. *See Corrosion Proof Fittings*, 947 F.2d at 1217 (striking down stringent limitations for lack of cost-benefit justification); *Natural Resources Defense Council*, 824 F.2d at 1164-66 (striking down lax limitation for failing to adequately protect health), *Sierra Club*, 657 F.2d at 311-312 (upholding limit as neither too lax nor too stringent under technology-based approach).

Polluters have substantial economic incentives to use the flexibility that performance standards offer to employ innovative means of meeting emission limitations that are less costly than traditional compliance methods. Such use of innovations saves polluters money. This incentive exists even for technology-based performance standards that did not contemplate the innovative compliance mechanism a polluter discovers.[62]

Professor Stewart has stated that polluters have "strong incentives to adopt the particular technology underlying"-a technology-based performance standard because "its use will readily persuade regulators of compliance."[63] It seems unlikely that this countervailing persuasiveness incentive would overcome the economic incentive to realize savings through an effective and cheaper innovation, even if the persuasiveness incentive were powerful. Moreover, polluters have a number of means of persuading regulators that their innovations perform adequately if they in fact do so. First, polluters may monitor their pollution directly to demonstrate compliance. Second, in some cases polluters may eliminate regulated chemicals, which certainly demonstrates compliance.[64]

While polluters have an equally powerful economic incentive to use cheaper alternative compliance methods for true command and control regulations, the polluter may have more difficulty persuading a regulator that an alternative is viable if she cannot measure emissions directly. Nevertheless, the polluter can deploy her substantial expertise to estimate the effectiveness of alternative techniques and may persuade regulators to accept alternatives. Indeed, she may persuade a regulator that a less effective technique is equally effective, because the regulator may feel insecure in second-guessing a company's judgment. In any case, empirical studies of actual responses to regulation do not support the idea that technology-based performance standards frequently discourage innovation by dissuading companies with innovative compliant technologies from using them to meet the standards.[65]

---

62. *See, e.g.*, OFFICE OF TECHNOLOGY ASSESSMENT, U.S. CONGRESS, GAUGING CONTROL TECHNOLOGY AND REGULATORY IMPACTS IN OCCUPATIONAL SAFETY AND HEALTH – AN APPRAISAL OF OSHA'S ANALYTIC APPROACH, OTA-ENV-635 64 (1995) ("Affected industries achieved compliance through adopting control measures that differed considerably from those that OSHA's rulemaking analyses presumed in confirming feasibility").

63. Stewart, *supra* note 30, at 1269. Professor Stewart refers to technology-based performance standards as "engineering standards." *Id.* at 1268-69.

64. Additionally, some performance standards are based in part upon pollution prevention and do not specify the precise materials or process changes required and/or contemplate a range of possible responses. *See* National Emission Standards for Hazardous Air Pollutants for Source Categories: Aerospace Manufacturing and Rework Facilities, 40 C.F.R. §§ 63.741-53 (1996). The author represented the Natural Resources Defense Council in the rulemaking proceeding that produced this regulation.

65. Professor Stewart cites no empirical support for such a notion. *See* Stewart, *supra*

One can apply a narrower, yet more persuasive, rigidity criticism to traditional regulation than the claim that traditional regulation rigidly dictates compliance methods. Traditional regulation often specifies the precise source from which emission reductions must come.[66] This means that polluters cannot substitute reductions from someplace other than the pollution source that a traditional regulation addresses, even if doing so costs less. Spatial specificity is a form of rigidity.

Spatial specificity, however, helps make standards enforceable. A regulatory agency, citizen group, or corporation seeking to evaluate compliance (or even just the existence of reductions in pollution) must generally look at each place where regulated pollution escapes into the environment in order to determine whether emission reductions have occurred.[67] Hence, it seems logical to specify obligations for specific places where emission reductions can be verified. Where a company cannot reliably measure emissions, a regulator or citizen may determine whether a reduction has occurred at these places by determining whether the polluter has properly applied a technique known to reduce emissions at that particular place.[68] An understanding of the reasons for spatial specificity need not lead to the conclusion that only traditional regulation makes sense. However, programs that lessen spatial specificity only produce real verifiable emission reductions when they adequately

---

note 30, at 1269. The empirical literature actually shows that industry sometimes chooses techniques different from those relied upon in standard setting. For example, a recent Office of Technology Assessment study concluded that industries had often used techniques not relied upon by the Occupational Safety and Health Administration in standard setting to comply. *See* OFFICE OF TECHNOLOGY ASSESSMENT, *supra* note 62, at 64 ("Affected industries achieved compliance through adopting control measures that differed considerably from those that OSHA's rulemaking analyses presumed in confirming feasibility."). Performance standards' failure to stimulate innovation in other cases seems to reflect a rather complex set of factors, including a lack of stringency in the standard. *See* Nicholas A. Ashford & George R. Heaton Jr., *Regulation and Technological Innovation in the Chemical Industry*, 46 LAW & CONTEMP. PROBS, 109, 139-40 (Summer 1983). This author has found no empirical support for the notion that the regulatory process frequently discourages cost saving innovations that would bring about adequate compliance with a performance standard. *See id.* at 141 (noting that Richard Stewart offers no evidence to support his assumption that regulation is a barrier to innovation).

66. *See* Asarco, Inc. v. EPA, 578 F.2d 319, 322 (D.C. Cir. 1978).

67. Because air and water disperse pollution rapidly after discharge into the environment, measuring pollution after discharge often does not reveal whether a particular polluter has reduced pollution to meet legal requirements. *See* Richard E. Ayers, *Enforcement of Air Pollution Controls on Stationary Sources Under the Clean Air Amendments of 1970*, 4 ECOLOGY L.Q. 441, 451 (1975).

68. *See, e.g.*, Adamo Wrecking Co. v. United States, 434 U.S. 275, 294-295 (1978) (Stevens J., dissenting) (describing technique of watering down building to reduce asbestos emissions during building demolition).

address the enforcement problems they create.[69] Lack of spatial specificity complicates enforcement by increasing the number and variety of claims, transactions, and activities that a regulator must evaluate to detect noncompliance.[70]

The notion that traditional regulation discourages innovation because of rigidity does not withstand analysis. In fact, very rigid regulations that completely banned the production and use of certain chemicals have led to widespread innovation.[71] For example, outright bans of ozone depleting chemicals stimulated the development of substitutes, thereby realizing an enormously important environmental improvement at little or no cost.[72] Zero emission standards for automobiles have forced the development of electric vehicles.[73] Undemanding traditional regulation may fail to stimulate innovation, but more demanding traditional regulation—sometimes described as technology forcing—often provides significant incentives to innovate.[74]

---

69. *See* Nancy J. Cohen, Comment, *Emissions Trading and Air Toxics Emissions: Reclaim and Toxics Regulation in the South Coast Air Basin*, 11 UCLA J. ENVTL. L. & POL'Y 255, 260-63 (1993) (discussing enforcement issues in proposed California emissions trading program).

70. This article discusses enforcement problems in more detail below. *See infra* notes 121-31 and accompanying text.

71. *See* Thomas O. McGarity, *Radical Technology-Forcing in Environmental Regulation*, 27 LOY. L.A. L. REV. 943, 944-52 (1994) (discussing EPA regulations banning lead and certain pesticides).

72. *See* CURTIS MOORE & ALLAN MILLER, GREEN GOLD: JAPAN, GERMANY, THE UNITED STATES AND THE RACE FOR ENVIRONMENTAL TECHNOLOGY 108-09, 191-93 (1994).

73. Miller, *supra* note 53, at 66-67.

74. *See* Nicholas A. Ashford, *Understanding Technological Responses of Industrial Firms to Environmental Problems: Implications for Government Policy*, *in* ENVIRONMENTAL STRATEGIES FOR INDUSTRY: INTERNATIONAL PERSPECTIVES ON RESEARCH NEEDS AND POLICY IMPLICATIONS 277, 296 (Kurt Fischer & Johan Shot eds., 1993); Ashford et al., *supra* note 53, at 426, 429-43, 463-64; TORNATZKY & FLEISCHER, *supra* note 30, at 174 (noting that environmental regulation has stimulated innovation); *see also* Ashford & Heaton, *supra* note 65, at 140-41 (noting that creative responses to regulation in chemical industry occurs in response to regulation precipitated "crises" or through actions of new entrants and correlates with stringency); Natalie M. Derzko, *Using Intellectual Property Law and Regulatory Processes to Foster the Innovation and Diffusion of Environmental Technologies*, 20 HARV. ENVTL. L. REV. 3, 20-21 (1996) (noting that technology-based standards provide incentives for pollution control industry to develop new technology and stating that Germany, top exporter of environmental technology, uses such standards); Adam B. Jaffe & Robert N. Stavins, *Dynamic Incentives of Environmental Regulations: The Effects of Alternative Policy Instruments on Technology Diffusion*, 29 J. ENVTL. ECON. & MGMT. S-43, S-45 (1995) (noting that technology-based standards, command and control standards, and market-based approaches all have the potential to induce technological change); Jean Olson Lanjouw & Ashoka Mody, *Innovation and the International Diffusion of Environmentally Responsive Technology*, 25 RES. POL'Y 549, 549-51 (1996) (remarking that innovation responds to pollution abatement expenditures, indicating severity of environmental regulation).

2. *The Lack of Incentives Problem*

Critics also advance the claim that "command and control" regulation provides no incentive to go beyond complying with current regulatory requirements and fails to provide continuous incentives for environmental improvement.[75] This charge that traditional regulation provides no incentive to reduce pollution below required levels does not completely survive rigorous analysis. Polluters subject to performance standards usually emit much less than their permits allow in order to make sure that they consistently comply with regulatory standards.[76] Hence, the enforceability of traditional standards can provide an incentive to surpass them to some degree. Moreover, polluters have an incentive to reduce pollution substantially below regulated levels when meeting a more stringent level costs less than meeting the level regulation requires.

Qualifying the lack of incentive inducements of traditional regulations, however, reveals a narrower, but still important, problem with traditional regulatory incentives. Traditional regulation offers little incentive to spend additional monies to reduce pollution more than necessary to protect oneself from enforcement penalties, when the costs of doing so exceed the costs of adequate compliance.

3. *Complexity, Uncertainty, and Delay*

Traditional regulation also seems unlikely to provide *continual* incentives to reduce. Traditional regulation provides little incentive to make additional reductions once an adequate compliance cushion exists. Accordingly, traditional regulation requires repeated government decision making in order to make progress in reducing emissions. Absent revisions of standards, progress in reducing may stall. Predictable, stringent environmental regulation may provide incentives to continue reducing pollution in between regulatory decisions. A possibility of government inaction or delay (or doubts about the stringency of future limitations), however, may lead polluters to decide against making further improvements at complying pollution sources.

Critics claim that technology-based regulation involves inordinate complexity and delay.[77] Thus, even if technology-based regulation does have the theoretical ability to stimulate continuous innovation, the uncertainty created by the complex information gathering process, the formal administrative

---

75. *See* La Pierre, *supra* note 30, at 774; *see also* Dudek & Palmisano, *supra* note 5, at 220-21.

76. *See generally* Economic Incentive Program Rules, 58 Fed. Reg. 11,110, 11,117 (1993) (to be codified at 40 C.F.R. pt. 51) (proposed Feb. 23, 1993).

77. *See* Ackerman & Stewart, *supra* note 6, at 174; Stewart, *supra* note 30, at 1273-77.

process, and industry opposition (often backed by litigation) frequently thwart innovation.[78]

This claim fully applies to emissions limitations that administrative agencies set, but the argument that the formal administrative process and industry initiated litigation create uncertainty generally does not apply to congressionally-set emissions limitations.[79] Congressionally specified limits have become more common in recent years.[80] These claims of delay and uncertainty apply even more to health-based standards and cost-benefit standards than they do to technology-based standards. For health-based standards and cost-benefit-based standards have proven even more difficult to implement than technology-based standards.[81]

The term "economic incentive" is attractive because it promises redemption from the plodding nature of governmental decisions. Part III addresses the question whether emissions trading actually offers such redemption.[82]

4. *The Inefficiency of Uniform Standards*

The most persuasive theoretical criticism of traditional regulation focuses on the economic inefficiency of uniform standards – legal rules that apply the same emission limitations to all pollution sources that the rule addresses.[83]

---

78. *See* Stephen Breyer, *Analyzing Regulatory Failure: Mismatches, Less Restrictive Alternatives, and Reform*, 92 HARV. L. REV. 549, 570-75 (1979); Stewart, *supra* note 30, at 1273-77, 1283-84, 1294-95.

79. *See* 5 U.S.C. § 553(b) (1994) (describing informal rulemaking procedures for administrative agencies, not Congress); Turner v. Elkhorn Mining Co., 428 U.S. 1, 15 (1976) (economic legislation presumed constitutional); Williamson v. Lee Optical, 348 U.S. 483, 487-88 (1955) (stressing deference due legislative decisions); United States v. Carolene Products Co., 304 U.S. 144, 152 (1938) (regulatory statutes will be upheld unless lacking a rational basis).

80. *See* David M. Driesen, *Five Lessons From Clean Air Act Implementation*, 14 PACE ENVTL. L. REV. 51, 52-54 (1997); Driesen, *supra* note 21, at 554, 606-07. Although substitution of congressional decisions for administrative decisions provides escape from some of the problems in administrative decision making, problems with the legislative process may still exist.

81. *See* Driesen, *supra* note 21, at 601-05; Driesen, *supra* note 80, at 55; Howard Latin, *Regulatory Failure, Administrative Incentives, and the New Clean Air Act*, 21 ENVTL. L. 1647, 1660-66 (1991) (explaining reasons why technology-based standards work better in practice); Latin, *supra* note 59, at 1304-14 (summarizing EPA experience under harm-based approaches); *see also* Oliver A. Houck, *TMDLs: The Resurrection of Water Quality Standards-Based Regulation Under the Clean Water Act*, 27 Envtl. L. Rep. (Envtl. L. Inst.) 10,329, 10,330 (July 1997) (describing how state regulation based on water quality rather than technology has proven ineffective).

82. *See infra* Part III.

83. *See* James T.B. Tripp & Daniel J. Dudek, *Institutional Guidelines for Designing Successful Transferable Rights Programs*, 6 YALE J. ON REG. 369, 369 (1989) (providing

Because facilities have unequal compliance costs, uniform standards demand relatively expensive reductions from some facilities without securing greater reductions from facilities with lower compliance costs.[84] Hence, uniform standards may use private sector resources that are devoted to pollution control inefficiently.[85]

This efficiency critique is correct, but incomplete. If marginal costs vary significantly between facilities, then any scheme that tailors reductions to each pollution source's marginal costs can improve efficiency, meaning the efficient use of private sector resources.[86] But this critique does not consider efficient use of public sector resources.

While tailored regulation may make more efficient use of private capital, it may make inefficient use of taxpayer funds devoted to crafting and enforcing regulations.[87] More tailored regulatory approaches may prove more expensive to design and/or enforce.[88] In order to determine whether any given alternative to uniform regulation will prove more globally efficient, one must evaluate enforceability, ease of administration, and other relevant concerns.[89]

The private economic efficiency criticism does not properly apply to all traditional regulation. It applies to regulatory programs that consist of uniform emissions standards for all facilities in a category.[90] Many environmental statutes, including the Clean Air Act[91] and Federal Water Pollution Control

---

examples of uniform standards).

84. *See* Hahn & Stavins, *supra* note 5, at 6.

85. *See* Richard B. Stewart, *Economic, Environment, and the Limits of Legal Control*, 9 HARV. ENVTL. L. REV. 1, 7 (1985).

86. For an explanation of marginal costs see ALLEN V. KNEESE & CHARLES L. SCHULTZE, POLLUTION, PRICES, AND PUBLIC POLICY 18-26 (1975).

87. *See* Kirsten H. Engel, *State Environmental Standard-Setting: Is There a "Race" and Is It "To the Bottom"?*, 48 HASTINGS L.J. 271, 287-88 (1997) (discussing economies of scale rationale for centralized standard setting and market efficiencies for interstate commerce); RESEARCH AND POLICY COMMITTEE OF THE COMMITTEE FOR ECONOMIC DEVELOPMENT, WHAT PRICE CLEAN AIR? A MARKET APPROACH TO ENERGY AND ENVIRONMENTAL POLICY 40 (1993) [hereinafter CED] ("The principal advantage of the command-and-control approach is that it is often easy to administer."); Latin, *supra* note 59, at 1271 (arguing that uniform standards offer decreased information collection and evaluation costs, more predictable results, better public access, reduced opportunity for obstructive behavior by regulated parties, and increased likelihood of surviving judicial review).

88. *See* Derzko, *supra* note 74, at 52 n.255; Latin, *supra* note 59, at 1314-31 (discussing experiences with site-specific variances); Stewart, *supra* note 30, at 1318.

89. *See generally* Latin, *supra* note 59.

90. *See* Hahn & Stavins, *supra* note 5, at 5-6 (applying efficiency critique to uniform technology-based standards).

91. 42 U.S.C. §§ 7401-7671 (1994 & Supp. I 1995).

Act,[92] which are usually cited as prime examples of a uniform technology-based approach, rely heavily upon nonuniform and even facility-specific decisions.[93]

---

92. 33 U.S.C. §§ 1251-1387 (1994 & Supp. I 1995).

93. The Clean Air Act and Clean Water Act permit and often require states to choose control strategies to meet standards for environmental quality. *See, e.g.*, PUD No. 1 v. Washington Dep't of Ecology, 511 U.S. 700, 723 (1994) (holding that state may impose instream flow requirements on proposed hydroelectric project under Clean Water Act); Union Elec. v. EPA, 427 U.S. 246, 266 (1976) (noting Clean Air Act's reliance on state emission limitations); Shanty Town Assocs. Ltd. Partnership v. EPA, 843 F.2d 782, 785, 789-791 (4th Cir. 1988) (discussing limits of federal authority over nonuniform state waste treatment programs); *see also* Robert W. Adler, *Addressing Barriers to Watershed Protection*, 25 ENVTL. L. 973, 1045 & n.427 (1995) (discussing state nonpoint source programs). In some instances, these statutes specifically require or permit tailored standards in individual permitting proceedings. *See, e.g.*, Chevron, U.S.A., Inc. v. Natural Resources Defense Council, Inc., 467 U.S. 837, 850 (1984) (noting that state agency determines compliance with "LAER" standards for new sources in permitting process); Navistar Int'l Transp. Corp. v. EPA, 941 F.2d 1339, 1339 (6th Cir. 1991) (reviewing facility specific RACT decision involving revision to state's implementation plan); Adler, *supra*, at 1045 n.427 (discussing state discretion regarding runoff controls). Often, even federal programs involve tailored individual permitting decisions with few uniform standards. *See generally* Oliver A. Houck, *Hard Choices: The Analysis of Alternatives Under Section 404 of the Clean Water Act and Similar Environmental Laws*, 60 U. COLO. L. REV. 773 (1989) (analyzing federal permit requirements protecting wetlands). Nonuniformity exists for some extremely significant pollution sources. For example, electric utility emission rates vary widely from state to state. *See, e.g.*, NATURAL RESOURCES DEFENSE COUNCIL, BENCHMARKING AIR EMISSIONS OF UTILITY ELECTRIC GENERATORS IN THE EASTERN U.S. 5 (1997).

The Clean Air Act requires EPA to set uniform air quality standards that states must meet. *See, e.g.*, Lead Indus. Ass'n v. EPA, 647 F.2d 1130 (D.C. Cir. 1980) (upholding ambient air quality standards). But because baseline state air quality and the mixture of pollution sources vary, so do the amount of required reductions and the mix of controls from existing sources. *See* Ackerman & Hassler, *supra* note 58, at 1477.

Professor Stewart minimizes the extent of decentralized decision making under the Clean Air and Clean Water acts. He writes:

> [T]he uniform technology-based standards in the Clean Air Act Amendments and the Federal Water Pollution Control Act, by imposing the same control requirements on all new or existing sources plants within a given industry, discourage firms from relocating in areas of high environmental quality.

Stewart, *supra* note 30, at 1266 (footnotes omitted). His later writing then repeatedly refers to "centralized uniform standards." *See, e.g.*, Stewart, *Risks*, *supra* note 5, at 156. The Clean Air and Clean Water Acts set, or require the EPA to set, minimum uniform national emission standards for certain pollutants from industrial source categories and new automobiles for the reasons stated by Professor Stewart. *See, e.g.*, 33 U.S.C. § 1312 (1994); 42 U.S.C. §§ 7411(a), 7412(d), 7521 (1994); *Shanty Town*, 843 F.2d at 784-85 (discussing federal role in regulating water quality and NPDES permit system under Clean Water Act). But states often may impose more stringent limitations than these minimum standards and states also set limitations for many pollution sources that these standards do not apply to. Hence, the conventional picture of uniform standards dominating environmental law is, at best, unbalanced.

Uniform standards have equitable advantages that may outweigh the monetary efficiencies theoretically achievable from nonuniform standards. Uniform standards treat facilities equally and allow administrative agencies to secure reductions from a large group of facilities through a single standard setting proceeding.[94] The point that uniform standards theoretically use private sector compliance resources with less than ideal efficiency, however, is correct.

5. *Some Conclusions About the Conventional Critique*

The conventional critique of traditional regulation exaggerates its defects and ignores its strengths. Traditional regulation usually does not command and control compliance methods, but it does provide spatially specific requirements in order to facilitate enforcement. Traditional regulation encourages innovation when sufficiently stringent, but not otherwise. Although traditional regulation provides incentives to go beyond compliance when doing so saves money or provides a "cushion" against enforcement, it does not provide continuous incentives to spend additional money to go beyond the cushion. Traditional regulation also suffers from problems of complex administrative decision making, at least for those decisions that administrators, rather than Congress, make. Uniform standards, while equitable and administratively efficient, may prove economically inefficient for pollution sources.

Because traditional regulation consists primarily of performance standards, scholars and policy-makers should abandon the command and control/economic incentive dichotomy. The term "traditional regulation," rather than the misleading command and control epithet, could be used to describe regulatory categories that include performance standards. Lobbyists for regulated industries may use the term "command and control" without regard to accuracy, because it helps undermine the political legitimacy of traditional regulation. Scholarly proponents recognize that emissions trading cannot wholly supplant traditional regulation[95] and should therefore avoid terminology that unfairly undermines traditional regulation.

---

94. *See* Engel, *supra* note 87, at 293 (stating that centralized uniform standard setting creates "level playing field" for economic competition); Stewart, *supra* note 30, at 1266; *cf.* N. Hanley et al., *Why is More Notice not Taken of Economists' Prescriptions for the Control of Pollution?*, 22 ENV'T & PLAN. A. 1421, 1426 (1990) (stating that agencies prefer to interpret equitable policy as one that imposes equal emission limitations instead of equal costs on all).

95. *See, e.g.*, WILLIAM J. BAUMOL & WALLACE E. OATES, THE THEORY OF ENVIRONMENTAL POLICY 190 (2d ed. 1988) ("[T]he ideal policy package contains a mixture of instruments, with taxes, marketable permits, [and] direct control . . . each used in certain circumstances to regulate the sources of environmental damage."); DALES, *supra* note 1, at 98 (contending that emissions trading is impracticable for "diffuse" pollution); Hahn & Stavins, *supra* note 5, at 15 ("The best set of policies will typically involve a mix of market and more conventional regulatory processes.").

Responsible emissions trading proponents have sound reasons for recognizing a continued need for traditional regulation.[96] If a buyer of pollution credits produces emissions with strong local health effects, for example, cancer-causing hazardous air pollutants, and is distant from the seller of credits, then ethical considerations may preclude allowing the buyer to avoid making reductions at her own plant, even if she purchases an equal quantity of emission reductions elsewhere.[97] The buyers's purchase of credits from the seller does not justify allowing the buyers's pollution to continue to cause cancer in the buyer's neighborhood.[98]

Furthermore, most scholars recognize that emissions trading requires good monitoring in order to succeed.[99] Because pollution sources have an economic incentive to try to exaggerate the value of reduction credits and to understate the value of debits in an emissions trading scheme, good monitoring is essential.[100] For some pollution sources, however, good monitoring

---

96. The practical difficulties here provide only a sample. *See* Hanley et al., *supra* note 94, at 1428-31 (discussing practical difficulties in establishing effluent charges and/or tradeable permits).

97. *See* Stewart, *Risks*, *supra* note 5, at 161 ("A marketable permit system . . . [may] not be appropriate in dealing with pollutants or chemical risks that have localized 'threshold' effects, causing serious damage only if they exceed a given concentration at a particular location"); *see also* Cohen, *supra* note 69, at 260-64 (discussing potential toxics issues in California's earlier trading proposal).

98. *See* Hahn & Stavins, *supra* note 5, at 14.

99. *See* Hahn & Hester, *supra* note 5, at 111 (contending that monitoring and enforcement issues play critical role in efficient design of regulatory approaches); Sidney A. Shapiro & Thomas O. McGarity, *Not So Paradoxical: The Rationale for Technology-Based Regulation*, 1991 DUKE L.J. 729, 748-49 (1991) ("[E]missions trading and pollution taxes require inspectors to monitor constantly the amount of pollution that a plant emits."); Stewart, *Risks*, *supra* note 5, at 161, 166.

100. Professor Tietenberg argues that some emission trades can reduce the difficulties of monitoring. *See* T.H. TIETENBERG, EMISSIONS TRADING 181 (1985). His analysis supporting that argument may not hold up to scrutiny. He states that allowing substitution of relatively monitorable reductions in large stacks for reductions from fugitive sources eased enforcement because it shifts control to the sources easiest to monitor. *Id.* at 181-82. Yet an enforcer has no way of knowing whether the reductions produced by the large stacks equal what the plant would have obtained from reducing the fugitive sources unless it measures the emissions from the fugitive sources and knows what percentage reductions the foregone fugitive controls would have produced (fugitive emissions standards usually establish work practices rather than requirements for a specified quantity of reductions, because emissions are unmonitorable and unpredictable). The example professor Tietenberg cites probably involves an easy gaming opportunity for a pollution source. By simply supplying a low estimate of the unmonitored foregone fugitive emission reductions, the source can claim that modest "extra" stack emission reductions are equivalent, whether or not this is true. In fact, emissions trading doubles the monitoring difficulty because a trade is only reliable if reliable monitoring exists at two places, the source of credits and the source of debits.

simply is not technically feasible.[101]

For this reason, emissions trading cannot supplant true command and control regulation.[102] Normally, command and control regulation exists precisely because an agency has determined that it cannot measure emission reductions.[103] Emissions trading may sometimes provide a good alternative to performance standards, but it will function poorly if used to supplant true command and control regulation. Hence, the command and control/economic incentive dichotomy not only unfairly disparages traditional regulation, it suggests application of emissions trading precisely in areas where it cannot work.[104]

The conventional critique does not address the issue of whether a traditional regulatory program should be considered an economic incentive program. Nor can a critique of traditional regulation tell us whether emissions trading will overcome traditional regulation's shortcomings. A careful analysis of emissions trading and a theory of economic incentives are necessary to address these questions properly.

B. Emissions Trading's Mixed Record of Environmental Performance

Proponents of emissions trading generally claim that economic incentive programs will remedy the defects that they attribute to traditional regulation

---

101. Examples of pollutants that one cannot monitor effectively include agricultural runoff, an important source of water pollution, and "fugitive" air emissions. *See, e.g.*, National Emission Standards for Hazardous Air Pollutants for Source Categories; Organic Hazardous Air Pollutants from the Synthetic Organic Chemical Manufacturing Industry and Seven Other Processes, 57 Fed. Reg. 62,608, 62,646 (1992) (codified as amended at 40 C.F.R. pt. 63) (proposed Dec. 31, 1992); Adamo Wrecking Co. v. United States, 434 U.S. 275, 294-95 (1978) (Stevens, J., dissenting) (work practice standard promulgated for asbestos because asbestos emissions from demolition cannot be measured). *See generally* Sierra Club v. Costle, 657 F.2d 298, 317 n.38 (D.C. Cir. 1981). Fugitive air emissions escape into the atmosphere at places too numerous to monitor effectively. *See also* Suzi Clare Kerr, Contracts and Tradeable Permit Markets in International and Domestic Environmental Protection 66 (unpublished Ph.D. dissertation, Harvard University) (on file with author) ("[A] command and control system may be the only feasible instrument when the costs of monitoring emissions or inputs is extremely high . . . .").

102. *See* Kerr, *supra* note 101, at 66.

103. *See, e.g.*, National Emission Standards for Hazardous Air Pollutants for Source Categories; Organic Hazardous Air Pollutants from the Synthetic Organic Chemical Manufacturing Industry and Seven Other Processes, 57 Fed. Reg. 62,608, 62,646 (1992) (codified as amended at 40 C.F.R. pt. 63) (proposed Dec. 31, 1992); *Adamo Wrecking Co.*, 434 U.S. at 294-95 (Stevens, J., dissenting) (work practice standard promulgated for asbestos because asbestos emissions from demolition cannot be measured); *Sierra Club*, 657 F.2d at 317 n.38.

104. *But see* Note, *Doing the Right Thing for Profit: Markets, Trade, and Advancing Environmental Protection*, 44 DRAKE L. REV. 611, 612 (1996) (contending that "free markets" can supplant command and control schemes).

by promoting efficiency,[105] stimulating innovation,[106] and providing continuous incentives to go beyond regulatory requirements.[107] They invoke the image of a free market system producing better environmental quality through unleashed innovative energy with little need for slow ponderous government decision making.[108] These advocates claim that emissions trading constitutes an economic incentive program with the features mentioned above.[109]

Emissions trading theoretically offers some efficiency advantages over traditional regulation to the extent that significant differences in the marginal cost of pollution control exist between pollution sources.[110] For example, if a regulator wishes to obtain eighty tons of total reductions from two pollution sources each emitting one hundred tons she could require each source to make a forty ton reduction. If one source, Seller, has control costs of $1,000 per ton and another, Buyer, has control costs of $3,000 per ton, then this eighty ton reduction will cost $160,000 ($40,000 spent at Seller and $120,000 at Buyer). Suppose, however, that the regulator allows Seller and Buyer to trade as long as they produce eighty tons of total reductions. Buyer may choose to pay Seller to produce forty tons of additional reductions (beyond the forty Seller already will produce) and forego making any reductions at Buyer. Buyer need only pay Seller a little more than $40,000 to realize an economic benefit. Thus, in this example, pollution trading allows the same reduction for less money, $80,000[111] rather than $160,000.[112]

Since the end of the 1970s, EPA has encouraged states to authorize various forms of emissions trading, usually between units within a plant, under the Clean Air Act.[113] These programs allowed pollution sources to

---

105. Stewart, *Risks*, *supra* note 5, at 159.

106. *Id.* at 160; Keohane et al., *supra* note 42, at 2 n.5.

107. Stewart, *Risks*, *supra* note 5, at 160, 163.

108. *See* Hahn & Stavins, *supra* note 5, at 7 & n.26 (stating that economic incentive systems ensure that firms "automatically" undertake pollution control efforts and invoking Adam Smith's "invisible hand" metaphor for a free market).

109. *See id.* at 7-10, 12-13; Stewart, *Risks*, *supra* note 5, at 158-60.

110. *See* Tripp & Dudek, *supra* note 83, at 374.

111. $40,000 + $40,000 = $80,000.

112. $40,000 + $120,000 = $160,000. *See* Stewart, *Risks*, *supra* note 5, at 159.

113. This Article focuses on the Clean Air Act because it has been the predominant forum for experiments with emissions trading. *See generally* RICHARD A. LIROFF, AIR POLLUTION OFFSETS: TRADING SELLING AND BANKING (1980). Administrative agencies have experimented with emissions trading and similar approaches under other laws as well. *See, e.g.*, Suitum v. Tahoe Reg'l Planning Agency, 117 S. Ct. 1659, 1662 (1997) (discussing use of "Transferable Development Rights" under interstate compact); Royal C. Gardner, *Banking on Entrepreneurs: Wetlands, Mitigation Banking, and Takings*, 81 IOWA L. REV. 527, 527-30 (1996) (discussing wetland regulation and production/withdrawal of wetland mitigation credits).

escape spatially specific construction bans, strict pollution controls for new pollution sources, and existing source emission regulations in exchange for claimed reductions elsewhere.[114] Scholars often assert that these programs, sometimes collectively referred to as "bubbles,"[115] greatly reduce compliance costs.[116] Generally, these assertions rely on econometric models rather than empirical studies comparing the actual costs of traditional programs to comparable trading regimes after implementation.[117]

The literature often fails to address adequately the question of whether emissions trading, now almost two decades old, has, in fact, stimulated innovation or even produced the emission reductions that comparable traditional regulation would generate.[118] Unfortunately, the history of emissions trading reveals no evidence that emissions trading and its precursors have stimulated innovation or environmental performance superior to comparable traditional regulation.[119]

---

114. For explanations of pollution offsets (in lieu of a construction ban), netting (in lieu of new source controls), and bubbles (in lieu of controls on existing sources of pollution), see LIROFF, *supra* note 41, at xix-xxi, 4-7. *See also* Errol Meidinger, *The Development of Emissions Trading in U.S. Air Pollution Regulation, in* MAKING REGULATORY POLICY 153 (1989) (Keith Hawkins & John M. Thomas eds., 1989) (providing history of these mechanisms and reasons for their adoption). *See generally* Comment, *Emission-Offset Banking: Accommodating Industrial Growth with Air-Quality Standards*, 128 U. PA. L. REV. 937 (1980).

115. Air pollution control experts sometimes generically use the term "bubble" to refer to all of these mechanisms and sometimes use it to refer to existing source bubbles only, as opposed to netting and offsets. *See* LIROFF, *supra* note 41, at 4-7 (discussing basics of bubbles, netting, and offsets).

116. *See* BAUMOL & OATES, *supra* note 95, at 171-72; Hahn & Hester, *supra* note 5, at 128; Jaffe & Stavins, *supra* note 74, at S-43 to -44.

117. *See* BAUMOL & OATES, *supra* note 95, at 171-72; Hahn & Hester, *supra* note 5, at 128; Jaffe & Stavins, *supra* note 74, at S-43 to -44. Professors Ackerman and Stewart, for example, cite estimates of costs made before implementation, rather than actual post-implementation studies of cost, to bolster their empirical case. *See* Bruce A. Ackerman & Richard B. Stewart, *Reforming Environmental Law*, 37 STAN. L. REV. 1333, 1349 n.38 (citing regulatory impact analysis prepared during development of regulations, not after compliance). They cite Tietenberg's book on emissions trading for the proposition that emissions trading "has achieved" $700 million in savings. *Id.* at 1348 & n.37. This figure includes bubbles, approved, proposed, or under development. TIETENBERG, *supra* note 100, at 53. This figure obviously includes and may consist entirely of precompliance estimates. To assume that emissions trading generates some cost savings is reasonable, but the magnitude will remain uncertain until we have studies comparing traditional regulations to comparable trading programs after compliance.

118. *See* Hahn & Stavins, *supra* note 5, at 15-16.

119. *See* Dudek & Palmisano, *supra* note 5, at 234 (discussing claims that little innovation has in fact occurred through emissions trading). Professors Dudek and Palmisano cannot cite a single instance of trading ever having stimulated any significant innovation. Instead, they first assert that there is little need for innovation, thereby avoiding making any claim that trading has promoted innovation. *Id.* at 235. They then refer to "recent data on trading in California"

1. Bubbles: Inadequate Environmental Performance

The empirical literature raises especially serious questions about whether bubbles have spurred adequate environmental performance.[120] The few studies of bubble implementation reveal that polluters often could not document claims that they had made the emission reductions that regulatory requirements underlying bubbles had required.[121] Polluters almost never

---

confirming that "invention and innovation *will result* from emissions trading programs." *Id.* at 236 (emphasis added). They fail to cite any actual data and the use of the future tense makes it unclear whether they are referring to some actual experience or a prediction about future experience.

Similarly, Professor Stewart asserts that emissions trading systems "have . . . encouraged innovation." Stewart, *Risks*, *supra* note 5, at 161. Perhaps he means this as a theoretical, rather than an empirical, observation. He may mean not that emissions trading has caused innovation, but that trading theoretically encourages innovation. In any event, he does not cite empirical data showing any actual innovation that emissions trading has stimulated. *See id.*

120. *See* LIROFF, *supra* note 113, at 28-29 (noting need to avoid "paper offsets," reductions in emissions that exist only on paper); *see also* Dudek & Palmisano, *supra* note 5, at 236 (noting that emissions trading has been "the harbinger of bad news").

121. For example, when EPA and its California counterpart inspected plants to verify compliance with bubble regulations for the aerospace industry in the late 1980s, they found that "almost all large sources operating under . . . bubbles . . . are not achieving the emission reductions or levels of control that are required." *See* CALIFORNIA AIR RESOURCES BOARD AND UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, PHASE III RULE EFFECTIVENESS STUDY OF THE AEROSPACE COATING INDUSTRY 4 (1990) (unpublished report, on file with author); *see also* David Doniger, *The Dark Side of the Bubble*, 4 ENVTL. F., July 1985, at 33, 34-35; LIROFF, *supra* note 41, at 80-89 (providing examples of bubbles that avoided requirements to reduce actual emission levels). Hahn and Hester have concluded that emissions trading (defined to include bubbling and netting) "has had a negligible effect on environmental quality." Hahn & Hester, *supra* note 5, at 137 (footnote omitted). They do not, however, base this assertion on empirical data. Rather, Professors Hahn and Hester rely "on the fact that the rules governing the various trading programs contain prohibitions against trades that would result in significant increases in emissions." *Id.* at 137 n.146. They do not explain the basis for their belief that these rules are adequate and the implicit assumption that these prohibitions have been regularly and correctly enforced. In any case, subsequent experience suggests they have not prevented abuse.

The claim that bubbles have had a "negligible effect" on environmental quality is consistent with the conclusion that bubbles have been a failure. If this negligible effect claim means that bubbles have not produced increases in pollution relative to baseline levels, then the negligible effect constitutes gross failure. For the Clean Air Act and many of the rules in state implementation plans authorizing bubbles were supposed to produce decreases in emissions, rather than just limit increases in areas not meeting air quality standards. *See, e.g.*, United States v. Wheeling-Pittsburgh Steel Corp., 818 F.2d 1077, 1081 (3d Cir. 1987) (describing bubble proposal as alternative emission *reduction* option); Natural Resources Defense Council v. Gorsuch, 685 F.2d 718, 720 (D.C. Cir. 1982) (noting that EPA does not dispute that Congress designed new source review standards for nonattainment areas to promote clean-up not just maintenance of air quality standards), *reversed on other grounds sub nom.* Chevron v. Natural Resources Defense Council, 467 U.S. 837 (1984); Citizens Against the Refinery's

undertook fresh pollution control projects to satisfy these regulations.[122] Instead, they claimed credits for incidental reductions that would have occurred without the regulation.[123] For example, polluters often claimed credits for routine business decisions to slow down production or shut down facilities.[124] Without the ability to trade, the underlying regulation would trigger a fresh reduction that would supplement any incidental reductions. The

---

Effects v. EPA, 643 F.2d 183, 184-85 (4th Cir. 1981) (explaining that offset requirement was designed to produce "positive net air quality benefit").

The actual conclusions of EPA officials relying on real data that Hahn and Hester cite seem consistent with failure. They report no reductions in actual emissions. Hahn & Hester, *supra* note 5, at 129 & n.105 (describing relevant data). Hahn and Hester also cite a statement from the head of the Reagan Era EPA's regulatory reform staff, the primary advocate of emissions trading within EPA, stating that bubbles led to "substantially greater emissions reductions than conventional limits, with the rest producing equivalent reductions." *Id.* at 129 & n.104. Hahn and Hester cite no real data supporting these statements. Dr. Liroff has stated that the statements of the regulatory reform staff have been misleading as to bubble performance. LIROFF, *supra* note 41, at 62-67.

122. *See* Doniger, *supra* note 121, at 34-35.

123. Dr. Liroff provides many examples of these bubbles. *See* LIROFF, *supra* note 41, at 62-67, 89-91. Dr. Liroff explains that states lured new plants in the 1970s by providing them with offsets that the state itself created. LIROFF, *supra* note 113, at 13-17. One offset consisted of a paper credit for "an asphalt substitution process that already was occurring for nonenvironmental reasons." *Id.* at 16; *accord* Citizens Against the Refinery's Effects, Inc. v. EPA, 643 F.2d 183, 187 (4th Cir. 1981). Liroff states that "the offset policy can be a meaningless paper game for abating pollution." LIROFF, *supra* note 113, at 22.

However, the experience varies from state to state. *Id.* Dr. Liroff cites some examples of bubbles that he regards as models. His evaluation of these bubbles clearly shows that they reduced emissions below prior baseline levels. *See, e.g.*, LIROFF, *supra* note 41, at 68 (providing example of actual emissions thousands of tons below uncontrolled levels). He concludes that "bubbles can reduce emissions below levels otherwise required." *Id.* at 69. However, he does not appear to have compared the reductions that traditional regulation would have achieved to the bubble regulation in all cases. *See id.* at 70-71.

Polluters have sought to claim credits even when they have taken no action to reduce pollution below actual emissions level by seeking to measure emission reductions against an "allowable" emissions baseline. *See id.* at 15-16 (discussing various baseline issues); Hahn & Hester, *supra* note 5, at 116-17 (discussing difference between actual and allowable baselines). Because pollution sources usually leave a "compliance cushion," this allows them to generate a paper credit without doing anything to reduce pollution.

Federal rules authorize paper credits when they fail to prohibit claiming reduction credits based on activities undertaken to meet state rules. If a pollution source can claim credits for actions taken to comply with state rules, then regulations designed to create fresh reductions from sources that the state has inadequately regulated will not accomplish anything. Polluters will rely upon reductions undertaken to meet state requirements at adequately regulated sources to justify their failure to make additional reductions at federally regulated units neglected by state regulations. Absent trading, of course, polluters would make both the federally and state mandated reduction, instead of using one of these reductions to justify foregoing the other.

124. *See* Hahn & Hester, *supra* note 5, at 117-18; Comment, *supra* note 114, at 937.

trading allowed polluters to claim credit for these incidental reductions in order to avoid any real fresh emission decreases. The bubble regulations, however, did not require polluters to assume debits for incidental emission increases (e.g. from a production increase). Hence, gaming has been a problem.

EPA introduced bubbles primarily as deregulatory mechanisms,[125] and bubbles generally have stimulated neither innovation nor adequate environmental performance at a cheaper price.[126] Rather, they have generated cost savings for industry, often by allowing unverifiable claims of compliance and paper credits to substitute for actual emission reductions and by reducing pollution reduction demands.[127]

2. *Lead Phase-Down: A Stringent Limitation Driving Substantial Change*

EPA allowed gasoline producers to trade lead allowances during a phase-down of lead from gasoline.[128] The lead phase-down created a substantial change: the reformulation and then virtual elimination of leaded gasoline.[129] The driver for this achievement seems to be the underlying requirement of a phase-down of lead.[130] Faithful implementation of a traditional phase-down

---

125. *See* LIROFF, *supra* note 41, at 37-38 (describing genesis of bubble idea in steel industry).

126. LIROFF, *supra* note 41, at 100 (stating that "most innovations under bubbles merely are rearrangements of conventional technologies").

127. *See* Open Market Trading Rule for Ozone Smog Precursors, 60 Fed. Reg. 39,668, 39,670 (1995) (proposed Aug. 3, 1995) ("Bubbles, netting and offsets have reduced sources' overall compliance costs. However, there have been significant problems of quality control, reducing the environmental effectiveness of the programs."); LIROFF, *supra* note 41, at 99 ("[C]ost saving approaches are not necessarily more cost-effective ways of meeting a goal; instead, they may be ways to avoid costs that may be necessary to meet the goal"); David D. Doniger, *Point ... And Counterpoint*, 4 ENVTL. F., Mar. 1986, at 29, 34 ("In practice ... there has been far more innovation in shell games and sharp accounting practices than in pollution control technology."); Richard A. Liroff, *Point and Counterpoint: The Bubble: Will it Float Free or Deflate*, 4 ENVTL. F., Mar. 1986, at 28, 30 (stating that compliance method that relaxes regulatory requirements at some points without compensating reductions may be more prevalent than bubbles that reduce actual emissions).

128. *See* Suzi Kerr & David Mare, *Market Efficiency in Tradeable Permit Markets with Transaction Costs: Empirical Evidence from the United States Lead Phasedown, in* KERR, *supra* note 101, at 93-167 (discussing lead phase-down program); Robert W. Hahn & Gordon L. Hester, *Marketable Permits: Lessons for Theory and Practice*, 16 ECOLOGY L.Q. 361, 380-91 (1989) (same). This article treats the lead phasedown program as an example of trading because this program authorized credit transfers. Because the rule authorized intertemporal trades, this rule also exemplifies "banking" of emission credits. *Id.*

129. *See* Hahn & Hester, *supra* note 128, at 383; Kerr & Mare, *supra* note 128, at 99.

130. Hahn & Hester, *supra* note 128, at 132 n.125 (stating that "ratcheting down of the standard" reduced lead sharply).

without trading probably would have produced the same change more quickly.[131]

3. Acid Rain: Good Environmental Performance, Little Innovation

The 1990 Amendments to the Clean Air Act create a system of transferrable emissions allowances to reduce sulfur dioxide (SO_2) emissions from large electric utilities, the most prominent contributors to acid rain.[132] Two features make the acid rain program far superior to EPA's bubbles.[133] First, the program caps the number of allowances for large utility units at a number representing a large cut in emissions.[134] Bubbles usually did not cap the emissions at regulated plants at a number representing a large cut in actual emissions.[135] Indeed, bubbles often limited emission rates (not total emissions) at

---

131. The introduction of inter-refinery trading into the lead phasedown program probably slowed the pace of environmental improvement. EPA's 1985 trading rule actually led to increased production of leaded gasoline in 1985. U.S. GENERAL ACCOUNTING OFFICE, VEHICLE EMISSIONS: EPA PROGRAM TO ASSIST LEADED-GASOLINE PRODUCERS 20 (1986) [hereinafter GAO, VEHICLE EMISSIONS]. The increase in production of leaded gas occurred because the rule allowed increased production of low lead gasoline to generate credits. *See* Regulation of Fuels and Fuel Additives; Banking of Lead Rights, 50 Fed. Reg. 13,116, 13,119 (1985) (codified at 40 C.F.R. pt. 80); Hahn & Hester, *supra* note 128, at 382 n.125. EPA's 1985 lead trading rule supplanted a rule that required refiners to meet a standard of 1.1 grams of lead per leaded gallon, effective January 1, 1986. Regulation of Fuels and Fuel Additives; Banking of Lead Rights, 50 Fed. Reg. at 13,116. The 1985 trading rule allowed refiners that banked purchased credits to continue exceeding these limits through the end of 1987. *Id.* at 13,117 (codified at 40 C.F.R. § 80.20(e)(2) (1988)). In actual implementation, inadequate reporting, compliance verification, and enforcement may have marred environmental performance. *See* GAO, VEHICLE EMISSIONS, *supra*, at 3-4, 18-19, 23-24 (citing failure to enforce against twenty-five potential violators, forty-nine cases of claimed credits not matching claimed sales of credits, error rates in reporting between 14% and 49.2%, and no verification of compliance); *cf.* Hahn & Hester, *supra* note 128, at 388 n.146.

132. *See* 11 RICHARD R. POWELL, POWELL ON REAL PROPERTY ¶ 865.5A[5], at 79a-329 (Patrick S. Rohan ed., 1997); Brennan Van Dyke, *Emissions Trading to Reduce Acid Deposition*, 100 YALE L.J. 2707, 2708 (1991).

133. Unlike many bubbles, the acid rain program seems likely to approximate its stated goals. *See* American Mun. Power Ohio v. EPA, 98 F.3d 1372, 1373 (D.C. Cir. 1996); Driesen, *supra* note 80, at 57; Jeanne M. Dennis, Comment, *Smoke for Sale: Paradoxes and Problems of the Emissions Trading Program of the Clean Air Act Amendments of 1990*, 40 UCLA L. REV. 1101, 1114-18 & n.54, 1125 (1993) (explaining program's goals).

134. *American Mun.*, 98 F.3d at 1373; *see* Byron Swift, *The Acid Rain Test*, 14 ENVTL. F., May-June 1997, at 17 (arguing that emissions cap is more important to acid rain program's success than trading).

135. *See* Oregon Envtl. Council v. Oregon Dep't of Envtl. Quality, 34 Env't Rep. Cas. (BNA) 1001, 1006-1007, 1009-1010 (D. Or. 1992) (describing two bubbles that increased plant-wide emissions and two that apparently held emissions constant relative to recent baselines).

select parts of plants, while leaving other parts of the plant unregulated.[136] They generally allowed claims about activities at other parts of the plant, or at other facilities, to substitute for meeting the spatially specific obligation.[137] Second, the acid rain program requires the use of continuous emission monitoring.[138] Because actual baseline emission rates in electric utilities are known, traded SO_2 allowances will likely reflect actual emission reductions.[139] The bubbles often applied to poorly monitored emissions.[140]

Thus far, the acid rain program has worked rather well. Plants use well-known methods of emission control to avoid exceeding allowances.[141] The plants have not employed substantial innovation, but such widespread diffusion of standard technologies may represent a perfectly adequate way of meeting many environmental goals.[142]

Actual compliance with the acid rain requirements has cost much less than government officials anticipated when Congress established the program.[143] Economic incentive proponents credit the emissions trading mecha-

136. *See, e.g.*, Natural Resources Defense Council v. EPA, No. 90-2447, 1991 WL 157261, at *1 (4th Cir. Aug. 19, 1991) (considering bubble as means of complying with emissions rate expressed in pounds of volatile organic compounds emitted per gallon of material used); United States v. Allsteel, No. 87 C 4638, 1989 WL 103405, at *1 (N.D. Ill. 1989) (unpublished disposition) (same); United States v. Alcan Foil Products, 694 F. Supp. 1280, 1281 (W.D. Ky. 1988) (same), *aff'd in part, rev'd in part*, 889 F.2d 1513 (6th Cir. 1989).

137. *See, e.g.*, Navistar Int'l Trans. Co. v. EPA, 941 F.2d 1339, 1344 n.10 (6th Cir. 1991) (describing bubble using credits from shutdown of some sources to justify lack of controls on another); Citizens Against the Refinery's Effects v. EPA, 643 F.2d 183, 184-85 (4th Cir. 1981) (allowing petroleum refinery to offset its emissions with reductions realized through state use of different asphalt to coat highways); *Oregon Envtl. Council*, 34 Env't Rep. Cas. (BNA) at 1006-07 (describing bubbles that allowed unused production at one pollution source and twenty year old emission controls at another to justify not complying with subsequently promulgated limits on emissions from coatings).

138. *See* 42 U.S.C. § 7651k(a) (1994).

139. *See, e.g.*, S. REP. NO. 101-228, at 321 (Dec. 20, 1989), *reprinted in* 1990 U.S.C.C.A.N. 3385, 3704.

140. *See, e.g., Oregon Envtl. Council*, 34 Env't Rep. Cas. (BNA) at 1011.

141. Driesen, *supra* note 80, at 58; *see* Alliance for Clean Coal v. Miller, 44 F.3d 591, 593 (7th Cir. 1995) (noting that principal compliance methods include fuel switching, clean coal, and scrubbers).

142. *See generally* Driesen, *supra* note 80, at 56-58. Byron Swift claims the acid rain program has "fostered significant innovation." Swift, *supra* note 134, at 17. The actual techniques employed by utilities that Swift describes as innovative, such as fuel switching and the use of scrubbers, are well known techniques. *Id.* Because little trading has occurred, it is apparent that a comparable performance standard would have had much the same effect, stimulating a competitive market to deliver conventional technologies, scrubbers, and low sulfur coal. We may see more innovation in the second phase when stricter limits apply. *Id.* at 22.

143. *See* Driesen, *supra* note 80, at 57; Swift, *supra* note 134, at 22 (noting that prices were originally estimated at $750 per ton, dropped below $100 per ton in 1996, and reached

nism for lowering costs.[144] In fact, few trades occurred in the program's first years.[145] Studies comparing the actual compliance costs of traditional regulation to pre-regulation estimates regularly show that regulators and industry greatly overestimate costs.[146] Hence, the low cost of sulfur dioxide control relative to estimates at the time Congress adopted the acid rain program may reflect a common feature of all regulation rather than some unique attribute of emissions trading.[147]

4. The Dichotomy as an Impediment to Learning Lessons From the History of Emissions Trading

In summary, emissions trading has a theoretical claim to increased efficiency. Because it lacks geographic specificity, emissions trading poses significant threats to enforcement regimes. Emissions trading may have caused significant cost savings, because it often allowed evasion of compliance obligations.[148] It has generated adequate environmental performance only when coupled with good monitoring and rules preventing gaming.

$110 per ton during 1997).

144. *See* Driesen, *supra* note 80, at 57.

145. *See* Swift, *supra* note 134, at 21 (estimating that as of March 1995 only one to three and one half percent of allowances were involved in real inter-utility trades). The lack of trading has occurred in other programs. *See* Kerr, *supra* note 101, at 65. Trading may increase as compliance deadlines for meeting fairly stringent "phase two" controls near. Indeed, trading increased in 1997. *See* EPA, *Cumulative Allowances Transferred Under the Acid Rain Program* (last modified Jan. 28, 1998) <http://www.epa.gov/acidrain/ats/cumtrans.html>.

146. *See* THOMAS O. MCGARITY, REINVENTING RATIONALITY: THE ROLE OF REGULATORY ANALYSIS IN THE FEDERAL BUREAUCRACY 131 (1991) ("Not surprisingly, retrospective studies reveal a pattern of consistent before-the-fact overestimation of compliance costs."); OFFICE OF TECHNOLOGY ASSESSMENT, *supra* note 62, at 10 ("In a good number of cases . . . the actual cost burden" of compliance "proved to be considerably less than OSHA had estimated."); Driesen, *supra* note 21, at 600-01 & n.241; Eban Goodstein & Hart Hodges, *Polluted Data: Overestimating Environmental Costs*, THE AMERICAN PROSPECT, Nov.-Dec. 1997, at 64 (noting that compliance costs are generally overestimated by over 100%).

147. *See generally* JUAN PABLO MONTERO, OPTIMAL DESIGN OF A PHASE-IN EMISSIONS TRADING PROGRAM WITH VOLUNTARY COMPLIANCE OPTIONS (1997); *Markets and Management Utilities: Complying with Fed Air Rules Saves $$ – Study*, AM. POL. NETWORK GREENWIRE, Nov. 15, 1995, at 5. The General Accounting Office found that utilities have been reducing their compliance costs without much trading. Eileen L. Kahaner, Note, *GAO's Analysis of Title IV's Sulfur Dioxide Emissions Allowance Trading Program*, 2 ENVTL. LAW. 239, 244 (1995). Competition among vendors has lowered the price of "traditional compliance options like" the use of low sulfur fuels and scrubbing. *Id.* These same techniques can be used to meet a performance standard without trading, and a performance standard would also tend to foster competition to sell technologies and materials needed to meet the standard. *See* Driesen, *supra* note 21, at 614-16.

148. *See* LIROFF, *supra* note 41, at 99 ("[C]ost saving approaches are not necessarily more

EPA has not learned enough from the acid rain program's success and prior programs' failures. In the 1990s, EPA has failed to prohibit 1980s-style trading–trading with inadequate monitoring and rules that allow paper credits–outside of the acid rain context.[149] The economic incentives/command and control dichotomy may partially account for this conspicuous failure to apply the lessons of almost two decades of experience.[150] That experience teaches

---

cost-effective ways of meeting a goal; instead, they may be ways to avoid costs that may be necessary to meet the goal."); Doniger, *supra* note 127, at 34 ("In practice . . . there has been far more innovation in shell games and sharp accounting practices than in pollution control technology."); Liroff, *supra* note 127, at 30 (stating that compliance method that relaxes regulatory requirements at some points without compensating reductions may be more prevalent than bubbles that reduce actual emissions); Open Market Trading Rule for Ozone Smog Precursors, 60 Fed. Reg. 39,668, 39,670 (1995) (proposed Aug. 3, 1995) ("Bubbles, netting and offsets have reduced sources' overall compliance costs. However, there have been significant problems of quality control, reducing the environmental effectiveness of the programs.").

149. *See* Dunstan McNichol & Kelly Richmond, *Pollution and PR*, AMICUS J., Spring 1997, at 37 (describing bubbles that permit increased pollution). EPA recognizes that allowing sources with actual emissions below allowable emissions, an extremely common occurrence, to use the difference as a credit can cause increases in emissions. *See* Economic Incentive Program Rules, 59 Fed. Reg. 16,690, 16,698 (1994) (codified at 40 C.F.R. § 51.490-.494). The credits justify escape from regulatory requirements even though no actual reductions occur. This was one of the major sources of paper credits in the bubbles of the early 1980s. Yet, EPA's 1994 rule governing state economic incentive programs continued to authorize states to use allowable emissions baselines in most situations. *See id.* at 16,697.

EPA also declined to establish strict minimum monitoring standards. *See* 40 C.F.R. § 51.493(e)(2) (1997). Instead, it simply required states to describe how they planned to determine emission credits. *See* Economic Incentive Program Rules, 59 Fed. Reg. at 16,698-707. EPA specifically rejected a state comment that emissions trading should be limited to those source categories that could be monitored reliably. *See id.*

EPA also declined to bar claiming credits for shutdowns and slowdowns in production, even for programs that do not cap overall emissions, another prominent source of unearned credits that harmed performance of early 1980s bubbles. *See* 40 C.F.R. § 51.493(d)(3) (1997); LIROFF, *supra* note 41, at 89-90; *cf.* American Mun. Power Ohio v. EPA, 98 F.3d 1372, 1372-76 (D.C. Cir. 1996) (upholding EPA interpretation of acid rain provisions to limit shutdown credits to preserve integrity of cap in program). The author represented the Natural Resources Defense Counsel in regulatory proceedings leading to the promulgation of the emissions trading rule.

150. Professors Ackerman and Stewart have argued that marketable permit schemes should provide added incentives to improve emissions monitoring. *See* Ackerman and Stewart, *supra* note 6, at 183. The arguments Ackerman and Stewart made at that time do not apply to all marketable permit schemes, do not seem fully persuasive for the schemes to which they apply, and require testing in light of subsequent experience. EPA has continued to encourage bubbles and other forms of emissions trading under the 1990 Amendments to the Clean Air Act's nonattainment provisions. *See Project: Regulatory Reform: A Survey of the Impact of Reregulation and Deregulation on Selected Industries and Sectors*, 47 ADMIN. L. REV. 461, 491 (1995) (discussing Clinton administration's expansion of trading as part of its effort to "reinvent government"). In spite of Congressional mandates to enhance emissions monitoring by 1992,

that a program that requires continuous emissions monitoring and caps emissions may well succeed, but that a program that does not adequately monitor pollution and prevent gaming usually fails.

If "economic incentives" are good and "command and control" is bad, then it makes sense to apply emissions trading widely and displace nearly all "command and control" regulation.[151] The simple dichotomy supports continuing application of emissions trading regimes, even to poorly monitored pollutants. The dichotomy also supports writing rules that fail to prohibit gaming.[152] This will stimulate the maximum expansion of the market by

---

EPA has not used this authority to force major improvements. *See* 42 U.S.C. § 7414(a)(3) (1994); *Agency Wants Extension for CAM Rule Until Late This Summer, Official Says*, 28 Env't Rep. (BNA) 305, 305 (June 13, 1997) (explaining that EPA has decided not to require continuous emissions monitoring); George Van Cleve & Keith W. Holman, *Promise and Reality in the Enforcement of the Amended Clean Air Act Part I: EPA's "Any Credible Evidence" and "Compliance Assurance Monitoring" Rules*, 27 Envtl. L. Rep. (Envtl. L. Inst.) 10,097, 10,108-12 (Mar. 1997) (describing EPA's proposed abandonment of improving emissions monitoring in favor of monitoring operation of control devices).

In contrast, Congress did mandate continuous emissions monitoring in the acid rain program. *See* 42 U.S.C. §§ 7651a(7), 7651k(a) (1994). This may show that EPA has difficulty establishing monitoring standards because of vigorous opposition from industry, which will profit from having insufficient monitoring. Public pressure on Congress may help remedy this problem when Congress adopts emissions trading schemes.

Professors Ackerman and Stewart's rationale actually only applies to emissions trading programs that auction off allowances, rather than give them away free. Ackerman & Stewart, *supra* note 6, at 183. They argue that if EPA must depend on auction revenue, it will have an interest in making allowances scarce and prices high by making sure that good monitoring applies to sources of emission reduction credits. *Id.* Professors Ackerman and Stewart do not consider the possibility that EPA can simply auction off additional allowances if the price becomes too cheap, thus authorizing more pollution in order to solve its fiscal problems. In addition, evidence unavailable at the time they wrote suggests, rather surprisingly, that the bureaucracies are reluctant to adequately fund their programs by charging sufficient fees for permits authorizing pollution. EPA has interpreted a Clean Air Act provision requiring a fee for each ton of pollution permitted very narrowly in order to minimize fees and avoid conflicts with industry. *See* 42 U.S.C. § 7661a(b)(3) (1994) (requiring fees adequate to cover all reasonable costs of permit program, not less than $25.00 per ton); 40 C.F.R. § 70.9(b)(2) (1997) (interpreting statutory provision to create presumption that $25.00 per ton is adequate and creating exceptions to $25.00 per ton requirement). The states generally have not exercised their authority to make sure that fees are sufficient to adequately fund their pollution control work.

151. *See* Dennis, *supra* note 133, at 1137-38 (discussing tension between goal of stimulating markets to reduce emissions and clean air).

152. *See* Economic Incentive Program Rules, 59 Fed. Reg. 16,690, 16,707 (1994) (codified at 40 C.F.R. § 51.490-.494) (rejecting strict monitoring requirements because they would restrict number of sources potentially subject to trading rules); JO ANNE H. APLET, NOX/SOX RECLAIM IMPLEMENTATION 17-18 (1995) (discussing Citizens for Better Environment's allegations that California's new emissions trading program increases emissions).

making cheap credits reflecting no real improvement available, even though it will undermine environmental quality.[153] A recognition that emissions trading is a tool that only works properly for well monitored pollutants and rules requiring sufficient actual emission reductions would limit the scope of trading programs and require strict rules ensuring the integrity of the programs enacted. If proponents of emissions trading are correct in asserting that emissions trading will succeed because of stimulated innovation or wide divergence in compliance costs between sources, then a market can thrive with rules prohibiting all potential opportunities to claim credits without undertaking fresh pollution reductions and only allowing trades where strict monitoring exists.

Apparently, emissions trading has not caused significant innovation. Even the lead phase-down owes the substantial changes it induced not to emissions trading, but to the stringency of its underlying limitations. The failure of emissions trading to cause significant innovation calls into question the adequacy of the command and control/economic incentive dichotomy.[154] If economic incentive programs, in contrast to command and control regulation, provide superior incentives for innovation, then one might have expected emissions trading to result in widespread innovation.

The lack of innovation in response to the emissions trading regime also raises the question whether emissions trading programs really are economic incentive programs. A clear theory of economic incentives may help in designing programs that will provide adequate incentives to motivate innovation and continuous reduction of pollution.

III. Defining Economic Incentives and Understanding Emissions Trading

This Part asks whether emissions trading relies upon economic incentives to a greater extent than traditional regulation. The possibility of a negative answer reveals some theoretical limits to emissions trading as a spur to innovation and continuous improvement.

A. A Broad Preliminary Definition of Economic Incentives

Many scholars advocate increased reliance upon economic incentives to achieve environmental goals. But what precisely is an economic incentive?

---

153. *See, e.g.*, APLET, *supra* note 152, at 12-13; SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT, SECOND ANNUAL RECLAIM PROGRAM AUDIT REPORT 8 (1997) (unpublished report) (on file with author) (recording high volume trading and emissions increase in first years of program).

154. *See* Derzko, *supra* note 74, at 50 (noting that there has been "virtually no" empirical testing of market based systems' "dynamic efficiency," but just theoretical modeling).

What distinguishes reliance upon economic incentives from reliance upon traditional regulation to meet environmental goals?

An economic incentive program can be defined as any program that provides an economic benefit for pollution reductions or an economic penalty for pollution. Defining economic incentives to include both positive and negative incentives includes pollution taxes in the definition.[155] Does command and control regulation qualify as an economic incentive program under this definition? Imagine a pure command and control law. The law commands polluters to perform specific pollution reducing acts, but provides no penalties for non-compliance. This law would probably motivate little or no pollution reduction, because polluters could violate the commands without consequence.[156] Command and control regulation only works when an enforcement mechanism exists.[157]

Traditional regulation relies upon a negative economic incentive – a monetary penalty for non-compliance – as the principle inducement to comply with regulatory requirements, true command and control requirements, such as work practice standards, and the more common performance standards.[158] Indeed, a traditional regulation's success depends heavily upon the adequacy of these monetary penalties.[159]

A formal definition of an economic incentive program as any program relying on positive or negative economic inducements to secure pollution reductions plausibly applies to just about any regulatory program. To evaluate possible explanations for the dichotomy's assumption that emissions trading relies on economic incentives, but traditional regulation does not, a functional analysis is helpful. Parties to this debate need to analyze whether emissions trading overcomes traditional regulation's weaknesses in spurring innovation and providing continuous incentives. This will require examination of the sources of economic inducements, the financing mechanisms, the likely responses of regulated polluters (both strategic and desired), and the govern-

---

155. *See* FREDERICK R. ANDERSON ET AL., ENVIRONMENTAL IMPROVEMENT THROUGH ECONOMIC INCENTIVES 18 (1977).

156. *See* Kerr, *supra* note 101, at 69-70.

157. Nicolas M. Kublicki, *The Paper Triangle: National Forest Timber, Solid Waste Disposal and Recycling*, 7 TUL. ENVTL. L.J. 1, 37 (1993); Mark A. Stach, *The Gradual Reform of Environmental Law in the Twenty-First Century: Opportunities Within a Familiar Framework*, 22 J. CORP. L. 621, 624-25 (1997).

158. *See, e.g.*, James Miskiewicz & John S. Rudd, *Civil and Criminal Enforcement of the Clean Air Act after the 1990 Amendments*, 9 PACE ENVTL. L. REV. 281, 352-64, 373-75 (1992) (describing monetary penalties in Clean Air Act).

159. *See id.* at 359 n.298 (stating that Congress intended that 1990 Clean Air Act amendments would ensure that violators not obtain economic benefits from non-compliance).

mental role in emissions trading. These questions provide the tools to develop a functional theory of economic incentives.

B. Economic Incentives and Emissions Trading

Because traditional regulation's dependence upon government decisions about emission limitations provides inadequate continuing incentives for innovation, the theory of economic incentives might focus on reducing reliance upon difficult government decisions. Because emissions trading depends upon government established emission limitations it may not provide incentives for continuous environmental improvement or innovation.

1. The Lack of Incentives for Continuous Improvement in Emissions Trading

Recall that traditional regulation failed to provide an incentive for continuous environmental improvement.[160] Once a polluter complies with a traditional regulation (with an adequate cushion) no further incentive exists to make more reductions unless doing so saves money. This subpart asks whether emissions trading overcomes this problem.

A pure emissions trading model may help clarify the relationship between emissions trading, emission limitations, and incentives for *continuous* pollution reductions. Imagine a law that allows any firm that reduces pollution to trade with any firm that increases pollution but fails to mandate emission reductions from particular pollution sources. This law would accomplish little. Without regulatory limits, firms would have no obligation to make further reductions and no incentives to reduce emissions at all (or to trade).

An emissions trading program necessarily includes requirements for specific reductions from pollution sources within the trading program and allows sources to avoid the limits by trading with sources of credits.[161] This means that some governmental body must set quantitative limits for specific pollution sources.[162]

---

160. *See supra* Part II.A.

161. *See, e.g.*, 42 U.S.C. § 7651c(e) (table A) (1994) (establishing "phase one" allowances, each constituting permission to emit one ton of sulfur dioxide). This feature of emissions trading is not just a peculiarity of the acid rain program, but rather a "necessary aspect" of "any" allowance trading program. Texas Mun. Power Agency v. EPA, 89 F.3d 858, 861 (D.C. Cir. 1996); *see also* Stewart, *supra* note 30, at 1335 (citing initial allocation of permits as problematic in transferrable system).

162. *See* Keohane et al., *supra* note 42, at 3 (describing choice to pursue emissions trading as "choice among the instruments" and issues of how to choose levels as separable issue); Michael C. Naughton, *Establishing Interstate Markets for Emissions Trading of Ozone Precursors: The Case of the Northeast Ozone Transport Commission and the Northeast States*

Once a pollution source has complied with the underlying limits, no further incentive exists to make additional reductions. The incentive to provide reductions, either by making them at the source or purchasing credits from elsewhere, continues throughout the compliance period defined by the underlying regulations. The incentive's duration precisely matches that of a traditional regulation with the same compliance period. Once the polluters regulated by a trading program have reached an equilibrium providing the reductions that the governmental body required, no incentive for further reductions exists.[163]

The acid rain trading program provides fairly long-term incentives because it provides for staged reductions over a long period of time.[164] However, Congress can couple long compliance times and ambitious staged reductions with either traditional regulation or emissions trading.[165] The acid rain trading program does not provide incentives to continue reducing net emissions after an equilibrium is reached that matches the underlying reduction mandate.[166]

Some commentators argue that emissions trading provides a continuing incentive to reduce "because the number of permits remain limited."[167] Hence, economic growth will increase the demand for permits, raise the price, and provide a greater incentive for polluters to reduce their emissions.[168]

Limiting the number of permits does not create an incentive for continuous net emission reductions below the equilibrium level required by the program. The limit creates an incentive for permit holders to reduce emissions only to the extent that others will increase emissions. Net emissions would remain consistent with those authorized by the promulgated emission limits.[169]

---

for Coordinated Air Use Management Emissions Trading Proposals, 3 N.Y.U. ENVTL. L.J. 195, 202 (1994); Tripp & Dudek, *supra* note 83, at 374-76; *cf.* GENERAL ACCOUNTING OFFICE, TRANSITION SERIES: ENVIRONMENTAL PROTECTION ISSUES 10 (1992) (incorrectly describing emissions trading as "nonregulatory alternative").

163. *See* Hahn & Stavins, *supra* note 5, at 8-9 & n.33 (emissions trading tends to reach equilibrium).

164. *See* Van Dyke, *supra* note 132, at 2709-10 (detailing compliance deadlines).

165. Long compliance deadlines may be justified when the reduction demanded cannot be implemented in a shorter time period and less justified if the reductions demanded can be produced fairly quickly.

166. *See* 42 U.S.C. § 7651b(a). This subsection caps emissions, with some exceptions, at 8.9 million tons of sulfur dioxide a year. It does not provide for reductions below that level. *Id.* It provides for pro-rata reductions in allowances for some sources, but only to the extent needed to meet this 8.9 million ton cap. *Id.* Hence, once the sources have the appropriate aggregate total of emissions, no incentive exists for further net reductions.

167. *See* Tripp & Dudek, *supra* note 83, at 374.

168. *Id.*

169. *See* Stewart, *supra* note 85, at 13 ("Given a fixed supply of permits . . . [t]he system

A legal rule limiting the number of permits creates incentives to avoid increases above the mandated level, whether or not the permits can be traded. The premise that a trading program limits the number of permits tacitly assumes that a legal rule prohibits the sources of additional pollution caused by economic growth from operating without purchased emission allowances.[170] The argument that a trading program restrains growth in emissions from economic growth also requires an assumption that the trading regime imposes a cap on the mass of emissions of the sources within a trading program (as in the acid rain program). A program authorizing trading to meet rate-based emission limitations or allowing any pollution source to operate without purchased allowances would tolerate increases in emissions associated with economic growth without demanding compensating credits.[171] Thus, even the modest argument that trading can restrain growth in emissions applies only to a particular idealized trading program, not emissions trading in general.

A traditional regulatory program that prohibits economic growth from creating additional emissions would, in theory, also provide a continuing

---

will ensure that we . . . keep in place.").

170. Tripp & Dudek, *supra* note 83, at 375. This may be quite a heroic assumption, because adopting and enforcing a prohibition on all pollution may prove difficult politically. The Clean Air Act does not currently contain such a prohibition. The Clean Water Act does contain a general prohibition on non-permitted discharges. *See* EPA v. State Water Resources Control Bd., 426 U.S. 200, 205 (1976) (stating that Clean Air Act prohibits discharge of pollutants without permit); Train v. Colorado Pub. Interest Research Group, Inc., 426 U.S. 1, 7 (1976) (same); Natural Resources Defense Council v. Costle, 568 F.2d 1369, 1374 (D.C. Cir. 1977); *cf.* Arkansas v. Oklahoma, 503 U.S. 91, 107-08 (1992) (noting that EPA may permit discharges into water bodies violating existing water quality standards). The courts and EPA have not always faithfully implemented the prohibition of non-permitted discharges. *See* Atlantic States Legal Found., Inc. v. Eastman Kodak Co., 12 F.3d 353, 358 (2d Cir. 1994) (holding that discharges of pollutants not listed in permit is permissible); Joanna Bowen, Atlantic States Legal Foundation v. Eastman Kodak Co.: *The Second Circuit Affirms the NPDES Permit as a Shield and Tries to Sink the Clean Water Act*, 12 PACE ENVTL. L. REV. 269, 271 (1994) (arguing that court interpreted Act more narrowly than EPA, which believes that pollutants not listed in permit application cannot be discharged); *cf.* Northwest Envtl. Advocates v. Portland, 52 F.3d 979, 986 (9th Cir. 1995) (noting that citizens may sue to enforce water quality conditions in permits, not just effluent limitations). *See generally* Michael D. Axline & Patrick C. McGinley, *Universal Statutes & Planetary Programs: How EPA Has Diluted the Clean Water Act*, 8 J. ENVTL. L. & LITIG. 253 (1993).

171. *See* Swift, *supra* note 134, at 18 (explaining that emission rates do not necessarily prevent increases in mass of emissions). Traditional regulations can limit pollution by mass rather than by rate. Hence, traditional regulation and emissions trading based on rates fail to constrain emissions in the face of growth in production, but limits on mass, whether expressed in performance standards or tradable allowances, may constrain emissions in the face of growth.

incentive to avoid net emission increases in response to economic growth.[172] A legal rule prohibiting all non-permitted emissions would improve the environmental performance of either an emissions trading scheme or traditional regulation. Even an idealized emissions trading program does not provide a more continuous incentive for pollution reduction than a comparable traditional regulation.

2. Complexity, Uncertainty, and Delay in Emissions Trading

Recall that problems of complexity, uncertainty, and delay prevented traditional regulatory programs from predictably tightening limits. These problems limited traditional regulation's ability to stimulate innovation.[173] This section considers whether emissions trading overcomes these problems.[174]

If an administrative body sets the limits underlying a trading program, then the problems of the complexity of administrative environmental decision making and the attendant delay may infect these decisions, just as they infect decision making in traditional programs.[175] The resulting uncertainty can lessen incentives to innovate, just as uncertainty about future emission limitations reduces such incentives in traditional regulation.[176] Further, just as

---

172. The traditional program would simply duplicate the assumptions implicit in the trading model Tripp and Dudek tacitly advance. *See generally* Tripp & Dudek, *supra* note 83. The government would set mass based emission limitations for pollution sources, something that must occur in the trading program as well. The same background legal rule would apply prohibiting the government from granting permits to new sources of emissions.

173. Professor Stewart cites uncertainty about the timing of emissions control decisions as a factor discouraging innovation. Stewart, *supra* note 30, at 1271-72, 1315-16.

174. Proponents of emissions trading have argued that emissions trading will simplify administration. *See* DALES, *supra* note 1, at 97 (comparing continuously monitored effluent trading not to uniform standard setting, but to case-by-case permitting).

175. *See* Latin, *supra* note 59, at 1290 (noting that to extent market incentive programs can be adjusted flexibly to respond to new information, they present same "moving target" effect as command and control regulation). *See generally* CED, *supra* note 87, at 42 (noting complexity of administration and operation of emissions trading).

176. *See* Dennis, *supra* note 133, at 1105 (noting that if need for reduction in acid rain becomes more urgent, allowances might be confiscated, thus upsetting the market); Kerr, *supra* note 101, at 6 (noting that because of high levels of scientific uncertainty and changing preferences regulatory systems must periodically readjust targets). Professor Stewart envisions "depreciating permits" over time according to a predetermined schedule. *See* Stewart, *supra* note 30, at 1333. Professor Stewart suggests that this proposal would obviate the need for "constant administrative or legislative tightening." *Id.* at 1332-33.

Emissions trading schemes that do not have a fixed long-term depreciation schedule still may require periodic tightening. A long term depreciation schedule can be applied to either marketable or unmarketable permits. Hence, whatever certainty this idea might create would

traditional regulation uses technological, cost-benefit, or health-based criteria to set limitations, the same criteria can be used to set the limitations governing trading programs.[177] Also, private parties have significant incentives to litigate disliked stringency determinations and allocative decisions.[178]

Congressional mandates of specific emission reductions may circumvent some of the problems with administrative decision making, including hard look judicial review.[179] Congress has, in fact, tried to circumvent administrative problems by mandating specific cuts of named pollutants through centralized emissions trading,[180] decentralized standard setting,[181] and centralized standard setting.[182] The scarcity of congressional time may limit the frequency of congressional mandates.[183] However, congressionally set limits have often fared relatively well and should be pursued.[184] Congressional limits may provide more democratic accountability than comparable adminis-

---

exist with or without emissions trading. Professor Stewart's proposal may make sense. However, his argument is not really an argument about emissions trading.

177. For example, California's RECLAIM program allows adjustment of reduction allocations based on technology reviews. These reviews assume that the facilities should reduce their emissions to levels equivalent to those under the traditional regulations RECLAIM replaced. SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT, *supra* note 153, at 19-20. The South Coast Air Quality Management District (SCAQMD) has allocated additional emission allowances, thereby harming air quality, when it concluded that a facility could not meet its target through locally applied technology known to the SCAQMD. *Id.* at 72-73.

178. *See* Texas Mun. Power Agency v. EPA, 89 F.3d 858, 861 (D.C. Cir. 1996) (involving claim seeking additional emission allowances); Indianapolis Power & Light Co. v. EPA, 58 F.3d 643, 647 (D.C. Cir. 1995) (same); Madison Gas & Elec. Co., 25 F.3d 526, 526 (7th Cir. 1994) (same); Monongahela Power Co. v. Reilly, 980 F.2d 272, 272-74 (4th Cir. 1992) (same); Thompson, *supra* note 5, at 1359 (noting that "bureaucrats would face tremendous special interest pressure" when they allocate emission allowances "because of the importance and monetary value of these rights").

179. *See* David Schoenbrod, *Goals Statutes or Rules Statutes: The Case of the Clean Air Act*, 30 UCLA L. REV. 740, 808, 815 (1983). Professors Stewart and Ackerman seem to have Congressionally set limits in mind. *See* Ackerman & Stewart, *supra* note 6, at 190.

180. *See* 42 U.S.C. § 7651(b) (1994) (setting goal of acid rain trading program to cut sulfur dioxide by ten million tons).

181. *See* 42 U.S.C. § 7511a(b)(1) (1994) (generally requiring states to cut volatile organic compounds by 15% from 1990 levels).

182. *See* 42 U.S.C. § 7521(g) (1994) (setting numerical standards for motor vehicles).

183. *See* Henry A. Waxman, *An Overview of the Clean Air Act Amendments of 1990*, 21 ENVTL. L. 1721, 1721-42 (1991) (explaining political forces that delayed amendment of Clean Air Act until 1990).

184. *See* Driesen, *supra* note 80, at 53-55. This author has argued elswhere that successful implementation usually follows great specificity in Congressional decision making. *Id.* at 54-55. Generally, statutory provisions that require major decisions from EPA or the states fare less well.

trative decisions, since the electorate can hold Congress more accountable for the results.[185] Yet the advantages of specific quantitative congressional decision making occur whether or not pollution sources may use trading as a means to comply with the limits.

In addition to the usual issues that arise in a traditional regulation, such as how costly reductions will be, how much benefit they will yield, and whether they are technologically achievable, arcane disputes arise about baseline emission levels, creditable reductions and the like in emissions trading programs.[186] Sources subject to trading have economic incentives to seek rules establishing the cheapest possible method of complying with a

---

185. *See* Ackerman & Stewart, *supra* note 6, at 189. Professors Ackerman and Stewart have argued that emissions trading tends to foster democratic decision making by focusing attention on issues people can more easily understand, such as the amount of emissions to cut, and avoiding arcane questions that only technocrats can understand. *Id.* With a little work, citizens can understand whether an EPA or state regulation will force a factory in their neighborhood to meet emission limitations, including technology-based limitations, that similar factories meet elsewhere, or that can be met with known technology. Understanding the myriad potential games that can be accomplished through emissions trading requires expertise that very few possess. Hence, it seems odd to defend emissions trading as a democratizing reform. *Cf.* Lisa Heinzerling, *Selling Pollution, Forcing Democracy*, 14 STAN. ENVTL. L.J. 300, 324-25 (1995) (arguing that acid rain program did not achieve democratizing goal).

186. *See* Tripp & Dudek, *supra* note 83, at 370-71 (explaining that designing and implementing emissions trading is technically complex); *see also* Texas Mun. Power Agency v. EPA, 89 F.3d 858, 867-75 (D.C. Cir. 1996) (upholding EPA's use of State-wide average baseline emission rate as basis for calculating emission allowances, its analysis of that data, and its decision regarding adjustment of allowances to account for prolonged outages during baseline period); Indianapolis Power & Light Co. v. EPA, 58 F.3d 643, 647 (D.C. Cir. 1995) (rejecting claims to adjustment of allowances based on power outages during period used to establish baseline emissions); Letter from Natural Resources Defense Council to Michael Shapiro, Assistant Administrator for Air and Radiation, Environmental Protection Agency, Providing Comments on Economic Incentive Program Rules and Related Guidance (June 13, 1993) (on file with author). EPA has a greater understanding of electric utility emissions of sulfur dioxide than it does of most emissions. Hence, one would expect even more disputes in most other contexts. *See* LIROFF, *supra* note 41, at 15-16.

Some emissions trading proponents seek to minimize the importance of these issues by dismissing them as "transitional" issues. *See* Ackerman & Stewart, *supra* note 6, at 185. Because most responsible proponents recognize that emissions trading cannot wholly supplant traditional regulation, issues regarding their interaction are likely to be with us for a long time. *See* BAUMOL & OATES, *supra* note 95, at 190 ("[T]he ideal policy package contains a mixture of instruments, with taxes, marketable permits, [and] direct control . . . each used in certain circumstances to regulate the sources of environmental damage."); DALES, *supra* note 1, at 98 (contending that emissions trading is impracticable for "diffuse" pollution); Hahn & Stavins, *supra* note 5, at 15 ("The best set of policies will typically involve a mix of market and more conventional regulatory processes."). Professors Ackerman and Stewart do not really explain why the issues complicating emissions trading would disappear over time. While these issues might be resolved appropriately given sufficient political will, it's hard to imagine their disappearance.

trading program.[187] The cheapest methods involve claiming compliance without doing anything at all to reduce emissions. For example, a participant might claim compliance by claiming credits for reductions that already occurred or for reductions that can occur through normal events in the business cycle, such as production declines and plant shutdowns without accepting debits for other normal events.[188] Demands to write rules that allow evasion of actual emission reductions can consume regulators designing programs, increase uncertainty, and delay progress.[189]

Efforts to establish an international trading regime for greenhouse gases, for example, may generate fresh evasion problems. United States utilities would like to claim credit for activities abroad in order to justify avoiding potential limits on their greenhouse gas emissions at home.[190] They may have incentives to claim credits for their role in projects that increase worldwide CO_2 emissions, principally construction of new coal burning power plants. Unless the underlying emissions trading rules prohibit this explicitly, they may claim a credit representing the difference between the project built and a dirtier project that could have been built if less modern equipment was used. Of course, industry has no interest in seeking rules that assign it debits for selling equipment that raises CO_2 emissions above current levels. Debits would increase their emissions control obligations and compliance costs.

Utilities also have an economic incentive to seek credits for helping forest protection efforts abroad. If the government allows them to substitute credits for inexpensive forestry projects for more expensive pollution control efforts, they will save money. Since forests do sequester carbon emissions that would otherwise warm the atmosphere this seems sensible at first glance.[191] But will the protection of any given forest have any effect on global carbon levels? If demand simply shifts to other unprotected forests then the protection effort may not decrease net deforestation at all. Rather, the protection effort may protect one area while channeling more deforestation into

187. *See, e.g.*, Letter from Gail Ruderman Feuer, Natural Resources Defense Council Senior Staff Attorney, to Henry W. Wedaa, Chairman, South Coast Air Quality Management District (Sept. 9, 1993) (on file with author).

188. *See* American Mun. Power – Ohio v. EPA, 98 F.3d 1372, 1374-75 (D.C. Cir. 1996) (rejecting creation of shutdown credits that would impede realization of pollution reductions); APLET, *supra* note 152, at 6-7, 12-13 (noting that shutdown credits used under California rules).

189. *See* APLET, *supra* note 152, at 20-22 (noting that California's RECLAIM program has produced no actual emission reductions and has introduced substantial uncertainty about realizing reductions below those required by 1991 technology-based limits).

190. *See Electric Utilities See Major Difficulties in Establishing Global Emissions Trading*, 28 Env't Rep. (BNA) 368, 368 (June 20, 1997).

191. *See* CLIMATE CHANGE 1995: THE SCIENCE OF CLIMATE CHANGE, *supra* note 9, at 449.

areas open to logging. Hence, emissions trading may provide incentives not just to make reductions elsewhere, but to claim credits for other activities that do not have comparable value.

Increased reliance on emissions trading may create a fresh incentive to resist emission limitations.[192] Polluters may want to avoid regulation of pollution sources they own in order to protect potential sources of future credits. Thus, emissions trading will offer less of an incentive for continuous improvement (i.e. beginning before and continuing after compliance deadlines in the regulation) than comparable traditional regulation.[193] Emissions trading, rather than providing an antidote to the problems of complex decision making that plague traditional regulation, provides a layer of additional complications and occasions for dispute.[194]

Emissions trading will contribute to quicker realization of environmental goals if regulators make the underlying emissions limitations more stringent than comparable traditional regulation. If emissions trading generates large cost savings, as proponents claim, program designers can demand more emission reductions than they could under a traditional regulation and still save polluters money.

Typically, cost considerations constrain the stringency of environmental regulation.[195] If the sources with high marginal control costs need not pay that cost because they can pay facilities with lower marginal costs to reduce in their stead, then there is no justification for a standard driven by the high marginal costs of the polluters with high local costs or even by their technological inability to meet the standard at the source.[196] An agency could allow pollution sources sufficient cost savings to motivate trading, but use the rest of the savings to pay for more stringent regulation.[197] For example,

---

192. *See* Hanley et al., *supra* note 94, at 1431 ("[I]t may be more difficult with tax or permit systems to force individual polluters to alter their discharges."); Dennis, *supra* note 133, at 1122-24 (positing that experience suggests allocation of pollution rights, even without takings protection, may empower those with allowances to resist pollution reductions).

193. *Cf.* LIROFF, *supra* note 41, at 137-38 (discounting similar argument).

194. *See* Meidinger, *supra* note 114, at 170.

195. *See, e.g.*, 42 U.S.C. § 7412(d)(2) (1994); Michigan v. Thomas, 805 F.2d 176, 180 (6th Cir. 1986) (noting that EPA has interpreted "reasonably available control technology" to be "the lowest emission limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and *economic* feasibility" (emphasis added)).

196. *Cf.* National Lime Ass'n v. EPA, 627 F.2d 416, 416-18 (D.C. Cir. 1980) (vacating emission limits because EPA failed to demonstrate that all pollution sources in category could meet them).

197. *See* Letter from Natural Resources Defense Council to Michael Shapiro, *supra* note 186, at 4-5. Indeed, existing environmental statutes may legally require this procedure when

assume that one pollution source, Seller, faces control costs of $1,000 per ton and another, Buyer, faces costs of $3,000 per ton. A uniform forty ton reduction requirement would cost $160,000.[198] Seeking the same aggregate eighty ton reduction through emissions trading would cost $80,000 if Seller made all the reductions. The regulator could, however, require a 120 ton reduction, costing $120,000, through emissions trading and still generate a $40,000 cost savings[199] relative to the eighty ton reduction required through traditional regulation. Using cost savings to increase stringency in this manner could speed achievement of environmental goals, but emissions trading without this feature does nothing to overcome delay.

3. *The Tension Between Efficient Spatial Flexibility and Creating Incentives for Innovation*

Recall that traditional regulation mandates emission reductions from specific pollution sources.[200] This section asks whether the spatial flexibility that emissions trading offers provides superior incentives for innovation.

An emissions trading program relies upon not just the same decision-making processes as traditional regulation, but also the same negative economic incentive that traditional regulation uses; the prospect of a monetary penalty for non-compliance.[201] A pollution source may comply by either reducing emissions locally or purchasing credit.[202] If the source fails to do either, it risks a financial penalty.

---

trading is adopted administratively under existing environmental statutes. *See* 42 U.S.C. § 7412(d) (1994) (requiring maximum achievable emission reductions); 7511(a)(1) (requiring attainment of air quality standards as expeditiously as practicable). If EPA can legally define provisions requiring "such reductions from existing sources . . . as may be obtained through adoption, at a minimum, of reasonably available control technology" (RACT) to authorize emissions trading, which is an open question, then emissions trading will make control options at one facility reasonably available to another. *See* 42 U.S.C. § 7502(c)(1) (1994). Thus, RACT regulations predicated on emissions trading should be more stringent than a traditional regulation.

198. (40 x $1,000) + (40 x $3,000) = $160,000.

199. $160,000 - $120,000 = $40,000.

200. *See supra* Part II.A.

201. *See* 42 U.S.C. § 7651j (1994).

202. For example, the acid rain provisions, with limited exceptions, penalize operators who emit sulfur dioxide in excess of the number of held allowances. *See* 42 U.S.C. § 7651(j). The provisions assign each unit included in the program an emissions limitation expressed as an allowance and the pollution source can reduce to that level without trading. *See* 42 U.S.C. § 7651a(3) (defining allowance as permission to emit one ton of sulfur dioxide); 42 U.S.C. 7651c (allocating allowances). Alternatively, the pollution source can purchase allowances from another source and use this as a credit to justify less than full local compliance. *See* 42 U.S.C. § 7651b(b).

A trading program's ability to motivate innovation and good environmental performance depends on at least three factors: (1) the stringency of the emission limitations governing pollution sources; (2) the size of possible monetary penalties; and (3) the likelihood that the government or citizens will catch non-complying polluters.[203] If regulators use emissions trading as a means of providing the same total emission reductions as a traditional program, emissions trading may provide less potent negative economic incentives to reduce pollution than a comparable traditional regulation, because the emission reduction obligation and monetary penalties may remain the same while evading regulatory obligations becomes easier.

It is easier for polluters to evade regulatory obligations when the complexity of enforcement increases, thereby decreasing the chances that a government enforcer will have time to detect failures to provide contemplated real reductions. Emissions trading requires an enforcer wishing to determine whether a buyer of emissions credits has satisfied an obligation to verify the amount of reductions foregone at the buyer's plant (which requires knowledge of current and baseline emissions from the uncontrolled source) and to evaluate whether the claimed reductions occurred at the source of the credits. The enforcer must run numerous other checks to make sure that no double counting or other gaming is going on.[204] Hence, agencies relying upon trading need more resources to verify compliance than agencies relying upon traditional regulation.[205]

Evasion of real emission reductions is easier in programs that do not require strict monitoring of pollution from all potential sources of credits and debits. Facilities subject to an emissions trading regime without adequate monitoring may pollute more than the law permits, because no monitoring detects the exceedances, just as in traditional regulation. Moreover, these undetected noncompliant facilities may claim emission credits for emitting less than the standard requires. The sale of these credits will justify increased pollution at a second facility. Hence, inadequate monitoring may prove twice

---

203. *See* JOEL A. MINTZ, ENFORCEMENT AT THE EPA: HIGH STAKES AND HARD CHOICES 103-05 (1995); Robert L. Hahn & Robert L. Axtell, *Reevaluating the Relationship Between Transferable Property Rights and Command-and-Control Regulation*, 8 J. REG. ECON. 125, 127-28 (1995); *see also* Richard E. Ayers, *Enforcement of Air Pollution Controls on Stationary Sources Under the Clean Air Amendments of 1970*, 4 ECOLOGY L.Q. 441, 470 (1975) (asserting that fewer issues of fact in enforcement action imply less likelihood of industry risking noncompliance).

204. Double counting occurs when two pollution sources rely on the same reduction for a credit or when one pollution source relies on actions taken to fulfill one regulatory requirement to satisfy a requirement that otherwise would have generated an additional reduction. *See* LIROFF, *supra* note 41, at 15-16 (describing situation that amounts to double counting).

205. *See* Derzko, *supra* note 74, at 52 n.255.

as detrimental in an emissions trading scheme because monitoring inadequacies tend to permit increased emissions at one facility and simultaneously justify a second increase at some other facility. This particular problem, however, may not apply to emissions trading programs that feature accurate, reliable monitoring.

The trading mechanism creates additional incentives for some polluters within the trading program, specifically where large differences in marginal control costs exist. It creates an economic incentive for polluters facing high marginal control costs to *increase* emissions above the otherwise applicable limit, at least to the extent that the high-cost polluters plans to purchase relatively cheap credits from other sources.[206] It also creates an incentive for polluters facing low marginal control costs to *decrease* emissions, at least to the extent the polluter plans to sell credits to sources with high costs.[207] If the market functions smoothly, then trading occurs, the incentives cancel each other out, and the net economic incentive mirrors that of a comparable traditional regulation (except for weakened enforcement's tendency to increase emissions).

Because a well designed trading program may induce pollution sources with low marginal control costs to go beyond regulatory limits to a greater degree than they would under a traditional regulation, commentators focusing only on the low-cost sources have argued that emissions trading creates greater incentives for technological innovation than traditional regulation.[208] As some economists have realized, this argument ignores the incentive for high-cost sources to avoid pollution reduction activities.[209] Trading reduces the incentive for high-costs sources to apply new technology.

In theory, emissions trading probably weakens net incentives for innovation.[210] If a regulation allows facilities to use trading to meet standards, the low-cost facilities tend to provide more of the total reductions than they would provide under a comparable traditional regulation. Conversely, the high-cost facilities will provide less of the total required reductions than they would have under a comparable traditional regulation. The low-cost facilities probably have a greater ability to provide reductions without substantial innovation than high-cost facilities. A high-cost facility may need to innovate to escape the high costs of routine compliance; the low-cost facility does not have this

206. Hahn & Stavins, *supra* note 5, at 8 n.33.

207. *Id.* at 8-9 & n.33.

208. *See* David A. Malueg, *Emissions Credit Trading and the Incentive to Adopt New Pollution Abatement Technology*, 16 J. ENVTL. ECON. & MGMT. 52, 54 (1987).

209. *Id.*

210. *See generally id.*

same motivation. Hence, emissions trading, by shifting reductions from high-cost to low-cost facilities, may lessen the incentives for innovation.

Some analysis of the Low Emissions Vehicle (LEV) program, a regulatory program that several states have enacted to stimulate innovation and secure emission reductions from automobiles, illustrates how emissions trading may decrease incentives for innovation.[211] The program requires the introduction of a large number of vehicles that must meet emission standards which car manufacturers can realize with fairly modest technological improvements, such as highly efficient catalysts.[212] The program also requires the introduction of a small number of Zero Emission Vehicles (ZEVs), most likely electric cars.[213] The automobile industry claims that the ZEVs will be expensive to produce.[214] One could theoretically design a program providing the same net emissions reductions as the LEV program by excluding the zero emissions mandate and requiring a more widespread implementation of the remaining requirements.[215] In the short run this would theoretically produce the same emission reductions for less cost. However, the zero emissions mandate provides the incentive to develop new technologies that may revolutionize the environmental performance of automobiles over time and even lower long-term costs.[216] Thus, there is a tradeoff between short-term efficiency and the desire to promote technological innovation.

---

211. *See* CAL. CODE REGS. tit. 13, § 1960.1(g) (1998); Virginia v. EPA, 108 F.3d 1397, 1412 & n.16 (D.C. Cir. 1997) (noting that Connecticut, New York, and Massachusetts have adopted LEV program), *modified*, 116 F.3d 499 (D.C. Cir. 1997); Motor Vehicle Mfrs. Ass'n v. New York State Dep't of Envtl. Conservation, 79 F.3d 1298,1298 (2d Cir. 1996) (upholding New York LEV program); American Auto. Mfrs. Ass'n v. Commissioner, 31 F.3d 18, 18-19 (1st Cir. 1994) (upholding Massachusetts LEV program).

212. *See Studies Will Examine Effects of Sulfur on Catalysts in Low Emission Vehicles*, 28 Env't Rep. (BNA) 403, 403 (June 27, 1997).

213. *See* Motor Vehicle Mfrs. Ass'n v. New York State Dep't of Envtl. Conservation, 17 F.3d 521, 528 (2d Cir. 1994). For a discussion of some of the technological issues concerning electric vehicles, see JAMES J. MACKENZIE, THE KEYS TO THE CAR: ELECTRIC AND HYDROGEN VEHICLES FOR THE 21ST CENTURY 21-73 (1994).

214. *Air Pollution: Panel Will Consider Alternatives to LEV Plan for Northeast, EPA Says*, 25 Env't Rep. (BNA) 705, 705 (Aug. 12, 1994); *Air Pollution: Quick Resolution Of Clean-Car Issue Sought; Automakers Ask Regulators To Avoid ZEV Plan*, 26 Env't Rep. (BNA) 556, 556-57 (July 14, 1995).

215. In practice, one could not do so with integrity. Measurement of automobile emissions is notoriously difficult, especially the "evaporative emissions." Arnold W. Reitze, Jr. & Barry Needleman, *Control of Air Pollution From Mobile Sources Through Inspection and Maintenance Programs*, 30 HARV. J. ON LEGIS. 409, 420, 445 (1993). ZEVs will virtually eliminate evaporative emissions as well as tailpipe emissions. Ashley Morris Bale, *The Newest in Motor Vehicle Emission Control: The Clean Fuel Vehicle*, 15 VA. ENVTL. L.J. 213, 262 (1996).

216. *See generally* MICHAEL SHNAYERSON, THE CAR THAT COULD: THE INSIDE STORY OF GM'S REVOLUTIONARY ELECTRIC VEHICLE (1996) (detailing innovations in automotive

Another example of the way emissions trading lessens the motivation to innovate is joint implementation, an international emissions trading program, proposed as a means of meeting climate change goals.[217] The United States has sponsored pilot projects to demonstrate the feasibility of allowing electric utilities, significant sources of greenhouse gases, to claim credits for emissions reductions undertaken abroad as a substitute for being below current levels at home. If the United States imposed extremely strict domestic reduction requirements upon electric utilities instead, the utilities might have to employ innovative technologies, such as fuel cells and solar energy.[218] However, joint implementation may allow utilities to avoid these innovations. Joint implementation may allow them to claim credit for upgrading a very dirty plant abroad with off-the-shelf technology at very modest cost. These credits might substitute for relatively expensive domestic investments in innovative technologies to meet emission limitations at home.

Emissions trading advocates often cite the increased flexibility of emissions trading as a reason to expect trading to generate more innovation than comparable traditional regulation. It is unclear why increased spatial flexibility would increase innovation. Locational constraints may increase the need for innovation by requiring focused pollution control efforts that might become expensive absent innovation. By contrast, easing the spatial constraints of traditional regulation may make it easier to choose to deploy a well understood control method at an emissions source that is cheaper to control, rather than to encourage innovation.[219]

These observations are not meant to suggest that emissions trading is bad. Lowering short-term costs is desirable. But, short-term savings do not necessarily coincide with the encouragement of technological advancement or long-term savings.[220] Significant up-front investment and stringent technical demands often play an important role in stimulating technological advances.

C. Theoretical Lessons From Emissions Trading

Emissions trading, traditionally considered an "economic incentive" program, may provide a less potent economic incentive to reduce pollution

---

technology and role of ZEV mandate in stimulating such innovations).

217. Remarks at the National Geographic Society, *supra* note 8.

218. *See generally At Last, The Fuel Cell*, ECONOMIST, Oct. 25, 1997, at 89; Andrew C. Revkin, *Under Solar Bill, Homeowners Could Cut Electricity Cost to Zero*, N.Y. TIMES, July 25, 1996, at B1.

219. *See* LIROFF, *supra* note 41, at 100 ("Most innovations under bubbles merely are rearrangements of conventional technologies.").

220. *See* Driesen, *supra* note 21, at 567-71, 614-16.

and innovate than a comparable traditional regulation.[221] An understanding of the reasons for this may contribute to a theory that would help guide design of better environmental programs. Analyzing a program's ability to provide economic incentives for pollution reduction requires an evaluation of all potentially relevant monetary flows. In simpler terms, "follow the money."

Emissions trading programs are often characterized as economic incentives because they use positive economic inducements. The lower cost source can increase revenue by reducing pollution below regulatory limits and selling credits to the higher cost source. The money to provide a positive inducement, however, must come from somewhere.

An emissions trading program produces no net incentive to do better than traditional regulation in any way because *emission increases finance emission decreases*. High-cost sources decrease costs by exceeding a regulatory limit. The savings the high-cost source realizes by exceeding a regulatory limit on pollution finance the low-cost source's "additional" pollution reductions.

The emissions trading example teaches that mimicking free market features that do not coincide with desired policy outcomes proves counterproductive. Emissions trading programs, although they create no special net incentives to reduce emissions, encourage trade in emission reduction credits. As mentioned above, one can always motivate trading by allowing pollution sources to avoid real reduction obligations by purchasing paper credits or allowing poorly monitored emissions reduction claims to become creditable. While this may create a robust market, it produces cost savings through inferior performance.[222] A theory focusing on developing robust markets leads to investment of scarce public resources in programs that fail to use economic incentives to motivate at least equivalent environmental achievement at lower cost.

---

221. The analysis above pertains only to the incentives for pollution sources. Other scholars have concluded that emissions trading also offers less incentives for the pollution control industry to innovate than traditional regulation. *See* Derzko, *supra* note 74, at 54 (discussing desirability of environmental patents).

222. Proponents of emissions trading tend to regard robust trading, rather than realization of emission reduction goals, as evidence of a successful emissions trading program. For example, Hahn and Hester oppose requirements in the Clean Air Act that require new pollution sources to acquire offsetting emission reductions at a ratio exceeding 1:1 in areas that have unhealthy air quality. *See* Hahn & Hester, *supra* note 128, at 376-77. They characterize this requirement as a "restriction on emissions trading," when it in fact requires more emissions trading than would occur with less stringent ratios. *Id.* at 376. They rationalize this characterization by pointing out that another loophole, netting, allows sources to escape the offset requirement altogether to the extent that the net emissions of a plant remain constant as a new unit is added. *Id.* at 377. This possibility exists, however, because of the regulations allowing netting, not because of the offset ratios. Similarly, Hahn and Hester identify the costs of verifying that emission reduction credits reflect real emission reductions in a trading program as "transaction costs" and then cite transaction costs as an impediment to trading. *Id.* at 377-78, 404.

The emissions trading example reveals that the term "economic incentive" has very little meaning if defined to include everything that relies on some kind of monetary penalty or benefit. Indeed, to the extent the term "economic incentive" should not apply to traditional regulation, it also should not apply to emissions trading. Both types of programs rely on monetary penalties to induce compliance with government set limits. Neither creates incentives for sources to continuously realize net reductions substantially surpassing the specifically mandated reductions.

The emissions trading example shows that one must carefully analyze programs to see which free market-like advantages they might offer. While emissions trading may have the capacity to use private sector compliance resources efficiently, it may use government resources for program design and enforcement inefficiently.

Emissions trading may provide no more incentive for continual improvement or innovation than traditional regulation. Emissions trading does not stimulate competition to maximize environmental performance. It simply authorizes some trading around of obligations the government has created.

A theory of economic incentives aimed at continuous environmental improvement and innovation needs more specificity than the command and control/economic incentive dichotomy offers. The theory might aim to approximate more carefully the dynamics that stimulate innovation in a free market.

IV. True Economic Incentives

This Part develops a theory of true economic incentives as an alternative to reliance upon repeated governmental decisions concerning the scale of emission reductions. Emissions trading does not provide a meaningful alternative to traditional programs, because it relies upon government decisions about the scale of reductions instead of decentralized responses to continuous incentives to reduce pollution. Hence, it makes sense to distinguish true economic incentive programs, programs that rely solely on positive and negative economic inducements to secure reductions, from mixed programs like emissions trading and traditional regulation, that rely on a combination of negative economic inducements, in the form of monetary penalties for noncompliance, and government commands.[223]

---

223. The free market economy already provides incentives to make pollution reductions that *reduce* a firm's costs without government intervention. The government can help firms realize these reductions by providing information that helps firms seize these opportunities. *See generally* Eric W. Orts, *Reflexive Environmental Law*, 89 NW. U.L. REV. 1227 (1995) (advocating concept of environmental law based on this kind of approach). EPA's successful green lights program provides an example of a government information program that helps firms seize

This Part discusses economic incentive programs that use economic incentives to overcome traditional regulation's weak stimulation of innovation and continuous improvement. It discusses the classic economic incentive of a pollution tax.[224] While this incentive does create an incentive for continuous improvement, unlike emissions trading, it still relies largely on government decision making, which may weaken the incentive's ability to stimulate innovation. This Part also discusses the creation of more dynamic economic incentives that rely upon private initiative, rather than government decision making, to drive innovation.

A. Taxes

The government may tax pollution[225] to create an economic incentive to reduce pollution.[226] In order for a tax to encourage innovation and superior

---

opportunities to reduce costs and pollution simultaneously. *See* Thomas O. McGarity, *The Expanded Debate over the Future of the Regulatory State*, 63 U. CHI. L. REV. 1463, 1512 n.246 (1996) (citing *'Green Lights' Pact Between U.S. Firms, EPA Could Cut Emissions by 235 Million Tons Annually*, 21 Env't Rep. (BNA) 1705, 1705 (1991) (noting that program as example of voluntarism)); Comment, *Reducing Carbon Dioxide Emissions to 1990 Levels by the Year Two Thousand: What Are the Options and Can the United States Achieve This Reduction Without Disrupting the Economy*, 3 DICK. J. ENVTL. L. & POL'Y 79, 83 (1993) (describing cost savings and associated emission reductions). EPA has persuaded numerous companies to install energy efficient lighting, which indirectly reduces power plant emissions, by explaining the long term savings in electricity costs. Joseph F. DiMento & Francesco Bertolini, *Green Management and the Regulatory Process: For Mother Earth, Market Share, and Modern Rule*, 9 TRANSNAT'L LAW. 121, 151 (1996) (stating that program has forged over one thousand "corporate partnerships" to install energy efficient lighting in over 3.3 billion square feet of office space over five years). Although the 'Green Lights' program does not create fresh economic incentives, it does contribute to the effective use of existing economic incentives. *See* Peter S. Menell, *Structuring a Market-Oriented Federal Eco-Information Policy*, 54 MD. L. REV. 1435, 1441 (1995).

224. Most of this discussion will focus on taxes because a proponent of subsidies would have to face the objection that the polluter, not the taxpayer, should pay the cost of pollution control. *See* Stewart, *supra* note 30, at 1322. In effect, the subsidy robs government programs to finance a polluter's efforts to reduce emissions. This approach conflicts with the traditional "polluter pays" principle at the heart of environmental law. *See also* BAUMOL & OATES, *supra* note 95, at 211-34 (discussing relative advantages of taxes and subsidies); *cf.* Kirk W. Junker, *Tax Exemption for Pollution Control Devices in Pennsylvania*, 34 DUQ. L. REV. 503, 512 (1996) (explaining state's use of tax exemption to encourage pollution abatement and control). Subsidies for polluting activities raise important policy questions. *See* Barbara Crossette, *Subsidies Hurt Environment, Critics Say Before Talks*, N.Y. TIMES, June 23, 1997, at A3.

225. The phrase "taxing pollution" describes an enormous number of possible applications. Choosing the activity or pollutants to tax actually becomes a crucial issue in the design of "pollution taxes." *See generally* ANDERSON ET AL., *supra* note 155, at 39-89.

226. *See* WILLIAM F. BAXTER, PEOPLE OR PENGUINS: THE CASE FOR OPTIMAL POLLUTION

environmental performance, it must have several characteristics.[227] First, the tax must apply to activities of firms that already comply with all applicable emission limitations, or that have no applicable limitations. Second, the tax must exceed the marginal costs of making additional reductions.[228] A tax that lacks these features creates insufficient incentives to reduce emissions below current levels.[229]

Neoclassical economic theory supports setting tax rates equal to the "social costs" of the pollution.[230] If a government calculation of the social costs of pollution leads to a tax less than the marginal cost of control, however, the tax will not provide an adequate economic incentive to reduce emissions.[231] Hence, a system designed to use economic incentives to improve environmental quality must establish tax rates exceeding the marginal cost of reductions. The theory that tax rates should equal social costs assumes that environmental quality should not improve when costs of further improvements outweigh the monetary value a government body affixes to avoiding harms the pollution causes, usually mislabeled as "benefits."[232]

This problem of criteria for determining the amount of a tax, however, flags a more general problem with taxes: some governmental body must establish the tax rate. In theory, the government can calibrate taxes to meet

---

73-78 (1974) (describing how tax results in optimum levels of pollution); Breyer, *supra* note 78, at 596-97 (discussing benefits of environmental tax regime); ENVIRONMENTAL LAW CENTER, VERMONT LAW SCHOOL, ENVIRONMENTAL TAXES IN NEW ENGLAND: AN INVENTORY OF ENVIRONMENTAL TAX AND FEE MECHANISMS ENACTED BY THE NEW ENGLAND STATES AND NEW YORK 1 (1996); *cf.* Joe Loper, *Evaluating Existing State and Local Tax Codes from an "Environmental Tax" Perspective: The Case of Energy-Related Taxes*, 12 PACE ENVTL. L. REV. 61, 64-65 (1994) (evaluating why tax on energy is not environmental tax unless it is higher than taxes on other goods).

227. For a detailed discussion of tax design considerations, see Amy C. Christian, *Designing a Carbon Tax: The Introduction of the Carbon-Burned Tax (CBT)*, 10 UCLA J. ENVTL. L. & POL'Y 221 (1992).

228. Marginal costs may vary depending on the amount of pollution reduction desired. Hence, one must design the tax to exceed the marginal cost of making the quantity of reduction desired.

229. *See* Hahn & Stavins, *supra* note 5, at 7 ("A firm will control up to the point where the marginal cost of control just equals the fee.").

230. *See* BAXTER, *supra* note 226, at 73-78 (recommending that tax rates equal pollution damages).

231. In addition, directing an agency to set a fee equal to social costs probably will not succeed as a practical matter. *See* Driesen, *supra* note 21, at 567-601 (discussing difficulty of determining environmental costs); Stewart, *supra* note 30, at 1328.

232. *See* Driesen, *supra* note 21, at 560-63; *cf.* Stewart, *Risks*, *supra* note 5, at 163 (stating that use of economic incentives does not require use of cost-benefit analysis to determine environmental goals).

any given goal precisely, but a scarcity of accurate information about control costs and environmental effects makes doing so in practice difficult.[233]

Because a political process fixes the tax rate, taxes do not provide the escape from government decisions inspired by the free market vision. Decisions about tax rates may cause disputes.[234] If the decision-making process involves predicting the quantity of pollution reduction a given tax will stimulate, the government must gather the same kind of information used for technology-based decision making. The government must predict whether the tax will exceed marginal control costs at facilities in order to determine whether the tax will reduce emissions.[235] The government must anticipate what techniques might be employed to reduce emissions in order to estimate the marginal control costs.[236] If the governments wishes to establish tax rates equal to "social costs," then the government must engage in an even more difficult information gathering and analytical effort.[237] Hence, delegating authority to fix tax rates to EPA or a similar state agency might lead to delay and uncertainty similar to that experienced under traditional regulation.[238]

To the extent legislative bodies set rates, a less constrained process, similar to that governing legislatively set emission limitations, may apply.

---

233. *See* Hahn & Stavins, *supra* note 5, at 8; *see also* Dennis, *supra* note 133, at 1110 (stating that value of environment relative to private goods cannot be established because it is public good).

234. A proponent of pollution taxes can count on opposition from the polluters that may have to pay the new tax. Hahn & Stavins, *supra* note 5, at 8 n.31 (quoting James M. Buchanan & Gordon Tullock, *Polluters' Profits and Political Response: Direct Control Versus Taxes*, 65 AM. ECON. REV. 139, 141-42 (1975)). This makes pollution taxes politically difficult to create, as President Clinton discovered when he proposed taxing British Thermal Units of Energy early in his first term. *See* Keohane et al., *supra* note 42, at 20-21. Polluters lobbied vigorously and successfully to defeat his very modest proposal. *See* Dawn Erlandson, *The BTU Tax Experience: What Happened and Why it Happened*, 12 PACE ENVTL. L. REV. 173, 179-84 (1994). Some groups may benefit from reduced taxes when environmental taxes are introduced, if pollution taxes displace existing taxes. The recipients of tax relief may become supporters of a pollution taxes. *See* Frank Muller & J. Andrew Hoerner, *Greening State Energy Taxes: Carbon Taxes for Revenue and the Environment*, 12 PACE ENVTL. L. REV. 5, 16 (1994) (discussing tax shifting strategy).

235. Baumol and Oates discuss a procedure that involves no estimation of control costs. This approach sets a pollution reduction target and then revises tax levels until the target is achieved. BAUMOL & OATES, *supra* note 95, at 162-63. An agency obeying a legal mandate to use taxes to reach a reduction target, however, would have to have a non-arbitrary basis for concluding the tax might meet the target. Therefore, it would have to estimate control costs.

236. *See* ANDERSON ET AL., *supra* note 155, at 15.

237. *See id.* at 7 ("[A]s a practical matter total social damages are almost impossible to compute."); Driesen, *supra* note 21, at 558, 594-604; Naughton, *supra* note 162, at 201-02.

238. *See generally* BAUMOL & OATES, *supra* note 95, at 160 (describing problems caused by the necessity for information).

Limits on legislative time, however, may constrain use of a legislative approach, and the legislators still might need similar information.

Because calibrating a tax to meet pollution reduction goals may prove difficult in practice, government bodies may have to revise tax rates repeatedly in order to meet public goals.[239] However, frequent revision may create uncertainties; comparable to the uncertainties traditional regulation creates, that weaken a taxation's ability to stimulate innovation. If plant operators cannot count on tax rates remaining constant or becoming stricter in a predictable fashion, they may lobby to weaken the tax system instead of implementing reductions in response to the incentive.[240]

Tax rates may change in response to ideology, perceived fiscal imperatives, and pressure exerted by taxpayers.[241] In contrast, a tax may become entrenched and therefore stable.[242] Stability may prove advantageous in terms of providing incentives for innovation, but may delay appropriate response to changing conditions and knowledge about environmental effects.[243]

A tax, unlike emissions trading, may offer a continuous incentive for environmental improvement. The operator can always reduce the tax by making additional innovations until the taxed pollution reaches the zero level, at least in theory.[244] A significant tax may be necessary to secure management work on developing and implementing innovation.[245] But the tax may provide an adequate incentive to implement further control anytime an innovation shifts the marginal cost of control to a level less than that of the tax.[246]

---

239. *See id.* at 178; Howard Gensler, *The Economics of Pollution Taxes*, 10 J. NAT. RESOURCES & ENVTL. L. 1, 10-12 (1995).

240. *See* MIKAEL SKOU ANDERSEN, GOVERNANCE BY GREEN TAXES: MAKING POLLUTION PREVENTION PAY 27 (1994).

241. *See* Thomas J. Purcell, III, *An Analysis of the Formation of Federal Income Tax Policy*, 18 CREIGHTON L. REV. 653, 653-61 (1985).

242. Kerr, *supra* note 101, at 7 ("Taxes are notoriously difficult to alter . . . .").

243. *See* BAUMOL & OATES, *supra* note 95, at 193-94 (discussing advantages and disadvantages of direct controls).

244. *See* Stewart, *supra* note 85, at 11 (discussing value incentives).

245. *See* Robert W. Hahn, *Economic Prescriptions for Environmental Problems: How the Patient Followed the Doctor's Orders*, 3 J. ECON. PERSP. 95, 107 (1989) (noting that most charges actually in effect are not large enough to affect greatly polluter's behavior).

246. *See* Richard McHugh, *The Potential for Private Cost-Increasing Technological Innovation Under a Tax-Based, Economic Incentive Pollution Control Policy*, 61 LAND ECON. 58, 59 (1985) (discussing nature of cost-increasing technological innovation); *cf.* ANDERSEN, *supra* note 240, at 28-29 (noting that successful Japanese sulfur dioxide taxes led to widespread scrubbing, not cleaner technology and that some firms have not responded to tax incentives as economists predict).

If the government adopts pollution taxes, it must enhance monitoring of emissions and enforcement activities.[247] Otherwise, it may allow taxable pollution to remain untaxed.[248] Hence, an enforcement difficulty remains.

In sum, taxes may provide a greater incentive for continuous innovation than traditional regulations or emissions trading. They do not require governments to set emission levels. Like emissions trading and traditional regulation, they rely upon difficult government decision making as the stimulant for emission reductions.[249]

B. Making Economic Incentive Programs More Dynamic Through Environmental Competition

Pollution taxes may create continuous economic incentives to reduce emissions, but they do not rely on the dynamic that drives a competitive free market – competition among firms.[250] Rather, the incentive comes from the same source as incentives in traditional regulation, government decisions.

We can design more dynamic economic incentives that encourage competition to reduce pollution, much as the free market creates competition to provide better amenities. This requires creation of mechanisms that circumvent the need for repeated government decisions and allow private actions, rather than government decisions, to stimulate reductions in pollution.

The law can apply either positive economic incentives, such as revenue increases or cost decreases, or negative economic incentives, such as revenue decreases or cost increases, to polluters. This reveals a possibility that has received too little attention.[251] Negative economic incentives can fund positive economic incentives.

Governments have designed programs that use negative economic incentives to fund positive economic incentives. New Zealand addressed the

---

247. *Accord* Stewart, *supra* note 85, at 11 (discussing monitoring of emissions).

248. *See* Kerr, *supra* note 101, at 64.

249. *See* BAUMOL & OATES, *supra* note 95, at 178-79 (citing study in which tax programs would increase costs to polluters by factor of six over equally effective control regime).

250. *See* Stewart, *supra* note 85, at 11 (noting emissions incentives). Firms can seize an advantage over competing firms under a pollution tax by innovating to escape or reduce the tax. *Id.* The amount of the tax limits the potential competitive advantage. Spending more than the marginal tax rate to control pollution offers no competitive advantage. Thus, this does not mirror free market dynamics, where the magnitude of advantages to be seized through innovation has few theoretical limits.

251. This possibility has received some attention. *See* Hahn, *supra* note 245, at 104-07 (describing effluent taxes dedicated to funding environmental improvement); Stewart, *supra* note 85, at 12 n.31 (noting that fees from pollution tax could be used to subsidize pollution reduction).

depletion of its fishery by imposing fees on fishing, a negative economic incentive, and using revenue from these fees to pay some fishermen to retire, a positive economic incentive.[252] This may reduce pressure on the fish if fees are high enough.[253] The California legislature has considered a program, Drive +, that imposes a fee upon consumers purchasing an energy inefficient or high pollution vehicle.[254] The proceeds fund a rebate on the purchase of an energy efficient vehicle or low polluting vehicle.[255] Similarly, New Hampshire officials have proposed an "Industry Average Performance System" that redistributes pollution taxes to the polluting industry in ways that favor lower emissions.[256]

One can build on this principle to craft laws that mimic the free market's dynamic competitive character far better than taxes or subsidies. In a competitive free market, a firm that innovates to reduce its cost or increase its revenues not only increases its profits, it often reduces its competitors' profits. Hence, firms in a very competitive market face strong incentives to innovate and improve.[257] Failing to innovate and improve can threaten their survival. Implementing innovations and improvements can help firms prosper in a competitive market.

One could craft an "environmental competition law" requiring polluters to pay any costs that competitors incur in reducing pollution plus a substantial premium, thereby creating a significant incentive to be among the first to reduce pollution.[258] An environmental competition law directly attacks a fundamental problem with existing free market incentives: the polluting firm must absorb any clean-up costs. Because the firm does not experience all of

252. T.H. Tietenberg, *Using Economic Incentives to Maintain our Environment*, CHALLENGE, Mar.-Apr. 1990, at 42, 43.

253. *Id.* at 42-43.

254. *See* Nathanael Greene & Vanessa Ward, *Getting the Sticker Price Right: Incentives for Cleaner, More Efficient Vehicles*, 12 PACE ENVTL. L. REV. 91, 94-97 (1994) (describing DRIVE+).

255. *Id.* at 94-95.

256. *See* JEFFREY C. MACGILLIVRAY & KENNETH COLBURN, A NEW APPROACH TO AIR POLLUTION REGULATION, INDUSTRY-AVERAGE PERFORMANCE SYSTEMS (IAPS) 20 (1997) (on file with author).

257. *See* TORNATZKY & FLEISCHER, *supra* note 30, at 168 (noting that intense competition tends to stimulate spread of innovation).

258. The government might still have to decide which pollutants to target. Like other economic incentive schemes, this one would require developing sufficient data to determine the relative pollution levels of facilities. The law would work best if it included some mechanism, such as a requirement that pollution levels be posted regularly on the internet, that made it possible to see whether a company environmentally has performed better than competitors, without having to obtain information from government files. Implementing legislation would also have to determine a common metric for determining relative reductions.

the costs of pollution itself (most are externalized and felt by the general public) it rarely pays to clean-up.[259] If firms could systematically externalize the costs of clean-up without substantial administrative intervention, just as they externalize the cost of pollution, then even a fairly modest premium might create adequate incentives to control pollution.

An environmental competition statute would create a private environmental law, with a few public decisions setting up the law but with substantial enforcement by low polluting businesses against competitors. The law would create a private right of action that allowed a business that realized environmental improvements through investment in pollution reducing (or low pollution) processes, control devices, products, or services to secure reimbursement for expenses, plus some premium, from more polluting competitors.[260] Hence, the scheme would create economic incentives for some compa-

---

259. *See* ANDERSON ET AL., *supra* note 155, at 3-4 (describing this principle). For an application of this principle to international environmental law, see David M. Driesen, *The Congressional Role In International Environmental Law and Its Implications for Statutory Interpretation*, 19 B.C. ENVTL. AFF. L. REV. 287, 306 (1991).

260. The definition of a competitor from whom an environmentally exceptional company might claim a payment would play an important role in such a statute. EPA traditionally regulates by grouping industrial processes that share standard industrial classification (SIC) codes and then creating subgroupings to try and address plants with similar environmental or physical characteristics. *See* OFFICE OF MANAGEMENT AND BUDGET, EXECUTIVE OFFICE OF THE PRESIDENT, STANDARD INDUSTRIAL CLASSIFICATION MANUAL (1987) (explaining SIC codes); *see also* Daniel J. Fiorino, *Toward a New System of Environmental Regulation: The Case for an Industry Sector Approach*, 26 ENVTL. L. 457, 473-74 (1996). This makes sense for regulation.

However, SIC codes do not fully describe competitors in a system designed to reward environmentally friendly innovation and apply a negative economic incentive to dirtier means of meeting the same consumer goal. Ideally, somebody who develops a system of integrated pest management (IPM), for example, that makes it possible to increase beet yield with little or no pesticides, should be able to collect a payment from pesticide manufacturers that compete with her to maximize beet yield. *See* Elizabeth B. Baldwin, Note, *Reclaiming Our Future: International Efforts to Eliminate the Threat of Persistent Organic Pollutants*, 20 HASTINGS INT'L & COMP. L. REV. 855, 891 (1997) (explaining IPM). Even if the IPM developer operates a research farm and the pesticide manufacturer operates a pesticide plant, the statute should regard them as competitors (or allow courts to develop a common law of competition based on broad principles).

Application of an environmental competition statute to a well-defined group of polluters with very clear definitions tailored to one problem would probably not generate large volumes of disputes (but also would produce less widespread environmental improvement). For example, one could require all electric utilities to pay fees for each ton of nitrogen oxide emissions and divide the proceeds evenly among the five electric utilities with the lowest rate of nitrogen oxide emissions at the end of the year 2000. This would be rather simple to administer. Broader programs would pose more competitor definition issues, but would offer even broader incentives for innovation and environmental improvement.

nies to become enforcers of the law, rather than creating incentives for all companies to resist enforcement.[261]

Such a proposal overcomes the fundamental problem with traditional emissions trading and taxes. Those mechanisms rely on government decisions as the driver for pollution reductions. An environmental competition law makes private initiative, motivated by the prospect of gain and the fear of loss, the driver of environmental improvement, thus replicating free market dynamics.[262] The magnitude of the incentive may depend upon the extent of industry fears about competitors' achievements, rather than only the fixed cost directly imposed by government.[263]

---

261. Such a law should have a dispute resolution mechanism. Competitor enforcement may produce more need for conflict resolution. An environmental competition law may create commercial disputes resembling those that arise under other commercial laws. Disputes may arise about defining what is a competitor, what costs a company incurred, and what reductions in pollution actually occurred. One may want to use some fees from polluters to finance specialized arbitration of these disputes.

An environmental competition statute should not generate complicated environmentally fruitless disputes. The Superfund law makes a variety of parties associated with toxic waste dumps strictly jointly and severally liable for clean-up. Representatives of companies facing Superfund liability often complain that this has led to protracted disputes largely because apportioning liability among potentially responsible parties (PRPs) has proven difficult. *See* Rena I. Steinzor & Linda E. Greer, *In Defense of the Superfund Liability System: Matching the Diagnosis and the Cure*, 27 Envtl. L. Rep. (Envtl. L. Inst.) 10,286, 10,290 n.19 (June 1997) (citing KATHERINE N. PROBST ET AL., FOOTING THE BILL FOR SUPERFUND CLEANUPS, WHO PAYS AND HOW? 26 (1995)) (describing such complaints).

The principle causes of protracted disputes under Superfund would not exist under an environmental competition statute. Allocating responsibility has proven difficult under superfund because good information about the past history of toxic waste dumps (who dumped, who allowed dumping etc.) is hard to come by and the program creates great uncertainty about the means and scope of eventual clean-up. It usually will not be difficult to determine who caused a reduction under an environmental competition statute, since liability will only arise after a pollution reducing activity is completed and documented.

PRPs and EPA often seek to allocate responsibility under Superfund before completion of clean-up. *See, e.g.*, Allen Samelson, *"Whose Liability is This Anyway?" The Allowability of Environmental Clean-Up Costs Potentially Attributable to Other Responsible Parties*, 24 PUB. CONT. L.J. 293, 308-09 (1995). This also hinders settlement because the total value of liability remains open-ended at the time of negotiation. An environmental competition statute should only allow claims based on already completed clean-up.

262. An environmental competition law might seem to create incentives to reduce first and do nothing to motivate reductions from slow movers. The dynamic such a program creates, like the dynamic of a free market, works more broadly than suggested above. Nobody would know, *a priori*, who the first movers would be. Thus, anybody who did not actively seek emission reductions would risk financial loss of uncertain dimension, precisely the risk companies face when they fail to innovate in making improvements or new products in a competitive market.

263. *See* TORNATZKY & FLEISCHER, *supra* note 30, at 86 (describing how firm research and development expenditures tend to respond to competitive pressures).

Moreover, such a scheme provides a continuous incentive to reduce pollution. Any company can profit by making an environmental improvement or lose money by failing to make one.[264] The government does need to establish the premium to be paid first movers. But once it established this, repeated government decisions are not necessary. Securing maximum incentives for innovation may require legal structures that induce competition to produce environmental improvement and lessen the need for repeated government decisions.

C. Theoretical Advantages and Disadvantages of True Economic Incentives

True economic incentive programs offer some advantages over traditional regulation, if they meet the requisites described above. They provide continuous incentives to reduce pollution, often through innovative means. They provide incentives to perform better than regulations require. They will tend to produce better results per dollar of industry expenditure than traditional regulation because companies with the cheapest reduction alternatives will probably reduce pollution the most in response to economic incentives.[265] True economic incentives also provide the possibility of achieving a lot with fewer difficult administrative decisions mandating emission reductions.

But one must move beyond even taxes to develop systems that do not depend, to a significant degree, upon difficult governmental decisions. Indeed, if we want to maximize free market-like innovation, we may wish to find strategies that stimulate competition to reduce pollution.

---

264. Companies might conclude that they would rather collude to avoid such a scheme than compete to earn money from it. All of the companies subject to the law could defeat it by deciding to do nothing. To prevent this collusion, lawmakers might restrict communication between companies regarding their plans under the law. Communication about reduction plans might be considered a combination in restraint of environmental trade and banned on a kind of antitrust theory. Laws drafted to make it possible for many companies to compete for pollution reduction reimbursement should also limit opportunities for collusion. *See* Hospital Corp. of Am. v. Federal Trade Comm., 807 F.2d 1381, 1387 (7th Cir. 1986) ("The fewer competitors there are in a market, the easier it is for them to coordinate their pricing . . . ."); DOUGLAS G. BAIRD ET AL., GAME THEORY AND THE LAW 175 (1994) ("As the number of firms in an industry increases, collusion becomes less likely."); Dean M. Harris, *State Action Immunity From Antitrust Law for Public Hospitals: The Hidden Time Bomb for Health Care Reform*, 44 U. KAN. L. REV. 459, 468 (1996) ("[A] reduction in the number of providers in the market increases the likelihood of collusion among the remaining firms . . . ."); Paul A. Jorissen, *Antitrust Challenges to Nonprofit Hospital Mergers Under Section 7 of the Clayton Act*, 21 LOY. U. CHI. L.J. 1231, 1235 (1990) ("[A] basic premise underlying economic analysis is that collusion becomes more likely when the number of firms competing in the market decreases."). *See generally* EDWIN MANSFIELD, MICROECONOMICS: THEORY AND APPLICATIONS 351 (8th ed. 1994).

265. *See* Kerr, *supra* note 101, at 64-65. Emissions trading shares this virtue.

On the other hand, true economic incentive programs do not involve the same degree of political control of pollution levels as traditional environmental regulation and emissions trading. True economic incentive programs obtain the level of pollution reduction that private actors choose to offer in response to the incentive. While government can exercise some control over the intensity of the incentive – especially in the tax context – one does not know *a priori* exactly what the incentive will produce.[266]

This lack of political control poses significant issues. Environmental statutes generally demand the amount of reductions needed to meet some public goal.[267] It may seem troubling to have pollution control schemes that do not purport to mandate the amount of reductions needed to meet a publicly chosen goal.

On the other hand, current environmental statutes, while sometimes producing substantial progress, often fail to realize their goals.[268] Statutes aimed at meeting public health goals often produce long debates about the right amount of emission reductions needed to protect public health, often in lieu of some of the concrete actions that improve public health.[269] Cost-benefit statutes tend to produce a failure to make decisions instead of cost-benefit balanced regulation.[270] So, a law that induced significant pollution reductions, but did not require calculation of environmental and public health benefits, might offer significant advantages.[271]

---

266. *See generally* Hanley et al., *supra* note 94, at 1424-25 (discussing difficulties in setting rates for effluent charges).

267. For example, many statutes aim to protect human health and the environment. *See, e.g.*, American Textile Mfrs. Inst. v. Donovan, 452 U.S. 490, 540 (1981) (stating that goal of Occupation Safety and Health Act is to advance worker health whenever feasible); Union Electric v. EPA, 427 U.S. 246, 266 (1976) (finding that purpose of Clean Air Act is to attain national air quality standards protecting health and environment); Public Citizen v. Young, 831 F.2d 1108, 1112 (D.C. Cir. 1987) (primary goal of Food Drug and Cosmetic Act is "human safety"). Neoclassical economists tend to favor a goal of "optimal" pollution and assume that this requires that regulation balances costs and benefits. *See* Driesen, *supra* note 21, at 583. Elsewhere, this author has challenged the assumption that cost-benefit balanced regulations produce optimal pollution levels. *Id.* at 581-600.

268. *See* Driesen, *supra* note 21, at 555 (noting progress but also noting failure to realize some goals).

269. *See* Robert R. Kuehn, *The Environmental Justice Implications of Quantitative Risk Assessment*, 1996 U. ILL. L. REV. 103, 145-48 (1996); Latin, *supra* note 59, at 1308-09; Wendy E. Wagner, *The Science Charade in Toxic Risk Regulation*, 95 COLUM. L. REV. 1613, 1677-81 (1995).

270. *See* Driesen, *supra* note 21, at 601-05 (noting this problem).

271. Moreover, legislative debates about pollution tax rates and their analogues may take public health protection and economic goals into account at least roughly. Thus, true economic incentive programs may have goals but may lack the expectation that administrative agencies

This lack of political control may threaten public participation in emission reduction decisions. Because private parties will make reduction decisions in programs based on true economic incentives, the public may lack opportunities to participate. The opportunity to participate in decisions about rate-setting may partially make up for this. In an environmental competition statute, government would decide which pollutants to address *a priori* and assess whether reductions achieved are satisfactory ex-post, when unusually good information might be available, providing opportunities for public participation. Public participation in directly providing reductions remains a problem.

Because true economic incentive programs, unlike emissions trading, may tend to supplement rather than supplant regulatory programs, this public participation problem will not defeat democratic control of emission levels. If the public can participate in decisions mandating reductions in the regulatory context, then the objection that the public lacks such an opportunity in a true economic incentive context seems less serious. One can also build opportunities for public participation into any administrative and adjudicatory processes associated with true economic incentive programs.

V. Conclusion

The conventional dichotomy between command and control regulation and economic incentives may have served a useful purpose in stimulating experiments with emissions trading. Realizing improvement will require a more nuanced approach.

The dichotomy tends to ignore the advantages and exaggerate the disadvantages of traditional regulation. Since even strong critics of traditional regulation recognize that traditional regulation may need to address pollutants that emissions trading cannot regulate effectively (such as pollution that cannot be properly monitored and pollution with important localized effects), we should refrain from undermining traditional regulation with the inaccurate "command and control" label, even as we seek to overcome its limitations. Scholars and governmental officials should employ the neutral term employed in this article, "traditional regulation."

The dichotomy hinders efforts to apply the lessons of almost two decades of experience with emissions trading. Emissions trading will work poorly if

---

will precisely calibrate regulations to meet them. *See* Stewart, *Risks*, *supra* note 5, at 159 (noting that in pollution tax system level of charge would be set to achieve environmental goals, but there is some uncertainty in responses by firms to such charges). Because we know that agencies cannot precisely calibrate regulations anyway, because the information about costs and environmental and health effects is inaccurate and incomplete respectively, this may not be a terrible loss. *See* Driesen, *supra* note 21, at 594, 600-01.

regulators adopt market expansion or displacement of command and control regulation as an objective, rather than full realization of planned reductions at lower cost.

One must ask whether the activities an economic inducement encourages coincide with public policy goals, taking into account potential strategic behavior. Similarly, one must consider the source of economic inducements in proposed schemes and take into account the precise nature of the government's role in proposals. This approach may help create a wise mixture of approaches tailored to specific problems.

If we wish to stimulate increased innovation and continuous improvement, we may need less government investment in emissions trading and more experimentation with true economic incentive programs. Programs designed to emulate the free market's competitive dynamics and properly designed pollution taxes may create economic incentives to continually innovate and improve.