

ELECTRICITY DEREGULATION, ENVIRONMENTAL EXTERNALITIES AND THE LIMITATIONS OF PRICE

I. INTRODUCTION

Electricity is arguably the central infrastructural element of modern society. Powering industrial machine tools, food refrigeration, building illumination, phone communication, computers, television and thousands of other devices and processes, electricity's contribution to 20th century life in developed nations has become indispensable. Society's interest in reliable, low-cost electricity is thus understandable and undeniable.

As economists, policy-makers and sometimes even consumers have realized, however, "cost" is not always fully apparent in the deceptively simple, disarmingly determinate figure of price. Low-priced power may not be the same as low-cost power. By the 1930s, economists began to acknowledge that, for some activities, certain costs were imposed on third parties or the public at-large and, consequently were not adequately reflected in the price of that activity.¹ This phenomenon—costs that elude capture in price—has been analyzed under the term "social costs," or more recently, "externalities."² For industries with substantial environmental impacts, like electricity production, environmental externalities can be significant.³

¹ See, e.g., A.C. PIGOU, *THE ECONOMICS OF WELFARE* 134, 183-88 (4th ed. 1932).

² The British economist A.C. Pigou is credited with some of the earliest comprehensive analysis of external costs, done in the 1930s, and taxes levied on emissions or other externalities have been named "Pigovian" or "Pigouvian" taxes after him. See, e.g., PIGOU, *supra* note 1, at 183-88; see also R. H. Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1 (1960) (analysis of situations where actions of business have harmful effects on others has largely followed analysis of Pigou); David M. Driesen, *The Societal Cost of Environmental Regulation: Beyond the Administrative Cost-benefit Analysis*, 24 *ECOLOGICAL L.Q.* 545, 577 (1997) ("Pigovian" externality tax named after Pigou). In one of the most heavily cited articles in legal scholarship, economist Ronald Coase dealt generally with the problem of externalities under the rubric of "social cost," treading similar terrain as Pigou but coming to different conclusions. See Coase, *supra*, at 29. Coase concluded that government should not always intervene to force industry to compensate those injured by the side-effects of industrial activity, and suggested that Pigou came to different conclusions. See *id.*

³ See, e.g., *infra* notes 178-93. By the mid-1970s pollution and pollution control were being discussed using the terminology of "environmental externalities," a conceptual framework that has persisted. See, e.g., HIROFUMI SHIBATA & J. STEVEN WINNICH, *THE OPTIMAL CONTROL OF ENVIRONMENTAL EXTERNALITIES* 5 (1976); *Re Integrated Resource Management Practices*, D.P.U. 89-239, 116 Pub. Util. Rep. 4th (PUR), 67, 87 (Mass. D.P.U. 1990) [hereinafter D.P.U. 89-239].

Environmental externalities are the environmental costs to society of given products that are not reflected in the transaction price for those products, and that therefore may be imposed on parties not involved in the transaction or on society as a whole.⁴ From the standpoint of individual corporate accounting, shifting private costs onto the public is advantageous and leads to apparent corporate efficiencies because the same revenue now appears to be generated on a smaller level of expenditures.⁵ From a social standpoint, however, allowing private parties to externalize their costs may lead to overall economic inefficiencies for society.⁶ If, for example, a coal plant can generate electricity a million dollars cheaper per year than a gas-fired plant, but causes a million and a half dollars more in health costs due to coal-induced increases in air pollution, from a society-wide standpoint it is economically inefficient to invest in coal-fueled electricity generation.⁷ The value of these environmental externalities is often expressed as the cost of environmental damages that occur in spite of, or outside of, legally required mitigation measures.⁸ For electricity, these exter-

⁴ See generally Pricing and Ratemaking Treatment to Be Afforded New Electric Generating Facilities Which Are Not Qualifying Facilities as Defined in 220 C.M.R. § 8.02, D.P.U. 86-36-G, available in 9 Massachusetts Administrative Law Library, Department of Public Utilities File (Jan. 1998), at 77 (Mass. D.P.U. 1989) [hereinafter D.P.U. 86-36-G] (cost of externalities is cost of environmental damages caused by activity for which compensation to affected parties does not occur; externalities result from production and purchase of product that yields incidental injuries to third party not directly involved in transaction). When regulations compel a market actor to account for the externality within the cost of the transaction, for example by installing pollution control equipment to correct the environmental impact, the social cost is eliminated or reduced and the externality is said to be "internalized." See generally D.P.U. 86-36-G, at 77; ZYGMUNT J.B. PLATER ET AL., ENVIRONMENTAL LAW AND POLICY: NATURE, LAW, AND SOCIETY 40-41 (1992). The previously external social cost is now reflected in the costs and prices of the transaction. See generally D.P.U. 86-36-G, at 77; PLATER ET AL., *supra*.

⁵ See generally AL GORE, EARTH IN THE BALANCE 189 (1992) (easy way to increase measured economic values is at expense of things left outside circle of economic accounting; more pollution dumped, the higher the short-term profits for polluter and his shareholders); PLATER ET AL., *supra* note 4, at 29 (in absence of legal rule forbidding pollution or requiring payment for pollution harms, rational producer will not undertake pollution controls because would increase costs and thereby reduce profits); Garrett Hardin, *The Tragedy of the Commons*, 162 SCIENCE 1243, 1245 (1968) (each rational person finds that his share of the costs of his pollution is less than his costs for pollution control, so as free enterprisers each is locked into fouling the collective nest).

⁶ See, e.g., D.P.U. 89-239, 116 Pub. Util. Rep. 4th (PUR) at 87; D.P.U. 86-36-G, at 79.

⁷ See generally D.P.U. 89-239, 116 Pub. Util. Rep. 4th (PUR) at 90; GORE, *supra* note 5, at 190.

⁸ See, e.g., D.P.U. 89-239, 116 Pub. Util. Rep. 4th (PUR) at 90; D.P.U. 86-36-G, at 77. But see PAUL L. JOSKOW, DEALING WITH ENVIRONMENTAL EXTERNALITIES: LET'S DO IT RIGHT! 4 (1992) (incorrect to assume that the price of externalities can be inferred from costs of residual environmental damages). This Note uses the terms "environmental impacts" and "environmental externalities" more or less interchangeably, because where such environmental impacts have

nalities range from damages due to loss of fisheries on a river dammed for hydropower to the impact of global warming caused, in part, by fossil-fuel fired electricity production.⁹

Costs and prices are inextricably tied to legal and policy decisions that determine, for example, the definition and enforcement of property rights, the extent of public subsidy, the level of taxation, the imposition of uniform standards, the thoroughness of regulation, currency exchange rates and the validity of contracts.¹⁰ Along with these general legal and policy factors, the costs and prices of electricity have been specifically shaped by the legally determined regulatory framework of the industry.¹¹ This framework, which coalesced in the early part of this century and endured for over fifty years, is now being reexamined and fundamentally restructured.¹² Because the legal constructs affecting electricity's price are being publicly renegotiated in the current restructuring debate, this is an opportune moment to address environmental externalities that have previously eluded capture in electricity's price.¹³ In doing so we may find that price is not the only, nor always the best, mechanism for securing all public policy objectives for this indispensable industry.¹⁴

From the inception of federal electric utility regulation, control of the environmental impacts of power production has been a concern of regulation, becoming a significant and clearly articulated objective since the 1970s.¹⁵ The initial governmental approach to regulating these environmental externalities was to eliminate or restrict them

occurred they have obviously not been successfully contained by required pollution control practices, and, unless paid for by some other mechanism, have become externalities. *See generally* Re Biennial Resource Plan Update Following the California Energy Commission's Seventh Electricity Report, Decision No. 91-06-022, 124 Pub. Util. Rep. 4th (PUR) 181,189 (Cal. P.U.C. 1991) [hereinafter Decision No. 91-06-022] (producers that create pollution have generally not had to bear all costs of pollution but have instead "externalized" substantial part of those costs to society). *But see* Joskow, *supra* note 8, at 3, 12, 13 (arguing it is misleading to equate environmental impacts with externalities; asserting externalities are only those environmental impacts that could be eliminated *cost-effectively*).

⁹ *See, e.g., infra* note 215.

¹⁰ *See, e.g.,* ENERGY INFO. ADMIN., FEDERAL ENERGY SUBSIDIES: DIRECT AND INDIRECT INTERVENTIONS IN ENERGY MARKETS 8, 53, 55 (1992); PLATER ET AL., *supra* note 4, at 31.

¹¹ *See, e.g.,* LEONARD S. HYMAN, AMERICA'S ELECTRIC UTILITIES: PAST, PRESENT AND FUTURE 143 (1983).

¹² *See infra* notes 33-174 and accompanying text.

¹³ *See, e.g.,* Congressional testimony to Senate Committee on Energy and Natural Resources by P. Chrisnan Iribe (Vice Chair, Electric Power Supply Association), Mar. 6, 1997, *available in* 1997 WL 8220935 (environmental issues are properly part of restructuring debate).

¹⁴ *See, e.g., infra* notes 335-417 and accompanying text.

¹⁵ *See infra* notes 33-135 and accompanying text.

through prohibitions or regulatory licensing schemes.¹⁶ With increasing regulation of power plant emissions after the passage of the Clean Air Act in 1970, for example, at least some of these externalized costs were eliminated; internalized in a price of electricity reflecting the expense of pollution control equipment needed to eliminate the externality.¹⁷ With growing environmental knowledge, and with a changing public perception of what is valuable, however, regulators and the public began to confront the possibility that significant costs caused by certain types of electricity were still being imposed on society, despite existing pollution control regulation.¹⁸

This Note explores some of the legal devices being implemented or considered for reducing these environmental externalities in the context of the restructuring of the electricity industry. To place the externalities and restructuring debate in context, this Note first examines the co-evolution of two interwoven policy objectives of electric utility regulation: 1) the search for least-cost power, through regulation and later through deregulation of the electricity generation system; and, 2) the continued effort to protect environmental objectives through the organization of power production.¹⁹ This co-evolution is explored in the context of key federal regulatory statutes.²⁰ The reaffirmation of these twin policy goals—least-cost power and environmental protection—is then examined in the electricity restructuring statutes of two states playing a leading role in deregulation, California and Massachusetts.²¹

Second, this Note discusses the environmental externalities involved in electricity generation, using carbon dioxide ("CO₂") emissions linked to global warming as representative of an intractable externality that the market on its own might not address.²² Third, this Note looks at possible regulatory mechanisms that could address electricity generation's CO₂ emissions and other externalities, particularly the mechanisms mandated in provisions of the California and Massa-

¹⁶ See, e.g., Clean Air Amendments of 1970 ("Clean Air Act"), Pub. L. No. 91-604, § 4, 84 Stat. 1676, 1679, 1680 (codified as amended in 42 U.S.C. § 7409(a), 7410(a) (1994)).

¹⁷ See generally *id.* § 4, 42 U.S.C. §§ 7410, 7411 (1994); see also Joskow, *supra* note 8, at 8 (emissions limits applied by environmental regulators have been used widely and internalize externalities).

¹⁸ See, e.g., D.P.U. 86-36-G, at 77.

¹⁹ See *infra* notes 33-176 and accompanying text.

²⁰ See *infra* notes 33-134 and accompanying text.

²¹ See *infra* notes 136-76 and accompanying text.

²² See *infra* notes 178-93 and accompanying text.

chusetts restructuring statutes.²³ Both market-based and non-market-based mechanisms are examined.²⁴

Using the example of CO₂ emissions, this Note then analyzes the advantages and disadvantages of market/price-based approaches to environmental externalities.²⁵ It explores some of the reasons why price and the market may have difficulty addressing long-term, world-wide environmental impacts like global warming.²⁶ Finally, it suggests that pursuit of the twin policy objectives of least-cost power and environmental protection may require the express and unapologetic use of both market and non-market mechanisms in a restructured electricity industry.²⁷

II. BACKGROUND

A. *Twin Goals for the Structure of Electricity Generation: Least-Cost Power and Environmental Protection*

Recent public debate on electricity restructuring has focused on low-cost power as if it were the paramount public objective for the structure of the industry.²⁸ Thus, at first glance, lower-cost power might seem the principal yardstick by which to measure restructuring proposals for the electricity industry.²⁹ In fact, structuring the electricity industry in a way that protects the environment is also a fundamental public policy objective, repeatedly affirmed by federal and state legislation, often as an objective co-equal with, or delimiting, least-cost power.³⁰ Environmental concerns have played a part in federal electricity regulation from its earliest days, and paradoxically have played a pivotal, if inadvertent, role in bringing about the movement towards electricity deregulation.³¹ Thus, the history of electricity regulation and deregulation has been determined by both the search for least-cost

²³ See *infra* notes 194–302 and accompanying text.

²⁴ See *supra* note 23.

²⁵ See *infra* notes 308–520 and accompanying text.

²⁶ See *infra* notes 337–417 and accompanying text.

²⁷ See *infra* notes 480–520 and accompanying text.

²⁸ See generally, Iribe, *supra* note 13.

²⁹ See, e.g., Iribe, *supra* note 13 (ultimate goal of restructuring is lower electricity prices); Massachusetts Department of Telecommunications and Energy, *The Electric Industry is Changing* (visited Apr. 1, 1998) <<http://www.magnet.state.us/dpu/brochure.htm#q1>> (stating that goal of restructuring is to reduce costs to all consumers over time by means of competitive market structure for electricity).

³⁰ See, e.g., Act effective Sept. 24, 1996, ch. 854, § 1(a), 1996 Cal. Legis. Serv. 3678, 3679 (West); Act of Nov. 25, 1997, ch. 164, § 1(b), (l), 1997 Mass. Legis. Serv. 637, 638 (West).

³¹ See, e.g., *infra* notes 33–134 and accompanying text.

power and the co-evolution of environmental policy aims in the structure of electricity generation.³²

1. The Co-Evolution of Least-Cost Power and Environmental Protection as Goals for the Structure of Electricity Generation

Although electric utilities are largely state regulated, the history of the rise and decline of electricity regulation, and the parallel emergence of public environmental objectives for the industry, can be sketched by tracing the evolution of a handful of federal statutes that strongly influenced that regulation: the 1920 Federal Water Power Act,³³ the 1935 Federal Power Act,³⁴ the Public Utility Regulatory Policies Act of 1978³⁵ and the Energy Policy Act of 1992.³⁶

Federal electricity regulation emerged against the backdrop of widespread state regulation of the industry.³⁷ In the early years of electric utility development—from the 1880s through the turn of the century—towns and cities granted electric utility franchises that were sometimes non-exclusive or even deliberately duplicative to create utility competition.³⁸ Disastrous competition in some cases led to company

³² See, e.g., *infra* notes 77, 89, 123, 143, 160–61 and accompanying text; see also Mass. *Enviro Official Warns Midwest Regulators to Address Ozone Transport, Energy Report*, Dec. 2, 1996, available in 1996 WL 11831807 (hereinafter *Mass. Enviro Official Warns Midwest Regulators*) (quoting Mass. DEP Commissioner Struhs' observation that EPA, FERC and the Chair of the Council on Environmental Quality all made solemn promises that deregulation will not interfere with achievement of minimum clean air standards for all Americans).

³³ Federal Water Power Act, ch. 285, 41 Stat. 1063 (1920) (codified as amended in scattered sections of 16 U.S.C. (1994)).

³⁴ Federal Power Act, ch. 687, title II, 49 Stat. 838 (1935) (codified as amended in scattered sections of 16 U.S.C.).

³⁵ Public Utility Regulatory Policies Act of 1978, Pub. L. No. 95-617, 92 Stat. 3117 (codified in scattered sections of 16 U.S.C.).

³⁶ Energy Policy Act of 1992, Pub. L. 102-486, 106 Stat. 2776 (codified in scattered sections of 15, 16 and 42 U.S.C.); see also Union of Concerned Scientists, *Risks and Opportunities: Renewable Energy in a Changing Electricity Industry* (visited Feb. 10, 1998) <<http://www.ucsusa.org/energy/restructure.intro.html>> (political factors including enactment of PURPA and EPAAct encouraged competition in electric sector).

A law intended to have primarily regional consequence, the Pacific Northwest Electric Power Planning and Conservation Act (1980), also played a role in explicitly merging least-cost power and environmental objectives for electricity regulation. See Pacific Northwest Electric Power Planning and Conservation Act, Pub. L. No. 96-501, 94 Stat. 2697 (1980) (codified at 16 U.S.C. § 839). Like numerous other federal acts regulating power discussed *supra*, this Act articulated strong environmental purposes, alongside its reliability, efficiency and cost-reduction goals. See *id.* § 2. It specifically identified the development of renewable resources in the region, conservation of electricity and the protection of fish and wildlife resources. See *id.*

³⁷ See *infra* notes 38–51 and accompanying text.

³⁸ See JOHN E. KWOKA, JR., *POWER STRUCTURE: OWNERSHIP, INTEGRATION, AND COMPETITION IN THE U.S. ELECTRICITY INDUSTRY* 3–4 (1996).

failures and consolidation.³⁹ The consolidation of monopolies, free to charge monopoly prices, in turn spurred widespread calls for public takeover of the industry.⁴⁰ The form of public ownership widely proposed and widely implemented was municipalization.⁴¹

In 1898, Samuel Insull, a dominant electricity industry leader, proposed to the National Electric Light Association ("NELA") that electric utilities should be regulated by state agencies that would fix rates and set service standards.⁴² Insull saw such an approach as a means to avoid calls for municipal takeovers of the industry on the one hand, and as a method of reducing disadvantageous intra-industry competition on the other.⁴³ In 1907 NELA called for such regulation.⁴⁴ By the end of that year, Wisconsin and a few other states had established utility regulatory agencies or added utility regulation to the duties of other existing state commissions.⁴⁵ By 1916 thirty-three states had such agencies, and virtually all had them by the 1920s.⁴⁶ Significantly, state regulation was then seen as a means of keeping electricity prices down.⁴⁷ As the Supreme Court of Wisconsin explained, the adoption of state regulation of electricity had as its goal the best possible service "at the lowest price practicable."⁴⁸ The state's high court observed that the granting of monopoly franchises in given geographical areas was necessary to eliminate excessive investments and expenses caused by two or more utilities co-existing where consumers only required one.⁴⁹ According to the court, the legislature

³⁹ See generally *Calumet Service Co. v. City of Chilton*, 135 N.W. 131, 143 (Wisc. 1912) (explaining one goal of Wisconsin's electricity regulatory statute as elimination of competing utilities with their excessive investments and consequent waste, displacement of existing utilities and increased electricity costs).

⁴⁰ See generally KWOKA, *supra* note 38, at 4 (municipally owned utilities portrayed private systems as unconstrained monopolists and portrayed themselves as defenders of electricity at fair prices).

⁴¹ See HYMAN, *supra* note 11, at 71.

⁴² See *id.* at 67, 71; see also Richard F. Hirsh, *Consensus, Confrontation and Control in the American Electric Utility System*, in *THE VIRTUAL UTILITY: ACCOUNTING, TECHNOLOGY & COMPETITIVE ASPECTS OF THE EMERGING INDUSTRY* 19, 23 (Shimon Awerbuch & Alistair Preston eds., 1997) (noting Insull's advocacy of public regulatory bodies establishing allowable electricity rates based on utility costs plus a reasonable profit).

⁴³ See Hirsh, *supra* note 42, at 23.

⁴⁴ See HYMAN, *supra* note 11, at 71.

⁴⁵ See, e.g., *Wisconsin Traction, Light, Heat & Power Co. v. Green Bay & Mississippi Canal Co.*, 205 N.W. 551, 554 (Wisc. 1925) (discussing 1907 Wisconsin utility regulation statute's enactment and scope); HYMAN, *supra* note 11, at 71.

⁴⁶ See HYMAN, *supra* note 11, at 71; KWOKA, *supra* note 38, at 4.

⁴⁷ See, e.g., *Calumet Service Co.*, 135 N.W. at 143.

⁴⁸ See *City of La Crosse v. La Crosse Gas & Elec. Co.*, 130 N.W. 530, 536 (Wisc. 1911); see also *Calumet Service Co.*, 135 N.W. at 143.

⁴⁹ See *Calumet Service Co.*, 135 N.W. at 143.

understood that allowing competing utilities to threaten existing investments and displace existing utilities would lead to waste, injustice to previous investors and ultimately increases in electricity costs.⁵⁰

The result of this state regulatory trend in the first quarter of the century was an electricity industry principally structured as a series of regional monopolies, whose rates and investment decisions were regulated by state public utility commissions.⁵¹ The typical regulated monopoly was vertical integration in a single electric utility of all three components of the business: 1) electricity generation facilities, 2) transmission lines and equipment and 3) distribution equipment.⁵² This arrangement was often justified by high costs of market entry and economies of scale that were thought to make electric utilities "natural monopolies."⁵³ The economies of scale achievable by these monopolies could be reaped for society by blocking exploitative monopoly pricing through government regulation.⁵⁴ Theoretically, government regulation would replicate market forces that ordinarily would keep price near the lowest cost of production through the pressure of competition.⁵⁵

Because of jurisdictional limits to state regulation, however, states had difficulty controlling the sprawling interstate electric utility holding companies that emerged in the 1920s and 30s.⁵⁶ By 1932, sixteen utility holding companies controlled an estimated seventy-five percent of all electricity produced in the United States.⁵⁷ The concentration of control permitted by this holding company structure led to excessive rates for consumers and the obstruction of state utility regulation.⁵⁸ In an attempt to regain control over the industry and reestablish reasonable rates for electricity, federal regulatory legislation was enacted.⁵⁹

⁵⁰ See *id.*

⁵¹ See, e.g., *id.* at 140; Hirsh, *supra* note 42, at 19.

⁵² See, e.g., Promoting Wholesale Competition Through Open Access Non-discriminatory Transmission Services by Public Utilities; Recovery of Stranded Costs by Public Utilities and Transmitting Utilities, 61 Fed. Reg. 21,540, 21,543 (1996) [hereinafter Order No. 888].

⁵³ See Re Pricing and Rate-making Treatment for New Electric Generating Facilities Which are Not Qualifying Facilities, D.P.U. 86-36-A, 89 Pub. Util. Rep. 4th (PUR) 190, 193 (Mass. D.P.U. 1987) [hereinafter D.P.U. 86-36-A]. But see HYMAN, *supra* note 11, at 72, 73 (regulation may not simply have been inevitable result of a natural monopoly; utilities may have sought regulated monopoly status to maintain profitability).

⁵⁴ See generally D.P.U. 86-36-A, 89 Pub. Util. Rep. 4th (PUR) at 193.

⁵⁵ See *id.* at 195.

⁵⁶ See DIVISION OF INVESTMENT MANAGEMENT, UNITED STATES SECURITIES AND EXCHANGE COMMISSION, THE REGULATION OF PUBLIC-UTILITY HOLDING COMPANIES 2, 2 ii.4 (1995).

⁵⁷ See KWOKA, *supra* note 38, at 5-6 (citing Asghar Zardhoohi, *Competition in the Production of Electricity*, in ELECTRIC POWER: DEREGULATION AND THE PUBLIC INTEREST 66 (Moorhouse, ed. 1986)).

⁵⁸ See DIVISION OF INVESTMENT MANAGEMENT, *supra* note 56, at 1.

⁵⁹ See *id.* at 1, 4.

One of the earliest federal statutes regulating electricity production was the Federal Water Power Act ("FWPA"), enacted in 1920.⁶⁰ The FWPA created the Federal Power Commission ("FPC"—later renamed the Federal Energy Regulatory Commission, "FERC") and gave it authority over hydroelectric projects in the navigable waters of the United States.⁶¹ The FWPA authorized the FPC to issue a license to citizens or American corporations wanting to create or operate hydropower facilities on navigable waters.⁶² The FWPA also allowed the Commission to regulate the power rates and services of the licensee where the states did not do so, and prohibited unreasonable, discriminatory and unjust rates or services for power sold interstate.⁶³

Congress passed the FWPA, in part, due to conservationists' efforts on behalf of comprehensive development of the water resources of the nation.⁶⁴ Conservationist W. J. McGee, the Secretary of the Inland Waterways Commission appointed by President Theodore Roosevelt in 1908, called for comprehensive river planning which would take account of "the purification of the waters," the control of floods, commercial river navigation and other benefits, as well as the development of hydropower.⁶⁵ The FWPA, as eventually enacted, expressed this comprehensive interest in both development and conservation.⁶⁶ The statute allowed the FPC to give priority to hydropower applicants whose plans were "best adapted to develop, *conserve* and utilize in the public interest the . . . water resources of the region . . ."⁶⁷ Though the FWPA was utilitarian in its focus, addressing navigation, water supply and hydropower in various provisions, it did address resource conservation in two provisions concerning the operation, maintenance or regulation of fishways connected with dams or river diversions.⁶⁸ In its concern about public losses due to private obstruction of navigation by hydropower dams, the FWPA implicitly recognized the need to regulate where private parties might externalize costs onto the public.

⁶⁰ See *supra* notes 33–36 and accompanying text.

⁶¹ See Gifford Pinchot, *The Long Struggle for Effective Federal Water Power Legislation*, 14 GEO. WASH. L. REV. 9, 19, 20 (1945) (recounting history of statute's evolution).

⁶² See Federal Water Power Act § 4(d).

⁶³ See *id.* §§ 19, 20.

⁶⁴ See *First Iowa Hydro-Electric Coop. v. Federal Power Comm'n*, 328 U.S. 152, 180 (1946); see also Pinchot, *supra* note 61, at 15–19 (recounting conservationists' battles leading to Federal Water Power Act).

⁶⁵ See Pinchot, *supra* note 61, at 16 (quoting principles formulated by McGee in report of the Inland Waterways Commission). President Theodore Roosevelt similarly supported comprehensive planning of the nation's waterways that would go beyond the single-purpose thinking of prior river projects. See *id.* at 15.

⁶⁶ Federal Water Power Act § 7.

⁶⁷ *Id.* (emphasis added).

⁶⁸ See, e.g., *id.* §§ 7, 10(a), 18, 25.

Also important in the emergence of federal regulation of hydropower were the arguments of conservationists like Forest Service head Gifford Pinchot against the give-away of hydropower sites on federal lands.⁶⁹ Pinchot proposed charging for such grants and limiting them to a set number of years—proposals enacted in the FWPA.⁷⁰ Thus, alongside concern over unreasonable electricity rates, concerns about the environment and about the free private use of public resources were implicit in one of the earliest federal statutes concerning power production.⁷¹

The Federal Water Power Act, however, proved insufficient to control the excesses of the electric utility holding companies.⁷² Voluminous reports on the industry by the Federal Trade Commission and the House Committee on Interstate and Foreign Commerce revealed ongoing abuses.⁷³ As a result of these reports, Congress passed the Public Utility Holding Company Act of 1935 ("PUHCA"), regulating certain financial and securities practices of these electric companies, in tandem with the Federal Power Act ("FPA").⁷⁴ The FPA subsumed the earlier FWPA.⁷⁵ The FPA granted the FPC jurisdiction over all interstate electricity transmission facilities of electricity, unless they were expressly excepted by statute.⁷⁶ The FPA also authorized the FPC to create regional districts for the voluntary interconnection and coordination of electric generation and transmission facilities for the purpose of "assuring an abundant supply of electric energy . . . with the greatest possible economy and with regard to the proper utilization and conservation of natural resources"⁷⁷ Thus, early on, Congress spoke of least-cost and environmental conservation goals for electricity regulation in the same breath.⁷⁸

⁶⁹ See Pinchot, *supra* note 61, at 12.

⁷⁰ See Federal Water Power Act §§ 6, 10(c); Pinchot, *supra* note 61, at 12, 13, 19.

⁷¹ See *supra* notes 64–70 and accompanying text. The free use of the nation's waterways to generate electricity is not that dissimilar from the free use of the nation's air in the generation of electricity. In both cases an essential component in the electricity generation process—a riparian resource for hydropower input in the former case and an atmospheric resource for combustion emission output in the latter—is being obtained gratis from public resources.

⁷² See *infra* notes 73–75 and accompanying text.

⁷³ See Public Utility Holding Company Act of 1935, ch. 687, title I, 49 Stat. 803 (codified at 15 U.S.C. § 79); DIVISION OF INVESTMENT MANAGEMENT, *supra* note 56, at vii.

⁷⁴ Public Utility Holding Company Act § 1; Federal Power Act § 201.

⁷⁵ See *First Iowa Hydro-Electric Coop.*, 328 U.S. at 172 n.17 (recounting statutory evolution of FPA and Federal Water Power Act).

⁷⁶ See Federal Power Act § 213.

⁷⁷ *Id.*

⁷⁸ See *id.*

With the price restraints established by a settled state/federal regulatory structure, ever-increasing economies of scale in power production and relatively stable costs for fuel and other inputs, the price of electricity continued to fall in the initial decades of government regulation and into the post-World War II period.⁷⁹ But the dramatic upturn in the cost of oil after the 1973 oil embargo and the substantial investment by the electric industry in costly nuclear plants and other large, capital-intensive generating facilities in the 1960s and 70s began a noticeable escalation of electric rates.⁸⁰ The inflation-adjusted average residential electric rate rose twenty-five percent from 1970 to 1985; the average adjusted industrial rate rose eighty-six percent.⁸¹ The largest generating facilities were no longer experiencing economies of scale.⁸² As FERC would later observe, "[b]igger was no longer better."⁸³ Consequently, some industrial customers decided to opt out of the utility system and build their own generation facilities.⁸⁴

By the late 1970s, the Senate Committee on Energy and Natural Resources expressed concern over higher electric bills, consumption of scarce fuels, the decline of domestic reserves of those fuels, increasing reliance on imported fuels and the costly, "and perhaps unnecessary," expansion of electric generating capacity.⁸⁵ Against the backdrop of the energy crisis of the 1970s and legislative concerns over energy conservation, efficient resource use and equitable electric rates, Congress passed the Public Utility Regulatory Policies Act of 1978 ("PURPA").⁸⁶ Congress enacted PURPA, in part, to encourage the

⁷⁹ See generally Order No. 888, 61 Fed. Reg. at 21,543.

⁸⁰ See *id.*; see also S. REP. NO. 95-442, at 9 (1978), reprinted in 1978 U.S.C.C.A.N. 7903, 7905-06. Fuel oil rose 400% in cost from 1973-1978; natural gas costs rose 175% in the same period. See S. REP. NO. 95-442, at 9 (1978), reprinted in 1978 U.S.C.C.A.N. 7906. In terms of capital intensive facilities, the costs of nuclear plants particularly exceeded estimates, sometimes by as much as 1000%. See Bernard S. Black, & Richard J. Pierce, Jr., *The Choice Between Markets and Central Planning in Regulating the U.S. Electricity Industry*, 93 COLUM. L. REV. 1339, 1346 (1993). Nuclear power in particular, once promised as a source of electricity "too cheap to meter," had proven too expensive to afford. See, e.g., HYMAN, *supra* note 11, at 115; Hirsh, *supra* note 42, at 29.

⁸¹ See Order No. 888, 61 Fed. Reg. at 21,544. But see Congressional testimony by Commissioner Susan F. Clark (of Florida Public Service Commission), Apr. 14, 1997, available in 1997 WL 11233109 (asserting U.S. as a whole has among the lowest electric rates in world; of industrialized countries only Canada and Sweden, both with large hydropower resources, have lower rates).

⁸² See S. REP. NO. 95-442, at 9 (1978), reprinted in 1978 U.S.C.C.A.N. at 7906; Hirsh, *supra* note 42, at 29.

⁸³ Order No. 888, 61 Fed. Reg. at 21,544.

⁸⁴ See *id.*

⁸⁵ See S. REP. NO. 95-442, at 9 (1978), reprinted in 1978 U.S.C.C.A.N. at 7906.

⁸⁶ Pub. L. No. 95-617, 92 Stat. 3117 (1978) (codified in scattered sections of 16 U.S.C.); see also S. REP. NO. 95-442, at 10 (1978), reprinted in 1978 U.S.C.C.A.N. at 7906-07.

development of alternative electricity sources that would reduce the demand for fossil fuels, such as small hydroelectric projects, cogeneration and other small power producers.⁸⁷ By encouraging the formation of numerous independent power producers, PURPA helped begin the erosion of the existing structure of utility monopolies operating as sole electricity generators for franchised service territories.⁸⁸ After the enactment of PURPA, the twin, often interwoven, trajectories of deregulation and environmental conservation began to emerge more distinctly.

PURPA announced as its purposes: 1) the conservation of energy; 2) the optimization of efficiency of use of facilities and resources by electric utilities; and 3) equitable rates to electric consumers.⁸⁹ To accomplish these ends the statute established a number of federal standards for electric utilities.⁹⁰ Though not mandatory for the states, the standards were to be formally considered and adopted or rejected by each state regulatory commission.⁹¹ The standards included: 1) the requirement that rates charged for electricity reflect the costs of providing electric service to each class of consumer; 2) a prohibition on quantity discounts for the energy component of electricity unless costs could be shown to decrease with such increased consumption; and 3) the requirement that each utility offer to its customers load management techniques determined to provide useful energy or capacity management advantages and to be practicable, cost-effective and reliable.⁹² Over time the approach outlined in these standards would evolve into "integrated resource planning" by the industry, where both generating facilities and load management/conservation techniques would be weighed in developing least-cost electricity services.⁹³

In addition to describing these standards, the statute also gave FERC authority to require any electric utility to provide transmission

⁸⁷ See Public Utility Regulatory Policies Act § 210; *Massachusetts Elec. Co. v. Department of Pub. Utils.*, 643 N.E.2d 1029, 1031 (Mass. 1994); see also S. REP. NO. 95-442, at 10 (1978), *reprinted in* 1978 U.S.C.C.A.N. at 7906-07.

⁸⁸ See Mark E. Haedicke, *Competitive-based Contracts for the New Power Business*, 17 ENERGY L.J. 103, 103, 104 (1996); Hirsh, *supra* note 42, at 30; Iribe, *supra* note 13.

⁸⁹ See Public Utility Regulatory Policies Act § 101.

⁹⁰ See *id.* § 111.

⁹¹ See *id.* §§ 111(a)-(c), 117.

⁹² See *id.* § 111(d). Quantity discounts encourage greater electricity use and may encourage waste, and can therefore have a negative impact on utility capacity management, national economic efficiency and the environment.

⁹³ See generally D.P.U. 89-239, 116 Pub. Util. Rep. 4th (PUR) at 72; see also 16 U.S.C. § 2621(d)(7) (1994) (adding integrated resource planning to federal standards). Environmental externality programs would later take place in the context of integrated resource planning. See, e.g., D.P.U. 89-239, 116 Pub. Util. Rep. 4th (PUR) at 74.

services to any other electric utility, provided certain conditions were met.⁹⁴ Conceptually at least, the statute raised the possibility of a national electric transmission system more open to utilities' commercial power transmission, or "wheeling," from point to point.⁹⁵ PURPA and associated federal regulations also defined non-utility generating facilities that met certain size, ownership and fuel criteria as "qualifying facilities" ("QFs"), and gave them the right to request connection to utility transmission facilities.⁹⁶ Environmental conservation and fuel diversity objectives were manifest in the suggestion that QFs use renewable energy as their primary energy sources.⁹⁷ Under the statute, QFs were also given the right to require utilities to purchase the electricity they generate at a non-discriminatory price that did not exceed the utility's incremental, or avoided, cost.⁹⁸

Although benefiting from an implicit state subsidy in the form of guaranteed utility power purchases at a price not exceeding the relatively high avoided cost rate,⁹⁹ QFs are entrepreneurial and stand at least partially outside the regulated monopoly framework.¹⁰⁰ Such independent power production soon became a significant source of the nation's electricity, accounting for about half of the new generating capacity created between 1990 and 1992.¹⁰¹ In California, QFs rose from only a negligible amount of electricity-generating capacity in the early 1980s to representing twelve percent of dependable capacity by 1991.¹⁰² The emergence of QFs, prompted by PURPA, thus began to create a pool of independent power generators—another building block for the foundation of a deregulated electric industry; and simultaneously pushed forward the development of renewable energy sources with fewer environmental externalities.¹⁰³

⁹⁴ See Public Utility Regulatory Policies Act § 203.

⁹⁵ See *id.*

⁹⁶ See *id.* §§ 201–202; see also Haedicke, *supra* note 88, at 104.

⁹⁷ See Public Utility Regulatory Policies Act § 201. The statute allowed FERC to establish rules governing the qualifying criteria, but the statute referred to an eighty megawatt power production facility capacity limit, the use of renewable resources, biomass, or waste as a primary energy source, and ownership terms that generally excluded electric utilities. See *id.*

⁹⁸ See *id.* § 210, 16 U.S.C. § 824a-3(a)–(b). The incremental cost, also known as the avoided cost, is the cost a utility would incur if the utility generated that increment of additional power itself or purchased it elsewhere. See, e.g., 16 U.S.C. § 824a-3(d); Decision No. 91-06-022, 124 Pub. Util. Rep. 4th (PUR) at 184; see also Haedicke, *supra* note 88, at 104 & n.12.

⁹⁹ See Decision No. 91-06-022, 124 Pub. Util. Rep. 4th (PUR) at 186 (utilities are now legally required to connect with QFs and buy their output under terms regulated by public utility commission).

¹⁰⁰ See generally Haedicke, *supra* note 88, at 105.

¹⁰¹ See H.R. REP. NO. 102-474, pt. 1, at 138 (1992), reprinted in 1992 U.S.C.C.A.N. 1954, 1961.

¹⁰² See Decision No. 91-06-022, 124 Pub. Util. Rep. 4th (PUR) at 186.

¹⁰³ See *supra* note 96–97 and accompanying text. See generally H.R. REP. NO. 102-474, pt. 1,

Along with the statutory changes, technological innovations helped lay the groundwork for the deregulation of the electric industry.¹⁰⁴ While very large facilities began to lose economies of scale, new, more efficient, smaller-scale technologies emerged, including natural-gas-fired combined-cycle generating plants.¹⁰⁵ Bolstering the potential of the new gas-fired technologies, a major upward revision in estimates of domestic and world-wide natural gas reserves occurred at the close of the 1970s and in the early 1980s.¹⁰⁶ The new gas-fired generation stations had the advantage of shorter construction times and generally lower impact on the environment.¹⁰⁷ Compared to coal, natural gas produces negligible amounts of sulfur dioxide and roughly two-thirds less CO₂ when burned.¹⁰⁸ Most significantly, the new gas-fired generation technologies could produce electricity at lower cost.¹⁰⁹ From a fuel

at 138 (1992), *reprinted in* 1992 U.S.C.C.A.N. at 1961 (PURPA facilitated emergence of independent power producers and introduced utilities to purchased power); Haedicke, *supra* note 88, at 104, 105.

¹⁰⁴ See, e.g., *infra* note 105 and accompanying text.

¹⁰⁵ See Order No. 888, 61 Fed. Reg. at 21,544. Combined-cycle generation plants use a combination of gas-fired turbines and steam turbines to generate electricity. See, e.g., W.M. Burnett & S.D. Ban, *Changing Prospects for Natural Gas in the United States*, 244 SCIENCE 305, 307 (1989); M.R. Erbes et al., *Off-design Performance of Power Plants: an Integrated Gasification Combined-cycle Example*, 237 SCIENCE 379, 381 (1987). The exhaust of the gas turbine is used to heat steam to power a steam turbine to produce additional electricity. See Erbes, *supra*, at 381. The addition of the steam cycle puts energy to work that once escaped up the chimney, thereby increasing electricity output per unit of fuel burned. See generally *id.* Combined-cycle plants can be fired by natural gas, or they can be fired by coal which is first gasified and cleaned of pollutants, in so-called "integrated coal gasification combined-cycle" ("IGCC") plants. See *id.*

¹⁰⁶ See Burnett & Ban, *supra* note 105, at 305, 306.

¹⁰⁷ See Order No. 888, 61 Fed. Reg. at 21,544. The greater efficiency of combined-cycle technology over conventional coal generation, coupled with the cleaner-burning quality of natural gas, means that combined-cycle systems produce less than half the CO₂ per kilowatt-hour produced by conventional coal-fired stations. See Burnett & Ban, *supra* note 105, at 307. Natural gas-fired combined-cycle plants also emit negligible quantities of volatile organic compounds or particulates, and produce 40% less nitrogen oxides (NO_x) than coal plants. See *id.* As clean as gas-fired plants may be in some respects, they still generate large quantities of CO₂—the main culprit in global warming. See, e.g., Tim Woolf & Bruce Biewald, *Efficiency, Renewables and Gas: Restructuring as if Climate Mattered*; ELECTRICITY J., Jan.-Feb. 1998, at 64.

¹⁰⁸ See, e.g., Burnett & Ban, *supra* note 105, at 306; Woolf & Biewald, *supra* note 107, at 66.

¹⁰⁹ See Order No. 888, 61 Fed. Reg. at 21,544; see also Peter Navarro, *A Guidebook and Research Agenda for Restructuring the Electricity Industry*, 16 ENERGY L.J. 347, 352-53 (1995) (at current natural gas prices medium-sized gas-fired plants often produce power cheaper than large coal-fired or nuclear plants). Combined-cycle facilities can generate electricity as cheaply as 3-5 cents/kilowatt-hour (kWh), compared with 4-7 cents/kWh for large coal-fired stations and 9-15 cents/kWh for nuclear plants. See Order No. 888, 61 Fed. Reg. at 21,544. It is important to note, however, that the current relatively low price of natural gas is an important part of the present low cost of gas-fired electricity generation. See, e.g., MASSACHUSETTS DIV. OF ENERGY RESOURCES, *THE POTENTIAL IMPACT OF ENVIRONMENTAL EXTERNALITIES ON NEW RESOURCE SELECTION AND ELECTRIC RATES* 8 (1991); Michael F. Donlan, *Brief Whitepaper on Open Access and Deregulation*

with dismal and diminishing prospects in the 1970s, natural gas became by the close of the 1980s "the fuel of the future."¹¹⁰

Thus, by the late 1980s, relatively abundant gas reserves, combined with independent power producers using cheaper, less-polluting, gas-fired electricity generation, gave policy-makers a stronger technological foundation for simultaneously advancing the twin goals of least-cost power and environmental protection.¹¹¹ Some policy-makers believed, however, that existing state and federal regulatory schemes were obstacles to full realization of the opportunities presented by these technological and organizational changes in the industry.¹¹² Consequently, certain state regulators suggested that electricity deregulation might now be appropriate.¹¹³ They argued that old justifications for regulated monopolies—such as very high capital start-up costs for generation companies—might no longer apply.¹¹⁴

Members of Congress were becoming similarly concerned that federal statutes, particularly PUHCA, were constraining the development of independent power.¹¹⁵ The House Committee on Energy and

of Retail Sales of Electricity and Gas, in RETAIL UTILITY DEREGULATION 1, 3 (Massachusetts Continuing Legal Education, Inc. 1996).

¹¹⁰ See Burnett & Ban, *supra* note 105, at 305; see also Hon. Richard D. Cudahy, *PURPA: The Intersection of Competition and Regulatory Policy*, 16 ENERGY L.J. 419, 426 (1995) (in late 1970s natural gas was believed to be in permanent shortage and use in electricity generation was drastically limited). Even with these favorable prognostications, the use of natural gas for electricity generation continued to decline into the early 1990s. See *Statistical Comm. of the Edison Elec. Inst., Statistical Yearbook of the Electric Utility Industry—1993* 29 tbl. 22 (1994). In the twenty-year period natural gas use in electricity generation declined from fueling 18.3% of the electricity generated in the United States in 1973 to fueling only 9.0% of electricity produced in 1993. See *id.* By 1996, however, natural gas had become the energy source for about 13.5% of electricity generated in the U.S. and was predicted to account for a little over 23% of generation in the year 2005. See INTERNATIONAL ENERGY AGENCY, *ELECTRICITY INFORMATION* 1996 671 (1997).

¹¹¹ See *supra* notes 96–110 and accompanying text. Technological determinists could convincingly argue that the current deregulatory movement is the product of the collapse of one fuel, nuclear, and the ascent of another, gas. See generally *supra* notes 80, 96–110 and accompanying text.

¹¹² See *infra* notes 113–14 and accompanying text.

¹¹³ See, e.g., D.P.U. 86–36-A, 89 Pub. Util. Rep. 4th (PUR) at 196 (utility regulation need not be a permanent form of business control; where competition emerges in industries that formerly had natural monopoly characteristics it may be appropriate or essential that regulatory constraints be replaced by competitive market forces). The old argument that a single, integrated monopoly generating, transmitting and distributing electricity in a given service area was seriously undermined once utilities began buying substantial amounts of electricity from independent power producers (IPPs). See generally Larry Parker, Congressional Research Service, *Electricity: The Road Toward Restructuring*, (visited Oct. 14, 1997) <<http://www.cnie.org/nle/eng-7.html>>. These purchases demonstrated that contractual arrangements, rather than single-company operation of both electricity production and distribution, could reliably meet customer demand. See *id.*

¹¹⁴ See generally *supra* note 113.

¹¹⁵ See H.R. REP. NO. 102–474, pt. 1, at 139 (1992), reprinted in 1992 U.S.C.C.A.N. at 1662.

Commerce noted the success of independent power production that resulted from PURPA.¹¹⁶ Independent electricity generators could not build projects in more than one state, however, without coming under the exacting SEC regulation specified by PUHCA.¹¹⁷ It was also unclear whether, under existing federal law, FERC had authority to order utilities to transmit, or "wheel," electricity for other companies.¹¹⁸ Without such open access to the transmission lines, the formation of regional and national markets for electricity would likely be inhibited.¹¹⁹ The federal Energy Policy Act of 1992 ("EPAAct") was meant to eliminate some of these barriers and open the monopoly-held transmission grid to a variety of electricity generators.¹²⁰

Through EPAAct, Congress sought to slow the rise of American oil imports, conserve energy, encourage efficiency, provide new energy options and more diverse supplies, develop renewable energy resources, increase competition in the electric industry and address global warming.¹²¹ Moreover, the Act expressly linked least-cost goals and environmental objectives in the nation's energy strategies.¹²² The statute announced, for example, that the goals of United States energy research and development included "meeting future needs for energy services at the lowest total cost to the Nation, including environmental costs"¹²³

In formulating EPAAct, congressional committee members observed the direct link between the level and type of energy consumption and the quality of the environment.¹²⁴ More efficient use of energy could be used to reduce power plant emissions of CO₂, the principal "greenhouse gas" causing global warming, and also of pollutants such

¹¹⁶ See *id.* at 133 (1992), *reprinted in* 1992 U.S.C.C.A.N. at 1956.

¹¹⁷ See *id.* at 139 (1992), *reprinted in* 1992 U.S.C.C.A.N. at 1962.

¹¹⁸ See *id.*

¹¹⁹ See generally *id.*

¹²⁰ See generally Energy Policy Act of 1992, § 721; H.R. REP. NO. 102-474, pt. 1, at 140 (1992), *reprinted in* 1992 U.S.C.C.A.N. at 1963.

¹²¹ See H.R. REP. NO. 102-474 pt. 1, at 133 (1992), *reprinted in* 1992 U.S.C.C.A.N. at 1955.

¹²² See Energy Policy Act of 1992 § 2001(3).

¹²³ *Id.* In its merger of environmental protection goals and lowest price goals in an implicit "environmental least-cost" formula, EPAAct echoed the formulation of the earlier 1980 Pacific Northwest Electric Power Planning and Conservation Act. See Pacific Northwest Electric Power Planning and Conservation Act § 3. Cost-effective electric systems under that 1980 Act were determined by least-cost reliable energy sources, and system costs were defined to include "quantifiable environmental costs and benefits . . . directly attributable" to a given electricity resource. *Id.* Thus, in EPAAct and in the earlier Pacific Northwest Electric Power Planning and Conservation Act, least-cost objectives and environmental goals were clearly joined. See *id.*; *supra* note 122 and accompanying text.

¹²⁴ See H.R. REP. NO. 102-474, pt. 1, at 133 (1992), *reprinted in* 1992 U.S.C.C.A.N. at 1955.

as sulfur oxides, nitrogen oxides and particulates.¹²⁵ Thus, in developing EAct, Congress expressly linked a competitive structure for electricity generation with the goal of reducing global warming and other environmental impacts.¹²⁶

EAct authorized a new class of power producers, the "exempt wholesale generator" ("EWG").¹²⁷ An EWG is a generator exclusively in the business of owning and/or operating a facility used for the generation of electricity to sell at wholesale.¹²⁸ EWGs are exempted from the utility registration and regulatory requirements of PUHCA.¹²⁹ Unlike the case of QFs under PURPA, utility holding companies are permitted to own an interest in one or more EWGs under EAct.¹³⁰ EWGs also do not have to meet the technical energy source criteria required for QFs.¹³¹ EAct also amended the Federal Power Act to allow any electricity generator to apply to FERC for an order requiring a transmitting utility to provide transmission services to the generator.¹³²

Thus, EAct considerably liberalized and widened the opportunities for independent power producers, freeing them from the regulatory burdens of PUHCA and potentially opening utility transmission facilities to their electricity.¹³³ While giving this impetus to the least-cost power objectives of the deregulatory momentum growing in the states, EAct also expressly placed the reduction of global warming on the national energy agenda, and implicitly advanced the goal of reducing other environmental externalities.¹³⁴ In states leading the deregulatory movement, like California and Massachusetts, the twin objectives of low-cost power and environmental protection would soon be reaffirmed in state utility restructuring legislation.¹³⁵

¹²⁵ See *id.* at 134, reprinted in 1992 U.S.C.A.N. at 1956.

¹²⁶ See, e.g., Energy Policy Act of 1992 §§ 1602(a)(2), 2001(3).

¹²⁷ See *id.* § 711; see also Haedicke, *supra* note 88, at 106.

¹²⁸ See Energy Policy Act of 1992 § 711.

¹²⁹ See *id.*

¹³⁰ See *id.*

¹³¹ See *id.*; see also Haedicke, *supra* note 88, at 106. QFs are limited in size and must use renewable or alternative fuel sources or meet certain efficiency standards if they burn fossil fuels. See, e.g., Decision No. 91-06-022, 124 Pub. Util. Rep. 4th (PUR) at 188.

¹³² See Energy Policy Act of 1992 § 721.

¹³³ See *supra* notes 127-32 and accompanying text; see also Iribe, *supra* note 13 (Congress pushed the competitive evolution of the electric industry further with passage of EAct). QFs are allowed to sell electricity at retail, however, while EWGs are limited to wholesale power sales. See Haedicke, *supra* note 88, at 106.

¹³⁴ See, e.g., Energy Policy Act of 1992 §§ 1602(a)(2), 2001(3). The Act called on the Secretary of Energy to develop an energy strategy "designed to achieve to the maximum extent practicable and at least-cost to the Nation . . . the stabilization and eventual reduction in the generation of greenhouse gases . . ." *Id.* § 1602(a)(2).

¹³⁵ See *infra* notes 143, 160-61 and accompanying text.

2. State Deregulation of Electricity Generation and the Reaffirmation of Environmental Protection and Least-Cost Power as Twin Objectives

California and Massachusetts have played leading roles in the push for deregulation, with both the California Public Utilities Commission ("PUC") and the Massachusetts Department of Public Utilities ("DPU") proposing restructuring programs in 1995.¹³⁶ Their state legislatures enacted restructuring legislation in 1996 and 1997, respectively.¹³⁷ Very high electric rates in both states played a role in this early drive to deregulate the industry.¹³⁸ California's electric rates were fifty percent above the national average, and were held to be one of the causes of its job loss to foreign competitors and to neighboring cheap-power states.¹³⁹ In 1996 California and Massachusetts ranked eighth and ninth in the nation respectively in the cost of residential electricity.¹⁴⁰ By 1997 California was spending \$23 billion a year on electricity.¹⁴¹

The California legislature enacted its electricity restructuring statute, Assembly Bill 1890 ("A.B. 1890"), in the fall of 1996.¹⁴² In A.B. 1890 the legislature explicitly linked the goals of low-cost power and environmentally sensitive electricity production; "It is the intent of the

¹³⁶ See *Re Proposed Policies Governing Restructuring California's Electric Services Industry and Reforming Regulation*, Decision No. 95-05-045, 161 Pub. Util. Rep. 4th (PUR) 217 (Cal. P.U.C. 1995) [hereinafter Decision 95-05-045]; *Re Electricity Industry Restructuring*, D.P.U. 95-30, 160 Pub. Util. Rep. 4th (PUR) 76 (Mass. D.P.U. 1995) [hereinafter D.P.U. 95-30]; see also Donlani, *supra* note 109, at 1 (California and New England at forefront of deregulation movement); Navarro, *supra* note 109, at 347 (California at forefront of deregulation). The California PUC actually made its initial proposal for restructuring on April 20, 1994, in "A Vision for the Future of California's Electric Services," also known as the "Blue Book" for the color of its cover. See ED SMELOFF AND PETER ASMUS, *REINVENTING ELECTRIC UTILITIES—COMPETITION, CITIZEN ACTION, AND CLEAN POWER* 75 (1997). In 1995, in D.P.U. 95-30, the Massachusetts DPU outlined its vision of electric utility restructuring, followed by a more detailed elaboration in D.P.U. 96-100 the next year. See *Re Electric Industry Restructuring*, D.P.U. 96-100, 172 Pub. Util. Rep. 4th (PUR) 391 (Mass. D.P.U. 1996) [hereinafter D.P.U. 96-100].

¹³⁷ See Act effective Sept. 24, 1996, ch. 854, 1996 Cal. Legis. Serv. 3678 (codified in scattered sections of CAL. CODE (West 1998), commonly referred to as A.B. 1890); Act of Nov. 25, 1997, ch. 164, 1997 Mass. Legis. Serv. 637 (codified in scattered sections of MASS. GEN. LAWS (1997)).

¹³⁸ See, e.g., Act of Nov. 25, 1997, ch. 164, § 1(d), 1997 Mass. Legis. Serv. at 638.

¹³⁹ See Navarro, *supra* note 109, at 354; Marla Dickerson & Chris Kraul, *What You Need to Ask to Make an Informed Decision—Power to the People: California's Era of Electricity Deregulation Begins Jan. 1, Bringing Consumers Many Choices, But Also More Than a Little Uncertainty*, L.A. TIMES, Dec. 21, 1997, at D1 (sidebar *Expensive Electricity*); see also Decision 95-05-045, 161 Pub. Util. Rep. 4th (PUR) at 245 (current regulatory scheme has failed to prevent California electric rates from being much higher than rest of nation).

¹⁴⁰ See Dickerson & Kraul, *supra* note 139, at D1 (sidebar: *Expensive Electricity*).

¹⁴¹ See CAL. PUB. UTIL. CODE § 330(b).

¹⁴² See Act effective Sept. 24, 1996, ch. 854, 1996 Cal. Legis. Serv. 3678.

Legislature to ensure that California's transition to a more competitive electricity market structure . . . creates a new market structure that provides competitive, low cost and reliable electric service . . . and preserves California's commitment to developing diverse, environmentally sensitive electricity resources."¹⁴³ The competitive framework created by A.B. 1890 will give customers the right to choose their supplier of electricity.¹⁴⁴ Transmission functions are to be separated from electricity generation functions, with the former left as a controlled monopoly and the latter rendered competitive and eventually unregulated.¹⁴⁵

Under A.B. 1890 California will create two state-chartered, non-profit market institutions: an "Independent System Operator" and a "Power Exchange."¹⁴⁶ The Power Exchange will provide a competitive auction similar to a commodities exchange, open on a non-discriminatory basis to all electricity providers where customers can meet their electricity demands.¹⁴⁷ The Independent System Operator will have centralized control over the statewide transmission grid, dispatching electricity from the suppliers to meet this demand.¹⁴⁸ The plan was scheduled to begin January 1, 1998, but difficulties with the complex computer programming required to coordinate the interconnected real time trading of electricity and the management of the electric grid caused a four month postponement of the system's start-up.¹⁴⁹

That least-cost power is not the sole goal for California's restructuring is perhaps best indicated by A.B. 1890's provision for accelerated and full recovery of costs associated with previous uneconomic utility investments and contractual obligations (so-called "stranded costs" or "transition costs").¹⁵⁰ The statutorily guaranteed recovery of stranded costs will raise the price of electricity that consumers actually pay above the power's going minimum market price.¹⁵¹ Stranded costs include those associated with large capital investments in nuclear generating stations and other expensive power plants.¹⁵² They also include long-term power purchase agreements that were made under the previous

¹⁴³ *Id.* § 1(a).

¹⁴⁴ See CAL. PUB. UTIL. CODE § 330(d).

¹⁴⁵ See *id.* § 330(k), (l).

¹⁴⁶ See Act effective Sept. 24, 1996, ch. 854, § 1(c), 1996 Cal. Legis. Serv. at 3680.

¹⁴⁷ See *id.*; Chris Kraul, *Computer Woes Delay Electricity Deregulation*, L.A. TIMES, Dec. 23, 1997, at A1.

¹⁴⁸ See generally Act effective Sept. 24, 1996, ch. 854, § 1(c), 1996 Cal. Legis. Serv. at 3680.

¹⁴⁹ See CAL. PUB. UTIL. CODE § 330(n); Kraul, *supra* note 147, at A1.

¹⁵⁰ See generally CAL. PUB. UTIL. CODE § 367; see also CAL. PUB. UTIL. CODE §§ 840, 841.

¹⁵¹ See generally *id.* § 330(s).

¹⁵² See, e.g., *id.* §§ 330(s), 368(d); see also *id.* § 840(f). The cost of nuclear power plants and

regulatory system but that may not be recoverable at market prices in a competitive system.¹⁵³ These costs are to be paid through a non-by-passable transition charge levied on electricity consumers.¹⁵⁴ The legislature also intends, however, to give an immediate rate reduction of no less than ten percent for residential and small commercial ratepayers, financing the rate reduction through the issuance of "rate reduction bonds."¹⁵⁵ Through the device of the rate reduction bonds, California is attempting to reconcile the goal of low-cost power with full repayment of utility investors for earlier costly misinvestments in nuclear power and other expensive energy sources.¹⁵⁶

In late 1997, in language closely tracking many of the provisions of the California statute, the Massachusetts Legislature enacted chapter 164 to restructure its electric utility industry.¹⁵⁷ The Legislature's finding that the state had one of the highest electricity rates in the United States, and that these high rates were having an adverse effect on Massachusetts business' ability to compete, prompted the enactment of chapter 164.¹⁵⁸ The Legislature's avowed goal was to create a framework by March 1, 1998 under which competitive electricity generators would offer power and customers would gain the right to choose their electric power supplier.¹⁵⁹

nuclear decommissioning may be the principal component of the problem of stranded costs. See, e.g., Congressional testimony to Senate Committee on Energy and Natural Resources by William D. Steinmeier (former president of the National Association of Regulatory Commissioners, and prior chair of Missouri Public Service Commission), May 22, 1997, available in 1997 WL 11233078 at *16-17, 22; Decision 95-05-045, 161 Pub. Util. Rep. 4th (PUR) at 223.

¹⁵³ See Act effective Sept. 24, 1996, ch. 854, § 1(b), 1996 Cal. Legis. Serv. at 3679; CAL. PUB. UTIL. CODE § 330(s); see also CAL. PUB. UTIL. CODE § 840(f).

¹⁵⁴ See CAL. PUB. UTIL. CODE § 330(v). Debate concerning stranded costs has centered on whether under deregulation *rate-payers* will pay off these costs through a surcharge on their electricity distribution bill, or whether the costs will indeed be left unpaid, in essence leaving the loss with existing utility *investors* in the form of depressed stock values or diminished dividends. See Steinmeier, *supra* note 152, at *16; Charles Stein, *For Investors, a Future of Uncertainty, Promise*, BOSTON GLOBE, Mar. 17, 1998, at F3 (observing that allowing utilities to recoup their stranded costs has been bad news for ratepayers who 'picked up the tab,' but good news for utility stock investors).

¹⁵⁵ See Act effective Sept. 24, 1996, ch. 854, § 1(b); see also The Utilities Reform Network, *Sparks Fly in the Electricity Market . . . Still More Deregulation* (visited Jan. 18, 1998) <<http://www.turn.org/sparks.html>> (expressing skepticism about rate-cut financed through sale of bonds, similar to refinancing mechanisms with lower monthly payments but a larger total payment over the long-run).

¹⁵⁶ See generally *supra* notes 151-55 and accompanying text.

¹⁵⁷ See *supra* note 137 and accompanying text. This session law should not be confused with Massachusetts General Laws chapter 164, which the Act of Nov. 25, 1997 amends.

¹⁵⁸ See Act of Nov. 25, 1997, ch. 164, § 1(d)-(e).

¹⁵⁹ See *id.* § 1(c); see also *id.* § 1(m).

The statute stresses the importance of increased competition in achieving long-term rate reductions.¹⁶⁰ It also asserts, however, that enhanced environmental protection goals are essential to a more competitive electricity market and calls for utilities to propose programs to promote energy conservation and demand-side management as part of their restructuring.¹⁶¹ Moreover, the statute requires the Commonwealth of Massachusetts ("Commonwealth") to ensure that energy conservation policies, activities and services are appropriately funded and available throughout the state.¹⁶² In its energy facilities siting provisions, it calls on the Energy Facilities Siting Board to act "so as to provide a reliable energy supply for the commonwealth with a minimum impact on the environment at the lowest possible cost."¹⁶³ Thus, as in California, the Massachusetts restructuring statute interweaves least-cost and environmental protection objectives.¹⁶⁴

As in the California plan, Massachusetts decided to separate the function of electricity generation from transmission and distribution services.¹⁶⁵ The successor distribution companies will have to ensure direct retail access by consumers to all electricity generators.¹⁶⁶ The separated generating companies will generally no longer be regulated as public utilities.¹⁶⁷ Distribution and transmission companies, however, will continue to be substantially regulated.¹⁶⁸ Distribution companies, for example, will have exclusive service territories defined by the Department of Telecommunication and Energy.¹⁶⁹ Thus, electricity distribution will, for now, effectively remain a regulated monopoly.¹⁷⁰

Further paralleling California, an important selling feature of the Massachusetts deregulation scheme is that chapter 164 requires utility

¹⁶⁰ See *id.* § 1(k).

¹⁶¹ See *id.* § 1(l).

¹⁶² See *id.* § 1(j).

¹⁶³ Act of Nov. 25, 1997, ch. 164, § 204, MASS. GEN. LAWS ch. 164, § 69H.

¹⁶⁴ See *supra* notes 143, 160-63 and accompanying text.

¹⁶⁵ See Act of Nov. 25, 1997, ch. 164, § 1(m) 1997 Mass. Legis. Serv. at 638; see also MASS. GEN. LAWS ch. 164, § 1A(b)-(c).

¹⁶⁶ See MASS. GEN. LAWS ch. 164, § 1A(a).

¹⁶⁷ See *id.*

¹⁶⁸ See, e.g., *id.* §§ 1B, 69H.

¹⁶⁹ See *id.* § 1B.

¹⁷⁰ See *id.* The Act does, however, require a study of exclusive distribution service territories to determine if such exclusivity should be terminated or altered. See Act of Nov. 25, 1997, ch. 164, § 912, 1997 Mass. Legis. Serv. at 713. Instead of a single electricity rate, consumers will be charged separate ("unbundled") rates for generation, for distribution, for transmission and for other services. See MASS. GEN. LAWS ch. 164, § 1D. Any stranded cost charges allowed by the Commonwealth will also be listed separately on the bill, as so-called "transition charges." See *id.* For consumers who decide not to purchase electricity from an independent generating company,

restructuring plans to reduce consumer electric rates by ten percent from the average undiscounted rates applicable in August of 1997.¹⁷¹ Chapter 164 similarly provides for recovery of stranded costs, called "transition costs" in the statute.¹⁷² Because it may be difficult to cover all costs of generating, transmitting and distributing electricity, pay off old misinvestments that contributed to high electricity rates in the first place and give consumers a ten percent rate cut, the statute authorizes rate reduction bonds to refinance some of these costs.¹⁷³

In sum, electricity deregulation as expressed in California's and Massachusetts' restructuring legislation does not depart from, but rather reaffirms, the twin policy objectives of least-cost power and environmental protection articulated in the evolution of federal regulatory statutes.¹⁷⁴ As Peggy Welsh, Executive Director of the National Association of Regulatory Utility Commissioners, has observed, values other than economic efficiency will continue to be important for the restructured electricity industry, including protecting the environment.¹⁷⁵ In restructuring the industry, least-cost power is not the sole or even paramount goal.¹⁷⁶ Thus, even under deregulation, the question is not whether to incorporate environmental protections and a reduction of externalities in restructuring the electric industry, but rather, how best to do so.¹⁷⁷

the distribution company will act as the default electricity provider. *See id.* § 1B(d). The distribution company also serves as the default provider of electricity for consumers who buy electricity from an independent generator, if and when the independent generator does not deliver. *See id.* § 1B(b), (d).

¹⁷¹ *See* MASS. GEN. LAWS ch. 164, § 1B(b). By Sept. 1, 1999 the rate reduction is required to reach 15%. *See id.*

¹⁷² *See, e.g., id.* §§ 1A(a), 1G. Transition costs may include unrecovered costs for generation plants, recovery for nuclear entitlements and certain post-shutdown and decommissioning costs for nuclear plants that are not recoverable from the Nuclear Regulatory Commission's decommissioning fund. *See id.* § 1G(b). In addition, transition costs may include purchased power agreements contracted earlier at rates that are now above market. *See id.*

¹⁷³ *See generally id.* §§ 1, 1G(c)(2) (companies demonstrating that 10% rate reduction is not financially viable, without use of rate reduction bonds to refinance debt associated with transition costs, may be allowed to use such bonds).

¹⁷⁴ *See supra* notes 143, 160-63 and accompanying text. California had already linked least-cost power and environmental protection objectives in earlier amendments to its public utility regulatory law, declaring that "in addition to other ratepayer protection objectives, a principal goal of electric . . . resource planning and investment shall be to minimize the cost to society of the reliable energy services that are provided by . . . electricity, and to improve the environment" CAL. PUB. UTIL. CODE § 701.1(a).

¹⁷⁵ *See* Lori M. Rodgers & Joseph F. Schuler Jr., *Ready, Fire, Aim—California and the Nation on the Eve of Competition*, PUBLIC UTILS. FORTNIGHTLY, Jan. 1, 1998, at 28-29.

¹⁷⁶ *See* Act of Nov. 25, 1997, ch. 164, preamble, § 1(b), (l), 1997 Mass. Legis. Serv. at 638; Act effective Sept. 24, 1996, ch. 854, § 1(a), 1996 Cal. Legis. Serv. at 3679.

¹⁷⁷ *See supra* notes 174-76 and accompanying text.

B. Advancing the Goal of Environmental Protection Through the Regulation of Environmental Externalities—The Case of Carbon Dioxide Emissions

Electricity generation is the source of a variety of environmental externalities.¹⁷⁸ These externalities may be relatively localized impacts, such as water consumption, the production of liquid and solid waste, land use impacts, fuel delivery impacts, noise, related transmission line impacts and aesthetic impacts.¹⁷⁹ Other effects of the industry are global in impact or reach irretrievably into the distant future. The radioactive waste from nuclear power plants, for example, will have to be safely isolated from the environment for at least 10,000 to 100,000 years.¹⁸⁰ Electric generating stations are also a significant source of air pollution, including sulfur oxides, nitrogen oxides, particulates and CO₂—the principal greenhouse gas.¹⁸¹ Because of the widely diffused and long-term consequences of global warming, electricity generation's CO₂/global warming externality is used here as a representative case of the general problem of environmental externalities for the industry.¹⁸²

¹⁷⁸ See, e.g., D.P.U. 89-239, 116 Pub. Util. Rep. 4th (PUR), at 94; Mary Nagelhout, *Valuation of Environmental Externalities in Electric Resource Selection*, PUBLIC UTILS. FORTNIGHTLY, Mar. 1, 1993, at 45.

¹⁷⁹ See, e.g., D.P.U. 89-239, 116 Pub. Util. Rep. 4th (PUR) at 94; D.P.U. 86-36-G, at 78; Nagelhout, *supra* note 178, at 45.

¹⁸⁰ See 10 C.F.R. § 960.4-2-1 (1997); see also *Nuclear Waste Policy Act of 1995: Hearing Before the Senate Comm. on Energy and Natural Resources*, 104th Cong. 14-15 (1995) (statement of Sen. Paul Wellstone) (estimated life-cycle costs of repository keep climbing and have reached \$33.1 billion with only \$19 billion in utility funding currently projected; shortfall could be left with public along with title to radioactive waste for 10,000 years and potentially infinite liability).

¹⁸¹ See, e.g., Congressional testimony of Lewis M. Milford (senior attorney for Conservation Law Foundation), Sept. 9, 1996, available in 1996 WL 10830888 (electric power industry is the largest single industrial source of air pollution, contributing to ozone, acidification and nitrification of lakes, rivers, estuaries and forests, premature death from small particle inhalation and mercury contamination); Woolf & Biewald, *supra* note 107, at 66 (electricity sector responsible for about one-third of U.S. CO₂ emissions).

¹⁸² See *infra* notes 183-92 and accompanying text. The environmental impacts of CO₂ are largely occurring as externalities because carbon dioxide is not yet subject to extensive federal and state regulation. See Joskow, *supra* note 8, at 10.

Although not as significant an externality as nuclear waste when measured by the dimension of time, the greenhouse gases carbon dioxide and nitrous oxide (N₂O), once emitted, do remain in the atmosphere for decades to centuries. See Intergovernmental Panel on Climate Change, *Summary for Policymakers: The Science of Climate Change—IPCC Working Group I*, § 1 (visited Feb. 10, 1998) <<http://www.ipcc.ch/cc95/wg1.htm>>. Thus, even immediate human action to reduce greenhouse gas emissions radically will not restore preexisting atmospheric conditions for some time. See generally *id.*, § 5 (thermal inertia of oceans would mean global warming would continue even after greenhouse gas concentrations were stabilized).

In the 1960s, climatologists like Syukuro Manabe of Princeton and oceanographer Roger Revelle began to speculate that increasing atmospheric CO₂ could cause global warming.¹⁸³ By the time the Intergovernmental Panel on Climate Change issued its 1995 report on global warming, the international scientific consensus had concluded that the balance of evidence suggested a discernible human influence on global climate was occurring,¹⁸⁴ with the consequent possibility that the earth's mean surface temperature would rise 1–3.5°C. by the year 2100.¹⁸⁵ Such a temperature increase might cause drought in some parts of the world, increased flooding in other areas, increased pest and disease outbreaks and other adverse effects on ecological systems and human society.¹⁸⁶ The increased melting of polar ice or thermal expansion of the oceans caused by the warming could raise ocean levels by nearly a meter, leading to greater coastal erosion, storm damage and potentially devastating losses of low-lying lands.¹⁸⁷ Many shoreline regions and small island nations are thus particularly concerned over the possible impacts of global warming due to greenhouse gases.¹⁸⁸

CO₂ is considered the most significant of the greenhouse gases and most of the human-originated CO₂ results from fossil fuel combustion.¹⁸⁹ The United States bears particular responsibility for the problem, as it produces over twenty percent of the world's energy-related CO₂ emissions.¹⁹⁰ Electricity generation is the sector of the American

¹⁸³ See, e.g., Gore, *supra* note 5, at 4–5; Kitta MacPherson, *Princeton Prophet—'Greenhouse godfather' predicted effect*, NEWARK STAR-LEDGER, June 11, 1990.

¹⁸⁴ See Intergovernmental Panel on Climate Change, *supra* note 182, § 4; see also WORKING GROUP II TO THE SECOND ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 1995: IMPACTS, ADAPTATIONS AND MITIGATION OF CLIMATE CHANGE: SCIENTIFIC-TECHNICAL ANALYSES 78 (Robert T. Watson et al., eds., 1996) (energy-related greenhouse gases create a danger of anthropogenic interference with Earth's radiative balance).

¹⁸⁵ See WORKING GROUP II TO THE SECOND ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *supra* note 184, at 22.

¹⁸⁶ See *id.*

¹⁸⁷ See *id.* at 22, 24, 31, 269. The Working Group II estimated that a one meter ocean level rise could result in a 6% loss of land area for the Netherlands, a 17.5% loss for Bangladesh and up to an 80% loss for the Majuro Atoll in the Marshall Islands, given current coastal protection systems. See *id.* at 36.

¹⁸⁸ See, e.g., ROSS GELBSPAN, *THE HEAT IS ON: THE HIGH STAKES BATTLE OVER EARTH'S THREATENED CLIMATE* 109 (1997) (Alliance of Small Island States, worried about territory losses from coastal flooding, is strongest advocate of tough greenhouse gas emissions limits).

¹⁸⁹ See, e.g., WORKING GROUP II TO THE SECOND ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *supra* note 184, at 12, 78, 84. About three quarters of human-caused CO₂ emissions are caused by fossil fuel combustion. See 1 *International Energy Agency, Climate Change Policy Initiatives—1994 Update* 14 (1994) [hereinafter *International Energy Agency, Climate Change Policy*].

¹⁹⁰ See *International Energy Agency, Climate Change Policy*, *supra* note 189, at 24–26 tbls.4–6.

economy most responsible for these massive CO₂ emissions, causing approximately thirty-seven percent of the U.S. output.¹⁹¹ Thus, the global significance of CO₂ externalities from the U.S. electricity industry is pronounced.¹⁹² Physical reduction of this externality could be achieved by: 1) reducing electricity consumption through conservation and efficiency; 2) increasing the electricity generated by non-combustion energy sources such as wind or solar power; 3) switching from coal and oil to natural gas, which emits less CO₂; or 4) absorbing CO₂ in carbon "sinks," such as forest preserves.¹⁹³

C. *Regulatory Options for Remedying Externalities Like Carbon Dioxide Emissions*

The overall thrust of electricity deregulation suggests that market pricing of electricity will steer, on its own, investment into the above four physical remedies for excessive CO₂ emission and thus adequately deal with the externality.¹⁹⁴ In their details, however, California and Massachusetts' electricity restructuring statutes have not left such environmental objectives to the workings of raw market price alone.¹⁹⁵ Instead, the statutes intervene in the electricity market with various

¹⁹¹ See *id.* at 178.

¹⁹² See *supra* notes 189-91 and accompanying text.

¹⁹³ See generally WORKING GROUP II TO THE SECOND ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *supra* note 184, at 589. Some consultants estimate that every forested acre pulls two tons of carbon from the atmosphere and stores it (in the form of wood) each year. See, e.g., Elizabeth Striano, *Carbon Sequestration: Robin Hoods of the Forest?*, PUBLIC UTILS. FORTNIGHTLY, Aug. 1997, at 24. A single average coal generation station, however, emits 4.3 million tons of CO₂ each year. See *id.*

American electric utilities have begun buying forest land or environmental easements to maintain forests to serve as carbon sinks (carbon sequestration). See *id.* at 25. For example, in the Rio Bravo Carbon Sequestration Project, Wisconsin Electric Power Co., Cinergy Corp., Detroit Edison Co. and PacifiCorp., working with the Nature Conservancy, UtiliTree Carbon Co. and the Programme for Belize, purchased 14,400 acres in Rio Bravo, Belize, to preserve it as forest. See *id.* Utilities are interested in preserving forests in the developing world, because the projects there are more cost-effective. See *id.* at 24. Even the Edison Electric Institute, which helped form the UtiliTree Carbon Co. as a sequestration project of 40 electric companies, admits that there are political problems involved with American companies going into another country, buying up its land and putting that land off limits for the next 100 years. See *id.* at 25; see also Michael D. Lemonick, *Turning Down the Heat*, TIME, Dec. 22, 1997, at 23, 24 (noting many developing countries rejected greenhouse gas emissions trading).

Engineers are also looking for technological means to separate CO₂ from the exhaust gases of power plants, for piping to exhausted natural gas fields for subterranean injection and permanent geologic storage. See generally WORKING GROUP II TO THE SECOND ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *supra*, at 589.

¹⁹⁴ See generally MASS. GEN. LAWS ch. 164, § 69H (suggesting policy of Commonwealth is to allow market forces to determine the need for and cost of electricity generation facilities).

¹⁹⁵ See, e.g., *infra* notes 260-63 and accompanying text.

mechanisms which will have the effect of reducing CO₂ emissions and other externalities.¹⁹⁶

Some of these interventions are market-based, in that they make heavily polluting generation more expensive or make less-polluting generation cheaper, but still allow consumers to choose the dirtier source of electricity if they wish.¹⁹⁷ Subsidies for conservation and renewable energy enacted by the restructuring statutes are such market-based interventions.¹⁹⁸ Statutory requirements to label electricity products by their power sources (e.g., percent nuclear, percent wind-generated) or air emissions are likewise market-based interventions because they give consumers information needed to make intelligent cost comparisons but still allow consumers to decide between various electricity products.¹⁹⁹

Some intervention mechanisms take a non-market form—for example, requiring an electricity vendor to use a certain percentage of power generated by renewable energy sources, or to meet certain emission performance standards.²⁰⁰ Such mechanisms do not allow the consumer to choose to pay more to pollute.²⁰¹ Instead, the state uses traditional “command-and-control” regulation to require or prohibit certain conduct by the electric utility.²⁰² Various market-based and non-market-based regulatory interventions are discussed below.

1. Market-Based Regulatory Mechanisms to Control Environmental Externalities Like Carbon Dioxide Emissions

a. *Environmental Adder Programs*

Shortly before the emergence of the electricity deregulation movement, the Massachusetts DPU, the California PUC and other state public utility commissions experimented with an explicit attempt to price externalities as “environmental adders.”²⁰³ This method, also known as

¹⁹⁶ See, e.g., *infra* notes 260–63 and accompanying text.

¹⁹⁷ See generally *infra* notes 260–63 and accompanying text.

¹⁹⁸ See *infra* notes 260–63 and accompanying text.

¹⁹⁹ See generally MASS. GEN. LAWS ch. 164, § 1F(6) (requiring labeling of electricity products, but not barring particular products).

²⁰⁰ See, e.g., MASS. GEN. LAWS ch. 25A, § 11F.

²⁰¹ See *infra* note 202.

²⁰² See, e.g., MASS. GEN. LAWS ch. 111, § 142N (requiring the Department of Environmental Protection to promulgate uniform emissions standards for fossil fuel-fired generating facilities).

²⁰³ See *infra* notes 210–42 and accompanying text. The monetary values for the externalities were added (hence “adders”) to other conventional costs for the resource to allow cost-comparison between options, with non-price criteria such as reliability or fuel diversity then applied to further weight various options. See, e.g., D.P.U. 89–239, 116 Pub. Util. Rep. 4th (PUR) at 94.

"monetization," set a dollar value—the adder—for each externality.²⁰⁴ The adder—for example, \$22/ton of CO₂ emitted—was used in cost comparisons between different power generation and conservation methods to select the least-cost generation option.²⁰⁵ Because the environmental adders programs were a well-developed attempt to address externalities in market form, they bear examination as an initial benchmark useful in assessing other intervention mechanisms.

Regulators argued that such adders would create a more accurate estimate of the full social costs of any given utility investment option.²⁰⁶ Theoretically, by giving a more realistic cost comparison of electricity alternatives, adders would ensure inclusion of environmentally preferable independent power sources, demand-side management ("DSM") and conservation and load management ("C&LM") measures in the meeting of electricity demand.²⁰⁷ State officials anticipated that the use of the adders would lead to less-polluting forms of electricity generation.²⁰⁸ Massachusetts and California briefly used this monetization approach.²⁰⁹

In 1989 DPU proposed various options for the inclusion of environmental externalities in facility and resource evaluation.²¹⁰ The next year the DPU issued final regulations requiring electric companies to use certain monetized values to account for the environmental externalities caused by the electricity resources they were considering.²¹¹ The DPU reasoned that in choosing between two equally priced, equally reliable facilities that both met federal pollution control standards, but that nevertheless caused markedly different levels of pollution, society

²⁰⁴ See, e.g., D.P.U. 89-239, 116 Pub. Util. Rep. 4th (PUR) at 87, 89.

²⁰⁵ See *id.* at 89, 98; MASSACHUSETTS DIV. OF ENERGY RESOURCES, *supra* note 109, at 1-2, 4.

²⁰⁶ See, e.g., Decision No. 91-06-022, 124 Pub. Util. Rep. 4th (PUR) at 187; MASSACHUSETTS DIV. OF ENERGY RESOURCES, *supra* note 109, at 4.

²⁰⁷ See generally D.P.U. 89-239, 116 Pub. Util. Rep. 4th (PUR) at 71 (part of integrated utility planning is to ensure inclusion of all appropriate resources including QFs, independent power producers ("IPPs"), conservation and load management ("C&LM") measures and other demand-side management ("DSM") options). Contrasted with supply-side management (increasing electricity supply), DSM includes electricity conservation, shifting electricity demand to off-peak hours and improving the energy efficiency of appliances and buildings. See Decision No. 91-06-022, 124 Pub. Util. Rep. 4th (PUR) at 187. The term C&LM is often used more or less interchangeably with the term DSM. See, e.g., MASS. REGS. CODE tit. 220, § 10.02 (1995); see also James W. Moeller, *Electric Demand-Side Management Under Federal Law*, 13 VA. ENVTL. L.J. 57, 57 (1993).

²⁰⁸ See, e.g., MASSACHUSETTS DIV. OF ENERGY RESOURCES, *supra* note 109, at 5.

²⁰⁹ See *infra* notes 210-42 and accompanying text.

²¹⁰ See D.P.U. 86-36-G, at 82-96; see also *Massachusetts Elec. Co.*, 643 N.E.2d at 1031 (in D.P.U. 89-239 the Department determined that in selecting new resources, electric company must consider environmental externalities); D.P.U. 89-239, 116 Pub. Util. Rep. 4th (PUR) at 71.

²¹¹ See D.P.U. 89-239, 116 Pub. Util. Rep. 4th (PUR) at 71, 89.

would pick the less polluting facility.²¹² Therefore, the DPU reasoned that the additional pollution from the non-selected facility must have an economic value to society.²¹³

The DPU's externalities regulations set out initial values for certain air emission externalities connected with combustion-based generating stations.²¹⁴ The DPU tried to account for a wide variety of environmental impacts in establishing environmental externality values, including human death, genetic effects, materials damage, losses in agricultural productivity and also impacts on non-priced "goods" such as losses of scenic value and damages to non-human species and natural systems.²¹⁵ Environmental externalities were used in cost-effectiveness tests for preapprovals of C&LM and generation programs, QF requests for proposals, power purchase agreements and resource planning filings with the DPU.²¹⁶

Because estimates of comprehensive damage costs caused by environmental externalities are difficult to make, the DPU decided to use the "cost-of-control" (also known as "implied valuation") method for approximating those damages and valuing the environmental adders.²¹⁷ Under this method the cost of pollution control equipment to reduce a given air emission by a ton is assumed to approximate the value to society to eliminate that ton of pollution.²¹⁸ The DPU assumed that society would be willing to pay that amount to avoid a ton of emissions in order to further avoid an equivalent or greater amount of environmental damage.²¹⁹ In other words, if society was, for example, already mandating the expenditure of \$6,500 per ton to reduce some of the nitrogen oxide emissions of generating stations, under the cost-of-control approach the environmental adder was set at \$6,500 per ton

²¹² See *id.* at 90.

²¹³ See *id.*

²¹⁴ See *id.* at 98. Externality values established by the DPU included: nitrogen oxides at \$6,500/ton emitted, sulfur oxides at \$1,500/ton, volatile organic compounds at \$5,300/ton, total suspended particulates at \$4,000/ton, carbon monoxide at \$870/ton, CO₂ at \$22/ton, methane at \$220/ton and nitrous oxide at \$3,960/ton. See *id.*

²¹⁵ See *Massachusetts Elec. Co.*, 643 N.E.2d at 1032. The DPU decided, however, to assess externalities from a "global perspective" and not consider site-specific environmental externalities, such as noise, visual and wetland impacts of specific facilities in the IRM process. See D.P.U. 89-239, 116 Pub. Util. Rep. 4th (PUR) at 94, 95, 96. It also decided not to consider externalities connected with the production of the fuel used by the generator, in terms of mining impacts for coal. See *id.* at 95. Instead it focused on all impacts resulting from plant operation including air, water, solid waste, spent fuel disposal impacts and resource use. See *id.*

²¹⁶ See D.P.U. 89-239, 116 Pub. Util. Rep. 4th (PUR) at 97.

²¹⁷ See *id.* at 90, 93.

²¹⁸ See *id.* at 91.

²¹⁹ See *id.*

for any remaining nitrogen oxides still being emitted by the plant.²²⁰ Although the DPU adopted this cost-of-control/implicit valuation methods for adders, it announced as its ultimate objective the use of comprehensive damage costs as the basis for environmental externality adders where feasible.²²¹

In late 1994, however, in *Massachusetts Electric Co. v. Department of Public Utilities*, the Massachusetts Supreme Judicial Court disallowed central aspects of the DPU's environmental externality requirements.²²² The court held that the DPU exceeded its authority when it required consideration of environmental externality values that might not reasonably be expected to affect a utility's costs and hence the rates that electric customers pay.²²³ The court held that the effects of pollution on persons other than the ratepayers and the over-all impact of pollution on society were important subjects, but were beyond the reach of DPU regulatory authority.²²⁴ According to the court, these wide-ranging environmental effects were the domain of the legislature and environmental and other regulators to whom the legislature has delegated authority.²²⁵

Following the Supreme Judicial Court's decision, the DPU stopped imposing monetized externality values on utilities.²²⁶ The DPU, however, continued to mandate that reasonably foreseeable environmental control requirements with cost implications for ratepayers be considered by utilities when weighing resource procurement alternatives.²²⁷

Unlike Massachusetts, the California Legislature required by statute that the state's PUC include a value for any costs to the environ-

²²⁰ See *id.*

²²¹ See D.P.U. 89-239, 116 Pub. Util. Rep. 4th (PUR) at 93.

²²² See *Massachusetts Elec. Co.*, 643 N.E.2d at 1033, 1034.

²²³ See *id.* at 1033.

²²⁴ See *id.* at 1034.

²²⁵ See *id.* The court rejected the view that the DPU lacked statutory authority to direct utilities to consider the relative environmental impact of alternative sources of electricity when deciding among alternative power sources. See *id.* at 1031. The court observed that reasonable costs incurred in protecting the environment, whether mandated or voluntary, could be reflected in a utility's approved rates. See *id.* at 1033. The court further held that if it reasonably appears that the emission of a pollutant will be affected in the foreseeable future by prohibitions, new restrictions, costly regulation or pollution penalties or taxes, the DPU could require the utility to pursue a course likely to be less costly to rate-payers in the long-run. See *id.* at 1034. The court accepted the DPU's conclusion that the acceptability of a potential electric power option should be determined, in part, by the possible costs to the utility of that source's likely pollution. See *id.*

²²⁶ See *Re Boston Edison Co.*, D.P.U. 95-1-CC, at *7 (Mass. D.P.U. 1995), available in 1995 WL 109422.

²²⁷ See *id.*

ment when calculating the cost effectiveness of energy resources, including C&LM options.²²⁸ The legislature added this provision in 1990, declaring the principal goals of electric utility resource planning and investment to be minimizing the cost to society of reliable energy services and improving the environment.²²⁹ The legislature also announced as part of this goal the encouragement of a diversity of energy sources through improvements in energy efficiency and the development of renewable energy resources, such as wind, solar and geothermal energy.²³⁰

In 1991 the California PUC began incorporating consideration of non-price factors, such as environmental impacts, in determining appropriate levels of QF development.²³¹ The PUC's announced goal was to arrive at "environmental least-cost" resource planning.²³² The commission noted that, although environmental quality had long played a significant role in discussions of electric resource strategies, the commission had not previously established a quantitative basis for weighing such non-price factors to determine the value of particular resource options.²³³ The commission also noted that the value of DSM is better appreciated when non-price factors are taken into consideration.²³⁴

Because of the severe air pollution problems in parts of California, the PUC first targeted air emissions in implementing its externality program.²³⁵ The PUC suggested, however, that it would eventually include water and land use impacts in assessing externalities.²³⁶ Like Massachusetts, California decided to calculate the value of these externalities by means of the "revealed preferences" method (i.e., implied valuation), using the costs of existing pollution control per ton of pollutant eliminated to approximate the externality's cost.²³⁷

In 1992, however, the PUC decided to retreat from a sweeping application of externalities.²³⁸ It decided not to apply externality values

²²⁸ See CAL. PUB. UTIL. CODE § 701.1(c).

²²⁹ See *id.* § 701.1(a).

²³⁰ See *id.* The legislature later added biomass as a renewable energy resource to be developed. See *id.*

²³¹ See Decision No. 91-06-022, 124 Pub. Util. Rep. 4th (PUR) at 184.

²³² See *id.*

²³³ See *id.* at 187.

²³⁴ See *id.*

²³⁵ See *id.* at 189, 190.

²³⁶ See Decision No. 91-06-022, 124 Pub. Util. Rep. 4th (PUR) at 189.

²³⁷ See *id.* In its 1991 decision implementing its externality adder program, the PUC proposed deriving the dollar/ton monetary value for various pollutants from various sources: the pollution control requirements of the air management district of the utility's service area, from a Pace University Study of pollution costs and from the California Energy Commission's 1990 Electricity Report, depending on the pollutant involved and other factors. See *id.* at 195, 196.

²³⁸ See Decision 92-04-045, 132 Pub. Util. Rep. 4th (PUR) at 222, 223; see also Richard D.

to "short term" power purchases—power supply agreements of less than five years—aiding the cost-competitiveness of existing coal-fired plants.²³⁹ Moreover, in a June 1995 decision involving QF bids governed by PURPA, FERC ruled against central aspects of the California PUC's use of environmental adders, in terms similar to the Supreme Judicial Court's ruling against the Massachusetts externality program.²⁴⁰ FERC did not object, however, to states using numerous other ways outside of PURPA to encourage electrical generation using renewable energy, such as directly ordering utilities to build renewable generation, denying certification to other types of facilities, encouraging renewables through the tax structure or giving direct subsidies to renewable energy generators.²⁴¹ FERC suggested, for example, that imposing a tax on fossil fuel generation or giving tax incentives to renewable energy sources might be one way to allow alternative generation to be cost competitive with fossil-fueled power without violating PURPA.²⁴²

Notably, neither the Supreme Judicial Court nor FERC denied the existence of environmental externalities in their rulings.²⁴³ Neither body definitively denied that attempting to account for externalities was socially beneficial.²⁴⁴ The Supreme Judicial Court instead reasoned that the DPU was not the appropriate body to make the decision about such externalities.²⁴⁵ For its part, FERC suggested alternative means of accomplishing environmental goals in electricity generation that did not violate PURPA.²⁴⁶

Gary & Michael L. Teague, *The Inclusion of Externalities in Electric Generation Resource Planning: Coal in the Crossfire*, 95 W. Va. L. Rev. 839, 858, 859 (1993).

²³⁹ See Decision 92-04-045, 132 Pub. Util. Rep. 4th (PUR) at 223.

²⁴⁰ See Southern Cal. Edison Co., 71 F.E.R.C. ¶ 61,269, at 62,080 (June 2, 1995). FERC said that the California PUC could account for environmental costs of fuel sources in the bidding process for power providers, but only for costs that would actually be incurred by the utility. See *id.* The FERC held that a state "may not set avoided cost rates or otherwise adjust the bids of potential suppliers by imposing environmental adders or subtractors that are not based on real costs that would be incurred by utilities." *Id.* FERC noted that PURPA set the utility's incremental or avoided cost as the maximum rate at which a utility could be required to purchase power from a QF. See *id.* at 62,079-80. FERC reasoned that to use methods like environmental adders would result in rates exceeding the incremental costs to the utility in violation of PURPA. See *id.* at 62,080.

²⁴¹ See *id.*

²⁴² See *id.*

²⁴³ See *Massachusetts Elec. Co.*, 643 N.E.2d at 1034; Southern Cal. Edison Co., 71 F.E.R.C. at 62,080.

²⁴⁴ See *supra* note 243.

²⁴⁵ See *Massachusetts Elec. Co.*, 643 N.E.2d at 1034.

²⁴⁶ See Southern Cal. Edison Co., 71 F.E.R.C. at 62,080.

b. *Emissions Taxes, Subsidies for Conservation and Renewable Energy*

Although use of environmental adders may be waning, other market-based mechanisms for controlling or addressing environmental externalities are being implemented or widely discussed.²⁴⁷ One such market-based mechanism is the emissions tax.²⁴⁸ Emission taxes assessed per unit of pollutant could be used to internalize environmental externalities.²⁴⁹ In effect, this approach adds a price to the emission.²⁵⁰ Polluters will theoretically reduce their pollution when the cost per unit of pollution control is lower than the tax per unit of pollution.²⁵¹ By paying for the additional pollution control equipment in the price of electricity, consumers will pay a price reflecting the environmental impact of that power's production.²⁵² Consequently, they may reduce their purchases of high-emissions electricity products, thereby reducing the environmental impact of their power consumption.²⁵³ Without resorting to government mandated emissions limits, the market mechanism of price, as modified by the emissions tax, would encourage consumers to select electricity options with fewer emissions.²⁵⁴

Another market-based means of reducing externalities is to subsidize energy efficiency and the production of electricity by renewable energy.²⁵⁵ By subsidizing renewably generated electricity, thereby making it cheaper, more consumers will select environmentally preferable electricity products.²⁵⁶ The externalities connected with coal or nuclear generation will be correspondingly reduced.²⁵⁷

²⁴⁷ See, e.g., *infra* notes 248–53 and accompanying text.

²⁴⁸ See, e.g., Black & Pierce, *supra* note 80, at 1393 (emission fees being discussed widely as feasible means of limiting greenhouse gas emissions).

²⁴⁹ See, e.g., JOSKOW, *supra* note 8, at 3; PLATER ET AL., *supra* note 4, at 31.

²⁵⁰ See generally JOSKOW, *supra* note 8, at 7.

²⁵¹ See *id.*

²⁵² See generally *id.*

²⁵³ See generally *id.* Cf. generally D.P.U. 86–36-G, at 79 (failure to internalize externalities through price or other means increases likelihood of suboptimal choice).

²⁵⁴ See generally JOSKOW, *supra* note 8, at 7; Black & Pierce, *supra* note 80, at 1392 (power producers will reduce emissions if doing so costs less than the emissions tax).

²⁵⁵ See, e.g., CAL. PUB. UTIL. CODE § 381.

²⁵⁶ See generally Jon Steinman, *Green Power May Be Too Pricey for the People—Deregulation: Environmentalists Worry That the Cost of Eco-friendly Electricity Will Discourage Consumers From the Choice Come January*, L.A. TIMES, Nov. 18, 1997, at B1 (one poll indicated 30% of California's consumers would pay premium for environmentally safe energy; most people will choose power provider based on price).

²⁵⁷ See, e.g., Stephen Bernow et al., *Quantifying the Impacts of a National, Tradable Renewables Portfolio Standard*, ELECTRICITY J., May, 1997, at 42–43; see also Woolf & Biewald, *supra* note 107, at 64–65 (renewable energy technologies could reduce CO₂ emissions from electricity, whereas coal and even gas may increase those emissions).

California's and Massachusetts' restructuring statutes provide for the subsidization of conservation and electricity generated with renewable energy.²⁵⁸ Without explicitly calling for electricity price mechanisms to account for environmental externalities, the statutes' subsidy provisions would, like adders, increase the relative cost of electricity options with high environmental impacts and decrease the cost of environmentally preferable electricity.²⁵⁹ California's A.B. 1890, for example, creates a special mandatory ("non-bypassable") rate component to fund certain environmental programs, to be collected by the distribution service on the basis of electricity usage.²⁶⁰ This charge will be used to fund cost-effective energy efficiency and conservation activities and in-state operation and development of existing, new and emerging renewable energy technologies.²⁶¹

Massachusetts similarly promotes energy efficiency and renewable energy sources in its electricity restructuring plan.²⁶² The Massachusetts restructuring statute creates, for example, a five-year mandatory charge per kilowatt-hour (kWh) for most electricity consumers to fund energy efficiency and DSM programs.²⁶³ Chapter 164 of the Massachusetts General Laws also requires the Commonwealth's Department of Revenue to investigate a possible income tax deduction for purchases of specified minimum levels of renewably generated electricity and for purchases of energy efficient equipment such as high-efficiency lighting.²⁶⁴ The statute directs the Secretary of Administration and Finance to study the possibility of requiring all state agencies and facilities to purchase electricity that includes a minimum of ten percent derived from renewable energy sources.²⁶⁵

²⁵⁸ See *infra* notes 260–68 and accompanying text.

²⁵⁹ See *generally infra* notes 260–68 and accompanying text.

²⁶⁰ See CAL. PUB. UTIL. CODE § 381.

²⁶¹ See *id.* Energy efficiency and conservation activities are to be funded at over \$228 million per year for the first three years of restructuring. See *id.* Renewable resource technologies are to be funded at \$109.5 million or more per year during this period. See *id.* The legislature stipulated that these programs should include options that reward the most cost-effective generation. See *id.* § 383. The statute effectively defines renewable energy resources as those whose electricity is not produced by nuclear energy, hydropower facilities greater than 30 megawatts, non-cogeneration fossil-fuel burning facilities or facilities that derive more than 25% of their energy from fossil fuel. See *id.*, § 381(b)(3); see also § 2805 (defining "conventional" power sources). The legislature particularly cited the need to support certain emerging photovoltaic and innovative solar thermal technologies and renewable energy facilities. See *id.* §§ 381(c)(3),(h), 383(a)(1),(3).

²⁶² See *infra* notes 263–68 and accompanying text.

²⁶³ See MASS. GEN. LAWS ch. 25, § 19. This charge is to be 3.3 mills (\$0.0033) per kWh the first year and decrease every year down to 2.5 mills per kWh. See *id.* Municipal lighting company electricity consumers are exempted from the charge. See *id.*

²⁶⁴ See Act of Nov. 25, 1997, ch. 164, § 318, 1997 Mass. Legis. Serv. at 714–15.

²⁶⁵ See *id.* § 330. Section 331 of the Act also requires state agencies doing new construction

Similar to California, Massachusetts' deregulatory legislation requires a five-year mandatory per kWh charge for most of the Commonwealth's electricity consumers to support the development of renewable energy projects.²⁶⁶ The revenues from renewable energy charges are to be paid into the Massachusetts Renewable Energy Trust Fund established by chapter 164.²⁶⁷ The purpose of the fund is to promote the increased availability, use and affordability of renewable energy in a more competitive energy marketplace.²⁶⁸

c. *Labeling Electricity Products*

Massachusetts' electricity product labeling requirement is another market-based regulatory mechanism that may be useful in controlling the environmental externalities of electricity generation.²⁶⁹ One necessary condition for efficiently functioning markets is full information about the products/services being selected by the consumer.²⁷⁰ Often, however, the market itself fails to provide full information, particularly concerning deleterious aspects or side-effects of products.²⁷¹ Manda-

or substantial renovations to design and build so as to reduce facility life cycle costs by using energy efficiency or renewable energy technologies. *See id.* § 331.

²⁶⁶ *See* MASS. GEN. LAWS ch. 25, § 20. The renewable energy project charge is set at 0.75 mills/kWh the first year, goes up to 1.25 mills/kWh by the third year and then decreases to 0.5 mills/kWh by the fifth year. *See id.*

²⁶⁷ *See id.*, § 68; MASS. GEN. LAWS ch. 40J, § 4E.

²⁶⁸ *See* MASS. GEN. LAWS ch. 25 §§ 20, 68; MASS. GEN. LAWS ch. 40J, § 4E. For purposes of expenditures from the fund, renewable energy technologies include solar and wind energies, ocean thermal, wave, or tidal energy; fuel cells; landfill gas; naturally flowing water and hydroelectric and low emission; and advanced biomass power conversion technologies such as gasification of agricultural and food wastes. *See* MASS. GEN. LAWS ch. 40J, § 4E(f)(1). Circumscribed funding is also available for waste-to-energy projects for a limited time. *See id.*

Beyond the promotion of renewable energy, the fund may also be used to advance public interests in the protection of the environment through the prevention, mitigation and alleviation of adverse pollution effects associated with certain types of electricity generation. *See id.* § 4E(c). To advance these purposes and the purpose of promoting renewable energy, the fund may be used to make grants, loans, equity investments, energy production credits, bill credits or rebates to customers. *See id.* § 4E(d). The Division of Energy Resources is required to issue an annual report containing information on the extent to which the energy markets are achieving the energy efficiency and fuel diversity goals of the state. *See* MASS. GEN. LAWS ch. 25A, § 11E.

²⁶⁹ *See infra* notes 270-83 and accompanying text.

²⁷⁰ *Cf. Re Pricing and Rate-making Treatment for New Electric Generating Facilities Which Are Not Qualifying Facilities*, D.P.U. 86-36-F, 98 Pub. Util. Rep. 4th (PUR) 76, 82-83 (Mass. D.P.U. 1988) [hereinafter D.P.U. 86-36-F] (information barriers helped caused market failure concerning some electricity options).

²⁷¹ *See, e.g.,* H.R. REP. NO. 449 (1965), *reprinted in* 1965 U.S.C.C.A.N. 2350, 2352 (legislative history of federal cigarette labeling act noting public relies on government for cautionary labeling of hazardous substances, thus Congress should take affirmative action to require cautionary health warning on cigarette packages); H.R. REP. NO. 1861 (1960), *reprinted in* 1960 U.S.C.C.A.N.

tory uniform labeling requirements may, therefore, be necessary to make market choices optimize the allocation of consumer dollars.²⁷² In a competitive electricity market, labeling electricity products with environmental impact and fuel-source information could theoretically enable consumers to select environmentally preferable electricity options, thereby reducing environmental externalities.²⁷³

Massachusetts' chapter 164 requires such labeling for electricity products.²⁷⁴ For example, before service is initiated by a generation company, the company must give the customer a written statement on the fuel mix and emissions of the generation sources the company uses.²⁷⁵ The company is also allowed to advertise the environmental benefits of the power sold, although there is no requirement to do so.²⁷⁶

Moreover, the Massachusetts Department of Telecommunications and Energy is directed to promulgate uniform labeling regulations for energy suppliers.²⁷⁷ The labeling must include fuel sources as well as air emissions of sulfur dioxide, nitrogen dioxides, CO₂, heavy metals and any other emission which the Department may determine causes significant health or environmental impact and for which sufficiently accurate and reliable data is available.²⁷⁸ Electrical suppliers are required to present such information to customers, including information about environmental characteristics of the sale of electric power products.²⁷⁹

In addition, chapter 164 requires the Massachusetts Commissioner of Energy Resources to provide consumers with information giving a consistent and reliable basis for comparing electricity services offered in the market.²⁸⁰ That information *may* include billing inserts providing information that allows consumers to select their electricity

2833, 2834 (legislative history of Federal Hazardous Substances Act noting need for mandatory labeling of hazardous materials; many have been injured or killed by substances not bearing adequate cautionary labels).

²⁷² See generally *supra* notes 270–71 and *infra* notes 274–83 and accompanying text.

²⁷³ See generally *infra* notes 274–83 and accompanying text.

²⁷⁴ See *infra* notes 275–83 and accompanying text.

²⁷⁵ See MASS. GEN. LAWS ch. 164, § 1F(5)(i) (1997).

²⁷⁶ See *id.* § 1F(5)(ii-iii).

²⁷⁷ See *id.* § 1F(6).

²⁷⁸ See *id.* Voluntary environmental labeling programs for electricity, such as the "Greene" program in California run by the Center for Resource Solutions, have also appeared in the restructured electricity market. See Natural Resources Defense Council, *Choosing Clean Power in California* (visited Feb. 10, 1998) <<http://www.nrdc.org/nrdc/howto/cncagp.html>.

²⁷⁹ See MASS. GEN. LAWS ch. 164, § 1F(6).

²⁸⁰ See MASS. GEN. LAWS ch. 25A, § 11D.

suppliers based on resource type and environmental considerations.²⁸¹ The Commissioner also *may* disseminate information identifying the mix of fuel and power generation sources and the level of air emissions for the different electricity services offered in the market.²⁸² Thus, one of the premises of restructuring seems to be that optimal environmental protection in electricity generation will be determined through a market governed by informed consumers selecting the level of emissions and the types of fuels they believe are best.²⁸³

2. Non-Market Regulatory Mechanisms for Controlling Externalities Like Carbon Dioxide

a. *Emission Performance Standards*

State restructuring schemes are also incorporating other regulatory mechanisms that more closely resemble conventional command-and-control environmental regulation.²⁸⁴ Under chapter 164 in Massachusetts, for example, to prevent and mitigate the impacts of pollutants from fossil fuel-fired generation facilities, the Department of Environmental Protection ("DEP") is required to promulgate uniform generation performance standards for emissions produced per unit of electrical output for any pollutant DEP determines to be a public health concern.²⁸⁵ DEP is only required, however, to have such a performance standard in place for one pollutant by May 1, 2003.²⁸⁶

Chapter 164 also amends statutory provisions concerning the state's Energy Facilities Siting Board ("the Board").²⁸⁷ The Board is required to review the need for, and the environmental impacts of, transmission lines.²⁸⁸ But the Board is no longer authorized to review the need for electrical generating facilities, and may only review their environmental impacts consistent with the policy of allowing market forces to determine the need for and cost of such facilities.²⁸⁹ To

²⁸¹ See *id.*

²⁸² See *id.*

²⁸³ See generally *supra* notes 274-82 and accompanying text.

²⁸⁴ See *infra* notes 285-95 and accompanying text.

²⁸⁵ See MASS. GEN. LAWS ch. 111, § 142N.

²⁸⁶ See *id.* If other northeastern states enact similar standards before May of 2003, DEP *may* adopt such standards. See *id.*

²⁸⁷ Compare MASS. GEN. LAWS ch. 164, § 69H (1997) with MASS. GEN. LAWS ch. 164, § 69H (1996).

²⁸⁸ See MASS. GEN. LAWS ch. 164, § 69H (1997).

²⁸⁹ See *id.* Compare MASS. GEN. LAWS ch. 164, §§ 69I, 69J (1996) (previously requiring construction of electricity facilities to be consistent with filed long-range electricity demand forecasts)

"streamline" review of such applications, chapter 164 provides that the Board shall conduct rulemaking to establish a "technology performance standard" for generating facilities emissions, including sulfur dioxide, nitrogen oxides, particulate matter, fine particulates, carbon monoxide, volatile organic compounds and heavy metals.²⁹⁰ Notably, carbon dioxide emissions are not on this initial statutory list.²⁹¹ The standard is to reflect emission rates achievable by *fossil fuel* generating technologies, as demonstrated by air permits that have previously been issued by the DEP.²⁹²

Reflecting concerns similar to those expressed in DPU's prior externality adder program, chapter 164 also authorizes the Energy Facilities Siting Board to establish its own guidelines requiring sufficient data to enable it to review the local and regional land use impact, local and regional cumulative health impact, water resource impact, wetlands impact, air quality impact, solid waste impact, radiation impact, visual impact and noise impact of the proposed facility.²⁹³ But any such guidelines are generally not allowed to require any data related to the necessity or cost of the facility.²⁹⁴ Furthermore, chapter 164 does not require the Board to make findings regarding alternative generating technologies for the proposal, as long as the proposed facility meets the technology performance standard—i.e., matches the performance of previous air emission permits issued by DEP.²⁹⁵

b. *Mandatory Generation Portfolio Characteristics*

Another strategy for reducing CO₂ emissions and other electricity externalities is to require that a certain percentage of electricity offered for sale in the restructured market be generated using renewable energy.²⁹⁶ In its simplest form, such an approach would amount to a non-market, command-and-control mechanism for addressing such

with MASS. GEN. LAWS ch. 164, § 69J1/4 (1997) (now barring requirement of data related to necessity or overall cost of facility). Generating facilities may not be built unless approved by the Board. See MASS. GEN. LAWS ch. 164, § 69J1/4 (1997).

²⁹⁰ MASS. GEN. LAWS ch. 164, § 69J1/4 (1997).

²⁹¹ See *id.* The list, however, is not exclusive. See *id.*

²⁹² See *id.*

²⁹³ See *id.*

²⁹⁴ See *id.* Despite the fact that the statute generally does not require an analysis of cost or need, the statute provides that the generating facility "shall be deemed to contribute to a necessary energy supply for the commonwealth with a minimum impact on the environment at the lowest possible cost" upon satisfactory completion of board review. *Id.*

²⁹⁵ See MASS. GEN. LAWS ch. 164, § 69J1/4.

²⁹⁶ See, e.g., MASS. GEN. LAWS ch. 25A, § 11F; Bernow et al., *supra* note 257, at 42.

environmental externalities.²⁹⁷ Market mechanisms, in the form of credits for renewable generation tradable between electric companies, however, could be used to reduce the cost of such a mandate.²⁹⁸ Proposals for this type of "renewables portfolio standard" are being discussed or implemented at both the state and federal levels.²⁹⁹

The Massachusetts restructuring statute, for example, scheduled an increasing mandatory percentage of electricity to be generated from renewable energy.³⁰⁰ Under chapter 164, the Massachusetts Division of Energy Resources is required to determine the current percentage of kWh sales to end-use customers in the Commonwealth that is derived from renewable energy.³⁰¹ Every retail electricity supplier must then provide an additional one-half to one percent of sales of electricity derived from renewables to end-use customers each year after 2003.³⁰²

III. ANALYSIS

A. *Reaffirming the Twin Policy Objectives of Least-Cost and Environmental Protection in the Restructuring of the Electricity Industry*

Since 1920 a growing theme in federal power regulation has been that electricity must be organized in a way that also serves the nation's environmental interests.³⁰³ PURPA and EPAct made this theme explicit

²⁹⁷ See generally Bernow et al., *supra* note 257, at 43.

²⁹⁸ See, e.g., *id.* at 42, 43. Generators using renewable energy in such a credit system would have two sources of income—one from the sale of their electricity, and another from the sale of renewable energy credits to generators or retail electricity suppliers in regions short on renewable generation. See *id.* at 43. A credit system is not just a market tool for achieving least-cost power. See *id.* at 44. It is also a means of overcoming the fact that some regions may be able to produce more renewably generated electricity than others, due to an abundance of wind, available solar energy, tidal power, etc. See *id.*

²⁹⁹ See, e.g., MASS. GEN. LAWS ch. 25A, § 11F; see also Bernow et al., *supra* note 257, at 42.

³⁰⁰ See *infra* notes 301–02 and accompanying text.

³⁰¹ See MASS. GEN. LAWS ch. 25A, § 11F.

³⁰² See *id.* § 11F(a). The statute creates the following schedule for increases in electricity derived from renewable energy: an additional one percent of sales by the end of 2003, an additional one-half percent of sales each year from 2004 through 2009, and an additional one percent of sales from 2010 on until determined otherwise by the Division of Energy Resources. See *id.* Chapter 164 considers solar, wind, ocean thermal, wave or tidal energy, fuel cells utilizing renewable fuels, landfill gas and low-emission biomass power conversion as renewable energy generating sources for these purposes. See *id.* § 11F(b). Waste-to-energy electricity generation from municipal solid waste and hydroelectric power may be counted as renewable generating sources in the base calculation until December 31, 1998. See *id.* The Division of Energy Resources is allowed to add other renewable energy technologies to the list, but coal, oil, natural gas except when used in fuel cells, and nuclear power are statutorily excluded from classification as renewable energy supplies for this calculation. See *id.*

³⁰³ See, e.g., *supra* notes 60–78 and accompanying text.

and planted it firmly alongside the goal of least-cost power in federal and state approaches to electricity regulation.³⁰⁴ Even in the heat of deregulatory restructuring, both California and Massachusetts have legislatively asserted that environmental protection goals are central to any reorganization of the electric industry.³⁰⁵ Thus, appraisal of evolving electricity restructuring proposals should include an analysis of how well they will address environmental externalities.³⁰⁶ In any analysis of the restructuring of the industry the question should not simply be: "How can we obtain the cheapest power?" The question should instead be: "How can we obtain low-cost, reliable power in ways that advance our national environmental goals?"³⁰⁷

Some enthusiasts for market and price as sole determiners of social investment might claim that deregulation of electricity and reliance on price will alone take care of environmental externalities.³⁰⁸ But the record of price in adequately assigning costs in the electricity industry is not reassuring.³⁰⁹ If price alone will not achieve our national environmental objectives, policymakers will need to enact regulatory mechanisms to intervene in the market.³¹⁰

The following analysis looks at some of the historic environmental failures of price in the electricity industry.³¹¹ It examines why price may have difficulty addressing environmental problems like CO₂ emissions, thus leaving them as externalities.³¹² It explores the advantages and shortcomings of some of the mechanisms developed by the states to intervene in the electricity market to answer environmental concerns.³¹³ Finally, it suggests some of the additional steps that could be

³⁰⁴ See *supra* notes 89–103, 121–34 and accompanying text.

³⁰⁵ See, e.g., Act effective Sept. 24, 1996, ch. 854, §1(a), 1996 Cal. Legis. Serv. 3678, 3679 (West); Act of Nov. 25, 1997, ch. 164, § 1(l), 1997 Mass. Legis. Serv. 637, 638 (West).

³⁰⁶ See generally Act effective Sept. 24, 1996, ch. 854, §1(a), 1996 Cal. Legis. Serv. at 3679; Act of Nov. 25, 1997, ch. 164, § 1(l), 1997 Mass. Legis. Serv. at 638.

³⁰⁷ See generally *supra* note 304 and accompanying text.

³⁰⁸ See, e.g., Iribe, *supra* note 13 (competition can be expected to provide lowest possible price and improve environmental performance); Bruce Biewald, *Competition and Clean Air: The Operating Economics of Electricity Generation*, ELECTRICITY J., Jan.-Feb. 1997, at 41, 42 (quoting utility official's argument that competition will produce environmental benefits because older coal and oil plants will not be economically viable in competitive market); *What is deregulation?*, BOSTON GLOBE, Mar. 17, 1998, at F1, F8 (some think competition will do more to improve environment than regulation ever did). But see Biewald, *supra*, at 44, 45 (one study concludes that existing dirtier plants will be competitive economically; competition alone cannot be counted on to improve environment); Woolf & Biewald, *supra* note 107, at 68 (older coal plants likely to be very competitive relative to new gas facilities and thus unlikely to be retired).

³⁰⁹ See, e.g., *infra* notes 315–26 and accompanying text.

³¹⁰ See, e.g., *supra* notes 60–71, *infra* note 319 and accompanying text.

³¹¹ See *infra* notes 315–26 and accompanying text.

³¹² See *infra* notes 327–417 and accompanying text.

³¹³ See *infra* notes 418–79 and accompanying text.

taken to better achieve the public goal of environmental protection within a restructured electricity industry.³¹⁴

B. The Limitations of Price in Addressing Long-Term, Global Environmental Problems Like Climate Change

1. Historic Failures of Price to Protect the Environment and Prevent Environmental Externalities

Price has repeatedly failed to signal full costs in the generation and use of electricity.³¹⁵ The cost of damming a river in 1920, in concrete and steel, labor and capital, for example, did not adequately capture the costs to society of impaired navigation or fisheries.³¹⁶ The federal government was forced to intervene, through the FWPA and other regulation of hydropower dam construction, to protect navigation, fisheries and other public interests that the market had failed to safeguard adequately.³¹⁷ Similarly, the market costs of erecting a coal-fired generating station in 1969 did not adequately reflect the social costs that the station imposed by degrading air quality.³¹⁸ The government was forced to mandate air pollution control through the 1970 Clean Air Act Amendments in order to protect air quality interests not previously recognized in conventional price-based decision-making.³¹⁹ If the market, by itself, had been sufficient to allocate all the environmental costs of electricity production to electricity companies without intervention, statutes like the 1970 Clean Air Act should not have been necessary.³²⁰ Instead, the market repeatedly has had to be corrected by

³¹⁴ See *infra* notes 480-518 and accompanying text.

³¹⁵ See *infra* notes 315-26 and accompanying text.

³¹⁶ See generally *supra* notes 60-71 and accompanying text.

³¹⁷ See generally *supra* notes 60-78 and accompanying text. Sadly, even upon regulation the government itself often undervalued public environmental resources. See, e.g., Pinchot, *supra* note 61, at 11.

³¹⁸ See *infra* note 319.

³¹⁹ See generally H.R. REP. NO. 91-1146 (1970), reprinted in 1970 U.S.C.C.A.N. 5356, 5360, 5356, 5357 (observing that air pollution continues to threaten health and well-being of American people and that strategies previously pursued against air pollution have been inadequate; establishment of national air quality standards by Clean Air Act Amendments will assure war against air pollution will take place nationwide). Prior to the 1970 amendments to the Clean Air Act, emissions standards for stationary sources of air pollution, like electricity generating plants, were established exclusively state by state. See *id.* at 5358. Members of Congress believed that national air emission standards would preclude states competing to attract plants by means of inadequate state air pollution regulations. See *id.* The amendments did not address CO₂ emissions, see *id.* at 5357 & n.1, a problem then just beginning to be suspected by only a small section of the scientific community. See generally *supra* notes 183-84 and accompanying text.

³²⁰ See generally *supra* note 319.

state and federal regulation to prevent the imposition on the public of the environmental costs of electricity.³²¹

As the Massachusetts DPU itself warned when it first announced its original environmental externalities ruling:

In a competitive resource market in which price plays a predominant role in determining the business success of competing resource developers, there is a danger of increasing the pollution of valuable environmental resources. This occurs because resource developers have the incentive to minimize environmental controls in order to minimize production costs, which in turn enables them to keep their price as low as possible (thus increasing their chances of winning a competitive resource solicitation), and affords them the opportunity to make private profits. By minimizing environmental controls, environmental costs external to the production and sale of energy increase Failure of the resource selection process to consider the differences in environmental impacts between various resource types—either by failing to internalize such environmental externalities directly with the price of energy produced by such options or by some nonprice mechanism that assigns a value on externalities produced or avoided—increases the likelihood of selecting suboptimal energy projects.³²²

Thus, in some respects the market is not only inadequate to guide consumers' allocation of resources in a way that advances the public goal of environmental protection and least overall cost, it may, in some instances, guide investment and consumption in directions that damage the environment and increase long-term cost.³²³

The market repeatedly ignored negative externalities imposed by the electric industry on the public.³²⁴ The market also failed to direct consumer and utility investment to environmentally preferable electric-ity options like energy conservation and renewable energy.³²⁵ This

³²¹ See, e.g., *supra* note 319.

³²² D.P.U. 86-36-G, available in 9 Massachusetts Administrative Law Library, Department of Public Utilities File (Jan. 1998), at 79 (Mass. D.P.U. 1989).

³²³ See *id.*; see also Congressional testimony to Senate Committee on Energy and Natural Resources by Julie A. Keil (president of the National Hydropower Association), May 8, 1997, available in 1997 WL 10571005 (in competitive electric sector decisions made are based exclusively on economic, cost-driven theories that do not recognize natural resource or environmental values).

³²⁴ See, e.g., *supra* notes 206-08, 319.

³²⁵ See *infra* notes 340-43 and accompanying text; see also Edward Rubin et al., *Realistic Mitigation Options for Global Warming*, 257 SCIENCE 148, 262, 264 (1992) (existing cost-effective

failure was evident, for example, in the lack of investment in cost-effective energy efficient lighting and appliances until regulators intervened.³²⁶

One of the principal environmental concerns regarding deregulation is that conservation and renewable energy may have difficulty making progress in a competitive electricity market.³²⁷ It is widely expected that renewable power from solar, wind, geothermal and other sources will cost more than conventional power—perhaps ten to twenty percent more.³²⁸ If California is any indication, though some niche marketers may sell their power based on its renewable energy content, most electricity will be marketed and purchased on the basis of low price rather than environmental considerations.³²⁹

The numerous provisions in restructuring statutes that constrain, adjust and modify the competitive generation market, suggest policy-makers are aware that price, on its own, will not adequately control environmental externalities and steer power purchases to environmentally preferable resources like conservation and renewable energy.³³⁰ For example, if legislatures were confident an electricity system governed solely by competitive pricing would steer sufficient investment to the generation of electricity with renewable energy, there would be no need to subsidize or require the use of renewable energy sources.³³¹ But both California and Massachusetts legislatures mandated support for renewable energy in their electricity restructuring statutes.³³² Similarly, the decade spent by numerous public utility commissions attempting to develop environmental externality adder mechanisms to

technologies could reduce electricity use by 45%, eliminate 515 million metric tons of CO₂ emissions per year and save American consumers \$30 billion annually; information barriers, institutional problems and other obstacles make it unlikely these measures will be fully implemented in absence of effective policy tools and incentives).

³²⁶ See *infra* text accompanying notes 340–43.

³²⁷ See, e.g., Keil, *supra* note 323. But see Greg Johnson, *Color of Power—'Green' Energy Firms' Tactics Mark Change in a Sleepy Industry*, L.A. TIMES, Nov. 20, 1997 at D4 (surveys suggest that 70% of Americans might embrace green power if prices are not too far out of line; early reports suggest green power marketing tests drawing 20% of customers).

³²⁸ See, e.g., Natural Resources Defense Council, *supra* note 278; Steinman, *supra* note 256, at B1; see also Adam Pertunan, *Principle, Not Price, Sells Green Power*, BOSTON GLOBE, Mar. 17, 1998, at F8 (most analysts predict alternative nonpolluting electricity will cost more).

³²⁹ See, e.g., Johnson, *supra* note 327, at D4 (battle over California's electricity market will be waged mostly on price); see also Pertunan, *supra* note 328, at F8 (most consumers will be driven primarily by lower prices in choosing power suppliers; studies show 5–33% of Massachusetts consumers will choose "green" electricity).

³³⁰ See generally *supra* notes 258–95 and accompanying text.

³³¹ See *supra* notes 258–61, 266–68, 300–02 and accompanying text.

³³² See *supra* note 331.

compensate for unregulated CO₂ emissions and other unaddressed costs of electricity generation also suggests regulatory awareness of the shortcomings in price.³³³ Even some of the harshest critics of adders admitted that certain environmental costs were not adequately incorporated in the price of electricity.³³⁴

2. Why Price May Fail to Address Long-Term, Global Environmental Problems Like Climate Change

The repeated failure of price to serve successfully both principal public objectives for the electricity industry—least-cost power and environmental protection—suggests that price is inadequate for achieving certain public purposes.³³⁵ There are a number of credible explanations for this possible limitation.³³⁶ The limitations of price may spring from some combination of: 1) information costs to consumers, discouraging change from the status quo; 2) the relatively short time frame used by individual consumers to assess costs and benefits compared to the much longer time frames appropriate for societal decisionmaking; 3) the difficulty of pricing geographically diffused costs, particularly those which will be borne by millions of widely dispersed individuals; 4) the difficulty of assessing costs for harms whose full magnitude is uncertain; and 5) the non-recognition by the market of important social values—like neighborliness, altruism, belief in international equity, reverence for the diversity of life, religious tenets and hope for our children's children.³³⁷ Each of these factors which may impair the adequacy of price in allocating resources is discussed below, with particular emphasis on its relation to CO₂ emissions.

a. *The Problem of Information Costs*

The market may have difficulty reliably steering consumers to least-cost and environmentally preferable electricity options in part

³³³ See *supra* notes 203–37 and accompanying text.

³³⁴ See, e.g., JOSKOW, *supra* note 8, at 3, 11.

³³⁵ See, e.g., *infra* notes 340–43 and accompanying text; see also John H. Cushman Jr., *U.S. Says Its Greenhouse Gas Emissions Are at Highest Rate in Years*, N.Y. TIMES, Oct. 21, 1997, at A22 (quoting observation of director of American Council for an Energy-Efficient Economy, in face of increased U.S. CO₂ emissions in 1996 despite commitment to reduce greenhouse gases, that “[l]aissez-faire does not work”).

³³⁶ See *infra* notes 338–417 and accompanying text.

³³⁷ See, e.g., GELBSPAN, *supra* note 188, at 131 (quoting Philippine environmental official's observation that climate change problem necessitates transcending greed; ultimately is question of ethics).

because of the problem of information costs.³³⁸ The time it takes a consumer to uncover information on cost-saving alternatives and to calculate if those cost-savings apply to the consumer's existing equipment and/or patterns of usage represents an additional cost to the consumer for any change from the status quo.³³⁹

A revealing example of a failure of market mechanisms in the electric industry caused by information barriers was the failure of consumers to buy energy-efficient lighting, refrigerators and other appliances in the 1980s, even where those appliances were cost-effective.³⁴⁰ As the California PUC admitted, programs that transform the market for energy-efficient products, for example by increasing building or appliance standards, are unlikely to be naturally provided by a competitive market.³⁴¹ The Massachusetts DPU similarly noted the dysfunction of the market in consumer failures to invest in cost-effective electricity-saving technologies.³⁴² Consumers frequently did not invest in electricity-conserving lighting, appliances and other technologies, even where those technologies were cost-effective when compared to the alternative of purchasing more electricity for conventional lighting and appliances.³⁴³

In explaining this market failure, the Massachusetts DPU agreed with commenters that consumer lack of information, particularly concerning recently developed technologies, was a cause of the lack of investment in cost-effective technologies.³⁴⁴ Thus, information barriers prevented market price from directing investment to the least-cost

³³⁸ See generally Coase, *supra* note 2, at 15 (observing that transaction costs, including discovering whom to deal with, are often sufficiently costly to prevent many otherwise desirable transactions).

³³⁹ See generally D.P.U. 86-36-F, 98 Pub. Util. Rep. 4th (PUR) at 82-83, 84 (consumers may fail to make cost-effective choices due to lack of information); Union of Concerned Scientists, *Market Barriers* (visited Feb. 10, 1998) <<http://www.ucsusa.org/energy/barriers.market.html>> (retail customers may have much less sophisticated understanding and modeling tools than utilities and industrial communities who themselves undervalue renewable energy).

³⁴⁰ See generally D.P.U. 86-36-F, 98 Pub. Util. Rep. 4th (PUR) at 82-83, 84.

³⁴¹ See Decision 95-05-045, 161 Pub. Util. Rep. 4th (PUR) at 258.

³⁴² See generally D.P.U. 86-36-F, 98 Pub. Util. Rep. 4th (PUR) at 82-83.

³⁴³ See *id.*; see also Decision 95-05-045, 161 Pub. Util. Rep. 4th (PUR) at 258.

³⁴⁴ See D.P.U. 86-36-F, 98 Pub. Util. Rep. 4th (PUR) at 82, 83. The DPU concluded consumers did not invest in energy-efficient electrical appliances for two other important reasons. See *id.* at 83. Some consumers lack the capital to make the initial investments in cost-effective lighting, appliances and other conservation options. See *id.* Electricity-saving devices often involve a higher initial cost. See *id.* Consequently, lack of capital may result in consumer investment in devices which are cheaper in the short-run, but more costly over the long-run. See generally *id.* The DPU further noted institutional barriers to investment in energy-efficient devices—for example, where landlords install the lighting and appliances, but tenants pay the electricity bills. See *id.* The landlord may therefore have an economic incentive to install cheaper lighting and appliances,

method of meeting demand.³⁴⁵ Because these market imperfections led to lack of investment in cost-effective conservation technologies, the DPU required direct involvement of utilities in marketing and implementing conservation options.³⁴⁶ In other words, government had to apply correctives to such market failures to capture the environmental and least-cost benefits of such conservation technologies.³⁴⁷ In the telling example of cost-effective conservation appliances, the market failed to advance the public objectives of least-cost and environmental protection adequately.³⁴⁸

A corollary to the problem of information costs is the fact that small cost-advantages for a given electricity option may only be apparent when aggregated over large numbers of consumers, and will not readily appear when calculated at the level of a single consumer or household.³⁴⁹ Aggregated demand has a bearing on information costs in that it may be cost-effective for utilities or utility commissions analyzing the aggregated demand of tens of thousands of consumers to hire expert staff to make comparisons on how to answer that demand at the least cost.³⁵⁰ In most cases it would not be equally cost-effective for an individual consumer to hire such expertise.³⁵¹

Mandatory labeling requirements, where electric companies distill the research on the environmental impacts of their product and present that information in a standardized format easily comparable to other companies' products, is a necessary, partial step in correcting this information costs problem.³⁵² From the corporate standpoint, the presentation of environmental impacts in readily comparable form is only a market advantage to the few companies with the least polluting generation of power.³⁵³ Thus, such labeling would not likely be done

since the higher operating costs will be borne by other economic actors. *See id.* The tenants may not want to install energy-saving refrigerators, lighting fixtures, etc. since the duration of their occupancy of the rental unit may be uncertain or limited. *See id.*; *see also* Rubin et al., *supra* note 325, at 264 (lack of information is one explanation for consumer failure to invest in cost-effective electricity saving devices).

³⁴⁵ *See generally* D.P.U. 86-36-F, 98 Pub. Util. Rep. 4th (PUR) at 83, 84.

³⁴⁶ *See id.* at 84.

³⁴⁷ *See supra* note 344 and accompanying text.

³⁴⁸ *See supra* note 344 and accompanying text.

³⁴⁹ *See generally* Navarro, *supra* note 109, at 388-389 ("In a world of imperfect information with significant transaction costs, larger customers with resources to fathom the market will have better access to bargains than smaller customers . . ."); Union of Concerned Scientists, *supra* note 339 (retail customers may have much less sophisticated understanding and modeling tools than utilities and industrial communities who themselves undervalue renewable energy).

³⁵⁰ *See generally supra* note 349.

³⁵¹ *See generally supra* note 349.

³⁵² *See generally infra* notes 353-59.

³⁵³ *See generally supra* note 5.

by individual electric companies governed solely by profit and market considerations.³⁵⁴ From a social standpoint, quick comparability of the otherwise hidden environmental side-effects of electricity products helps consumers allocate resources optimally, thus overcoming information cost barriers to desirable transactions.³⁵⁵ Mandatory electricity labeling, properly done, is a clear case of regulatory intervention helping achieve the optimal allocation of social resources where the market itself would not have done so.³⁵⁶

b. *Problems in Accounting Over Long Time Frames*

In its analysis of the failure of consumers to invest in cost-effective electricity-conserving appliances, the Massachusetts DPU concluded that the time frame used by consumers to compare electricity options was too short.³⁵⁷ Consumers may not evaluate energy-saving technologies on the ten- to twenty-year product life cycle over which the savings occur, but may consider only those products with a short payback period.³⁵⁸ By contrast, the cost-effectiveness of utility investments in generating facilities may be examined over payback periods as long as twenty years.³⁵⁹ If consumers make purchases based on too short a payback time frame, they may actually invest in more costly means of meeting their demands, thereby leading to a failure of the market to allocate resources efficiently.³⁶⁰

Where the costs of an electricity option are not fully manifest for scores of years, or even centuries—as may be the case with the global warming impacts of CO₂ emissions—the inherent near-sightedness of individual consumer choices based on price may be even more problematic.³⁶¹ At best, individuals have perhaps a fifty-year time frame for analyzing the rationality of their own purchasing decisions, i.e., the length of their adult lives.³⁶² Costs of a purchase that must be “paid”

³⁵⁴ See generally *supra* note 5.

³⁵⁵ See generally Union of Concerned Scientists, *supra* note 339.

³⁵⁶ See *supra* notes 344–55 and accompanying text.

³⁵⁷ See D.P.U. 86–36-F, 98 Pub. Util. Rep. 4th (PUR) at 82–83.

³⁵⁸ See *id.* at 83; Ralph C. Cavanagh, *Least-Cost Planning Imperatives for Electric Utilities and their Regulators*, 10 HARV. ENVTL. L. REV. 299, 318 (1986); Rubin et al., *supra* note 325, at 263–64.

³⁵⁹ See, e.g., D.P.U. 86–36-F, Pub. Util. Rep. 4th (PUR) at 83.

³⁶⁰ See *id.* at 82–83.

³⁶¹ See *infra* notes 362–69 and accompanying text.

³⁶² See generally *Global Climate Change: Hearing Before the Senate Comm. on Energy and Natural Resources*, 104th Cong. 25–26 (1996) (statement of Timothy E. Wirth, Under Secretary of State for Global Affairs) (in understanding the limits and opportunities in what an industry can do, we should be asking what does that industry want to look like in 2020, 2030 or 2050); PIGOU, *supra* note 1, at 26.

more than fifty years into the future are probably ignored in making current purchases, or so heavily discounted that they are, for all practical purposes, ignored.³⁶³ Thus, from the perspective of an individual consumer, cheap natural gas-fired electricity today might be a rational choice, even if it would cause global climate disaster a century from now.³⁶⁴

Unlike individuals, society must make decisions based on its needs for centuries, since it will last longer than the individuals who comprise it.³⁶⁵ Thus, what is rational from an individual economic point of view may be irrational from a societal point of view.³⁶⁶ Moreover, there are intergenerational inequities in making decisions now that have irreversible negative impacts on future generations.³⁶⁷ A decision by millions of individual market actors to burn off all of the earth's fossil fuels now at maximum consumption rates at the cost of a depleted and overheated earth, a century hence may represent such a disjuncture between individual and social rationality.³⁶⁸ In such cases, particularly

³⁶³ See generally PIGOU, *supra* note 1, at 26-30 (analyzing discrepancy between valuation of present satisfactions and satisfactions to be had in distant future); Cudahy, *supra* note 110, at 427 (markets not notable for long-term foresight).

³⁶⁴ See generally PLATER ET AL., *supra* note 4, at 30, 33 (interests of the future underrepresented in market; unborn generations who will inherit environmental problems generated in this century have no say in today's marketplace; efforts at monetization too heavily discount future values, such as preserving natural patrimony for future generations); see also Union of Concerned Scientists, *supra* note 339 (suggesting in deregulated electric market energy decisions will be made using shorter payback periods than utility discounted rates generally used; even investments cost-effective to society based on long-term economic savings will be ignored).

³⁶⁵ See generally United Nations Framework Convention on Climate Change, May 9, 1992, art. 3, 31 I.L.M. 849, 854 [hereinafter Framework Convention on Climate Change] (parties should protect climate system for benefit of present and future generations); H.R. REP. NO. 102-474(I), at 133 (1992), *reprinted in* 1992 U.S.C.A.N. at 1956 (in crafting EPAct legislators endeavored to take the long view by developing infrastructure that will steadily improve our environment, energy security into 21st century).

³⁶⁶ See, e.g., *supra* notes 362-65, *infra* note 367-69 and accompanying text.

³⁶⁷ See generally GORE, *supra* note 5, at 190-91 (criticizing accepted formula of conventional economics that heavily discounts value of resources to future generations; effect is to magnify the power of current generation to compromise all future generations; need for intergenerational equity not yet reflected in current economic system); K.S. SHRADER-FRECHETTE, BURYING UNCERTAINTY: RISK AND THE CASE AGAINST GEOLOGICAL DISPOSAL OF NUCLEAR WASTE 189-201 (1993) (summarizing philosophical and ethical arguments for a duty to future generations and rebutting position that no duty is owed to future generations).

³⁶⁸ See PIGOU, *supra* note 1, at 28, 29; see also SHRADER-FRECHETTE, *supra* note 367, at 193 (at simplest level intergenerational equity means each generation will have same opportunity to use resources like oil, clean air, soil, water or be compensated for the depletion of those resources); Cudahy, *supra* note 110, at 426 (simple common-sense virtue of conserving energy speaks for itself; waste is never sound policy). In 1932, in a disturbingly early framing of the problem, Pigou wrote:

There is also waste, in the sense of injury to the sum total of economic satisfaction,

where future consequences are extreme, society may not be able to afford to let the market alone make the decision.³⁶⁹

Thus, while it may be correct that the current value of a given power plant's or even state's contribution to global warming may be small,³⁷⁰ a given state or nation may still want to spend more now on non-CO₂ emitting power sources.³⁷¹ This decision would be difficult enough to make for politicians and regulators who are paid to review hundreds of pages of scientific reports and testimony; it is nearly impossible for the market to make through the actions of individual consumers.³⁷² Such a decision would likely be irrational in *market* terms because of the low market value of events which may occur scores of years into the future.³⁷³ For situations where what is rational for society is irrational for individual consumers, society may need to make and implement investment decisions by non-market means.³⁷⁴

c. *Problems in Accounting for Diffused Global Impacts and Impacts on Community Members who have Little Cash*

When the harms of pollution are widely dispersed, and particularly when the individuals harmed are not in a position to bargain with the polluter, market failure is likely.³⁷⁵ In the context of electricity production and global warming, this shortcoming of the market may

when one generation . . . uses up for trivial purposes a natural product which is abundant now but which is likely to become scarce and not readily available, even for every important purposes, to future generations. This sort of waste is illustrated when enormous quantities of coal are employed in high-speed vessels in order to shorten to a small degree the time of a journey that is already short. We cut an hour off the time of our passage to New York at the cost of preventing, perhaps, one of our descendants from making the passage at all.

Pigou, *supra*, at 28. Pigou's example raises clearly the general problem of non-conservation for the future, even though we know that technology may be able to compensate for resource destruction in some cases, as here, where oil-powered transoceanic travel has now replaced coal-powered. *See id.*

³⁶⁹ *See, e.g., id.* at 29 (wide agreement that government should protect interests of future in some degree against irrational discounting and our preference for ourselves over our descendants).

³⁷⁰ *See, e.g., Joskow, supra* note 8, at 11; Black & Pierce, *supra* note 80, at 1417-18.

³⁷¹ *See generally* PIGOU, *supra* note 1, at 28-30.

³⁷² *See generally* Union of Concerned Scientists, *supra* note 339.

³⁷³ *See generally* GORE, *supra* note 5, at 191 (our economic system does not measure effect of decisions on future generations).

³⁷⁴ *See generally* PIGOU, *supra* note 1, at 29-30 (clear duty of government as trustee for unborn and present generations to defend, by legislative enactment if necessary, exhaustible resources from reckless spoliation).

³⁷⁵ *See* PLATER ET AL., *supra* note 4, at 32; *see also* Coase, *supra* note 2, at 18 (governmental regulation may lead to improvements in economic efficiency when, as is normally the case with

be best illustrated by the problem of small islands far removed from the consumption transactions of the American electricity system.³⁷⁶ As discussed above, consumption of cheap fossil-fuel fired electricity products may superficially benefit American consumers in terms of price, but lead to increased global warming which may cause territorial losses for some small islands.³⁷⁷ With the difficulty of foreign access to American courts, alongside difficulties of proving causation, legal remedies for these island losses seem unlikely.³⁷⁸ But even if monetary compensation to islanders could somehow be imposed on American producers and consumers of electricity, there may be no sum of money adequate to compensate for the loss of ancestral homelands.³⁷⁹ Similarly, Americans' sense of neighborliness, empathy or equity may make us unwilling to have our electricity system impose such burdens on others even if we paid more for the privilege of doing so.³⁸⁰

A related problem of the market is that it fails to recognize the needs of community members who have little cash.³⁸¹ In weighing the diminution in property value or the increased expenditures in remedial health care of a poor community due to global warming against the income savings of wealthy communities consuming large amounts of cheaper electricity, the cost-benefit balance may be unfairly skewed to the latter.³⁸² The undesirably skewed outcome in letting the market "solve" the emissions problems of the developed world at the expense of the poorer developing world is apparent, for example, in current

smoke nuisance, large numbers of people are involved and therefore transaction costs of handling the problem through the market would be high).

³⁷⁶ See generally *supra* notes 186-87 and accompanying text.

³⁷⁷ See generally *supra* note 376.

³⁷⁸ See, e.g., *Delgado v. Shell Oil Co.*, 890 F. Supp. 1324, 1335, 1372-73 (S.D. Tex. 1995) (dismissing under doctrine of forum non conveniens suit by thousands of foreign farmworker-plaintiffs alleging injury by U.S. pesticide used on farms abroad).

³⁷⁹ See generally GELSPAN, *supra* note 188, at 109 (quoting Samoan Ambassador's comment that "we will not allow some to barter our homelands . . . for short-term economic interest"); *id.* at 186 (quoting noted scientist's observation that "[i]t may be cost-effective, for example, to relocate the inhabitants of the Marshall Islands . . . but it wouldn't be moral"); Navarro, *supra* note 109, at 399 (marketed goods, like hamburgers, easy to value because they are regularly sold in the marketplace at posted prices; much more difficult to value non-marketed goods, such as clean air, because there are few if any markets where such amenities are bought and sold at posted prices).

³⁸⁰ See generally Union of Concerned Scientists, *Energy Solutions to Fight Global Warming* (visited Feb. 10, 1998) <<http://www.ucsusa.org/energy/energy.gwsolutions.html>> (as largest contributor of CO₂ emissions U.S. bears special responsibility for curbing global warming); *infra* note 409.

³⁸¹ See generally PLATER ET AL., *supra* note 4, at 30.

³⁸² See generally *infra* notes 384-89 and accompanying text.

discussions on "joint implementation" strategies for addressing the high CO₂ emissions of the industrialized world.³⁸³

Under joint implementation, a developed nation would not have to meet its emissions reductions targets within its own borders if, by acting jointly with another nation, it could meet reductions targets through actions there.³⁸⁴ Under such a scheme, a developed country could continue its CO₂ emissions from electric generating stations, but make up for them in the developing world by funding CO₂ emissions reduction or the creation of carbon dioxide "sinks," like forest preserves, there.³⁸⁵ Because preserving forest land and other remedial actions are often cheaper in the developing nations than in the developed world, such an approach is cost-effective and thus desirable in market terms.³⁸⁶ But joint implementation has proven controversial, particularly among the developing countries.³⁸⁷ Understandably, a plan where the United States will continue driving high fuel consumption cars and using large quantities of fossil-fuel fired electricity, while in exchange developing countries will submit to foreigners buying their forests and putting them off limits to local economic use, does not strike many in the developing world as the best approach to CO₂ reduction.³⁸⁸ When there are gross disparities in purchasing power between the world's human communities, cost-benefit market-based decisionmaking may distribute costs to the poor and benefits to the wealthy.³⁸⁹

³⁸³ See generally *infra* notes 384-89 and accompanying text.

³⁸⁴ See generally *International Energy Agency, Climate Change Policy*, *supra* note 189, at 15.

³⁸⁵ See, e.g., *supra* note 193. See generally Framework Convention on Climate Change, *supra* note 365, art. 3:3, 31 I.L.M. at 854 (efforts to address climate change may be carried out cooperatively by adherent nations); *International Energy Agency, Climate Change Policy*, *supra* note 189, at 15, 16 (many joint implementation efforts involving companies have involved afforestation projects in developing countries).

³⁸⁶ See, e.g., *Global Climate Change: Hearing Before the Senate Comm. on Energy and Natural Resources*, 104th Cong. 32-33 (1996) (statement of Senator Kyl) (arguing there are greater opportunities for emissions control in Third World countries in terms of cost/benefit than there are in the developing nations);

³⁸⁷ See, e.g., *International Energy Agency, Climate Change Policy*, *supra* note 189, at 15; Lemonick, *supra* note 193, at 24.

³⁸⁸ See generally *International Energy Agency, Climate Change Policy*, *supra* note 189, at 15; see also Framework Convention on Climate Change, *supra* note 365, art. 3:5, 31 I.L.M. at 855 (cooperation by adherent nations should lead to sustainable economic growth and development in all adherents, particularly developing countries). Energy efficiency and alternative energy technology transfers, however, might prove more acceptable forms of joint implementation. See generally Framework Convention on Climate Change, *supra* note 365, art. 4:5, 31 I.L.M. at 858 (developed countries shall take all practicable steps to facilitate transfer of environmentally sound technology, particularly to developing countries); *International Energy Agency, Climate Change Policy*, *supra*, at 175 (Clinton administration believes there is substantial potential in joint implementation projects, perhaps involving technology transfers).

³⁸⁹ See *supra* notes 384-88.

While the market often undervalues the needs of poor human communities because of their meager purchasing power, the market usually completely ignores the needs of non-human communities for similar reasons.³⁹⁰ Even if trees may occasionally have standing, they definitely have no purchasing power.³⁹¹ Thus, the last surviving colony of an endangered alpine wildflower species about to be extinguished by climate change, for example, has no way to register its own "demands" in market terms.³⁹² Unless someone with cash, or property rights exchangeable for cash, somehow sets a price on such a loss, the market will probably not recognize the loss.³⁹³

d. *The Problem of Uncertain Harms; the Precautionary Principle*

Uncertain harms may also be very difficult for market mechanisms to handle appropriately.³⁹⁴ Price, in part, reflects a summation of all past production costs of a product and all future costs which may be properly assessed against the product.³⁹⁵ Future costs, however, may not be easily predictable.³⁹⁶ Some cost-benefit accounting appears to assume each additional ton of CO₂ added to the atmosphere produces a proportional additional global warming harm as compared to each prior ton of CO₂ in a smooth linear progression.³⁹⁷ Where such a linear progression exists, a simple cost-benefit calculus of marginal costs versus marginal harms might make some sense, with every additional ton of CO₂ being counted as equivalent to a prior ton.³⁹⁸

Climate scientists have noted, however, that the climate system is non-linear in nature and future changes may involve surprises, particularly when the system is rapidly forced.³⁹⁹ Thus, there may be one or more environmental thresholds, below which the harm of additional

³⁹⁰ See, e.g., GORE, *supra* note 5, at 183; PLATER ET AL., *supra* note 4, at 31.

³⁹¹ See generally *Sierra Club v. Morton*, 405 U.S. 727, 741-43 (1972) (Douglas, J., dissenting) (concern for protection of nature should lead to conferral of standing upon trees and other environmental objects to sue for their own preservation); PLATER ET AL., *supra* note 4, at 31 (trees do not buy and sell).

³⁹² See generally John R. Luoma, *Warming the Wild*, AUDUBON, July-Aug. 1996, at 102, 104 (reporting troubling news for rare alpine flowers; warmer, drier climate would lead to elimination of some rare alpine plants); Paul Rauber, *Heat Wave: If We Continue to Ignore the Danger Signs the World of the Future Will Be a Hotter, Poorer, Deadlier Place*, SIERRA, Sept.-Oct. 1997, at 34, 38 (suggesting alpine species moving upwards to escape global warming effects may run out of mountain).

³⁹³ See generally GORE, *supra* note 5, at 183.

³⁹⁴ See generally *infra* notes 399-400.

³⁹⁵ See generally *supra* notes 219-20 and accompanying text.

³⁹⁶ See, e.g., *infra* notes 399-400 and accompanying text.

³⁹⁷ See, e.g., JOSKOW *supra* note 8, at 6 & fig. 1, 7.

³⁹⁸ See generally *supra* note 395 and accompanying text.

³⁹⁹ See Intergovernmental Panel on Climate Change, *supra* note 182, § 6.

CO₂ is minimal and can be absorbed by atmospheric systems, and above which the harm of the additional tonnage is severe or accelerated.⁴⁰⁰ Determining the correct environmental costs in such instances will be problematic if the exact thresholds are not known. Thus, even where price reflects environmental costs, if those costs are unlikely to increase in a predictable, linear fashion, the market may undervalue the impacts of additional production and fail to allocate resources appropriately.⁴⁰¹

Where the exact parameters of environmental consequences are unknown, the international consensus expressed in both the Rio Principles and the United Nations Framework Convention on Climate Change is to adopt a precautionary approach.⁴⁰² As expressed by the Framework Convention on Climate Change, this approach means that where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing preventative or mitigating measures.⁴⁰³ As applied to the electricity industry, a precautionary approach may mean that crude price mechanisms are inappropriate regulators where greenhouse gases are involved.⁴⁰⁴ Until the causal links of the global warming problem are more precisely understood, so that one ton of CO₂ is known to cause about \$X in harm, a precautionary approach argues against reliance on price alone as a guide to the optimal quantity of fossil-fueled electricity generation.⁴⁰⁵

⁴⁰⁰ See generally WORKING GROUP II TO THE SECOND ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *supra* note 184, at 5 (ecological and social systems complex, with many non-linear feedbacks; as future climate extends beyond impacts of past climate variation it becomes more likely actual outcomes will include surprises and unanticipated rapid changes).

⁴⁰¹ See generally *supra* note 400 and accompanying text.

⁴⁰² See The Rio Declaration on Environment and Development, Principle 15, June 13, 1992, United Nations Conference on Environment and Development, 31 I.L.M. 876, 879; Framework Convention on Climate Change, *supra* note 365, art. 3:3, 31 I.L.M. at 854.

⁴⁰³ See Framework Convention on Climate Change, *supra* note 365, art. 3:3, 31 I.L.M. at 854. The Convention does recognize, however, that even measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost; and that economic development is an essential aspect of climate change measures. See *id.*; see also *id.* art. 12:4, 31 I.L.M. at 865 (developing countries proposing climate protective projects for financing may include estimate of incremental costs and benefits); *id.* art. 4:7, 31 I.L.M. at 858 (extent developing countries will implement Convention commitments will take into account that economic and social development and poverty eradication are priorities of developing country parties).

⁴⁰⁴ See *supra* notes 399-403 and accompanying text.

⁴⁰⁵ See generally *supra* notes 399-404 and accompanying text.

c. *The Problem of the Market's Inability to Value Non-Market Social Goals*

For individuals and for societies, cost-effectiveness is not the only grounds for making investment decisions.⁴⁰⁶ It was probably not "cost-effective," for example, to build a National Park system, nor to launch a program to land humans on the moon. Left to the market, these types of projects would probably not have been undertaken. The market might determine the most cost-effective means to achieve such goals—it might even render such goals infeasible—but it did not, and probably could not, on its own begin to mobilize resources for such goals. There was no clear profit in such projects. Paybacks, if any, were decades away; thus, real and substantial costs outweighed uncertain benefits. Consequently, these projects, though nationally desirable, were not the kind of undertakings endorsed by the market. The market may be similarly ill-equipped to initiate important environmental goals, such as a habitable, biologically diverse planet in the year 2198.⁴⁰⁷

In addressing a problem like global warming, which is caused in part by electricity generation's CO₂ emissions, numerous legitimate non-market-based motivations are conceivable, including altruistic, good neighbor motives and equity considerations.⁴⁰⁸ The United States might, for example, want to act as a good neighbor to keep small island nations from drowning in rising seas due to global warming.⁴⁰⁹ It might wish to do so even if the costs of such action outweigh any costs to American electricity consumers caused by the loss of island nations.⁴¹⁰

Similarly, equity considerations, or a sense that reparations are due, might motivate the United States to make sharp greenhouse gas emissions reductions now in order to compensate for its high volume of prior emissions.⁴¹¹ Such action would be legitimate even if the con-

⁴⁰⁶ See generally PIGOU, *supra* note 1, at 11–13 (distinguishing between economic and non-economic welfare).

⁴⁰⁷ See generally GORE, *supra* note 5, at 190 (past a certain point, it is impossible to price environmental effects; value of clean air and water, abundance of life on earth is incalculable).

⁴⁰⁸ See, e.g., *infra* notes 409–10 and accompanying text.

⁴⁰⁹ See generally *Mass. Enviro Official Warns Midwest Regulators*, *supra* note 32 (quoting Mass. DEP Commissioner David Struhs' observation that we all bear a "common responsibility . . . to something higher than shareholders. And that's the health and well-being of neighbors."); Black & Pierce, *supra* note 80, at 1418 (introducing an altruism factor strengthens the case for greenhouse gas environmental adders); see also Framework Convention on Climate Change, *supra* note 365, art. 4:8(a), 31 I.L.M. at 858 (parties shall consider actions necessary to meet specific needs of developing country parties arising from climate change, especially on small island countries); *supra* notes 187–88.

⁴¹⁰ See generally *supra* note 409.

⁴¹¹ See, e.g., GELBSPAN, *supra* note 188, at 112 (quoting Chinese environmental official's

sequent costs to American electricity consumers exceed the global warming harms that those consumers would individually avoid by reducing their emissions.⁴¹² Given that the developing world may need to give priority to poverty eradication over greenhouse gas containment, it may be especially important for the United States and other developed nations to reduce emissions at a level proportional to or greater than their historic contributions to the causes of the climate problem.⁴¹³

Although no national consensus has expressly endorsed these non-market motivations, a general consensus favoring environmental objectives has long been evident in electricity regulatory statutes.⁴¹⁴ Moreover, the United States has ratified the United Nations Framework Convention on Climate Change, agreeing to the international goal of stabilizing atmospheric greenhouse gas concentrations at levels that do not dangerously interfere with the climate system.⁴¹⁵ Furthermore, both Congress and the state legislatures have repeatedly shown a willingness to subsidize—i.e., to undertake even where not cost-effective—environmentally preferable forms of electricity generation.⁴¹⁶ Thus, it is inappropriate to assume that the American people want only those environmental protection measures that are “cost-effective” and that our electricity generation system must make all of its investment decisions based simply on market price.⁴¹⁷

comment that “80 percent of the world’s pollution is caused by the developed countries and they should be responsible for those problems”).

⁴¹² See generally Framework Convention on Climate Change, *supra* note 365, art. 3:1, 31 I.L.M. at 854 (on basis of equity, differentiated responsibilities and respective capabilities, developed countries should take lead in combating climate change); see also *id.* art. 4:2(a), 31 I.L.M. at 856 (developed countries taking lead in controlling climate change taking into account need for equitable and appropriate contributions by each of the parties). The United States has repeatedly been the source of 22–23% of the entire world output of CO₂ from energy use and production. See International Energy Agency, *Climate Change Policy*, *supra* note 189, at 24–26 tbls.4–6. Even compared to many other developed countries, we have double to quadruple the CO₂ emissions per capita of most other nations. See *id.*

⁴¹³ See generally Framework Convention on Climate Change, *supra* note 365, arts. 3:1, 4:7, 31 I.L.M. at 858.

⁴¹⁴ See, e.g., *supra* notes 64–71, 77, 89–93, 121–26, 143, 161–62 and accompanying text.

⁴¹⁵ See Framework Convention on Climate Change, *supra* note 365, arts. 2, 4:2(a), 31 I.L.M. at 854, 856; International Energy Agency, *Climate Change Policy*, *supra* note 189, at 11, 175. One of the aims of the Convention is to return the carbon dioxide and other greenhouse gas emissions of the parties to their 1990 levels. See Framework Convention on Climate Change, *supra*, art. 4:2(b), 31 I.L.M. at 857.

⁴¹⁶ See, e.g., *supra* notes 258–63 and accompanying text.

⁴¹⁷ See *supra* note 416. By way of comparison it is useful to note that the public goal of around

C. *Advantages and Disadvantages of Possible Regulatory Mechanisms for Controlling Environmental Externalities in the Context of a Restructured Industry*

1. *Externality Adders and Their Problems*

As discussed above, price has repeatedly failed to direct the electricity industry in ways necessary to protect the environment.⁴¹⁸ Given this history of price failure and the fact that global warming may well fit many of the criteria for situations where price has inherent limitations—for example, having impacts that are geographically dispersed, that develop over long time periods and that may invoke non-market social concerns—interventions in the market are probably needed to protect the environment.⁴¹⁹ Various possible market intervention measures may offer advantages over price alone, but they also carry disadvantages.⁴²⁰

Neither the Massachusetts nor California restructuring statutes expressly utilize externality adders to level the playing field between combustion and non-combustion power sources.⁴²¹ Because their externality adder programs explicitly focused on the problems of environmental externalities, and because they were such well-developed and widely debated corrective programs, a discussion of adders is useful in clarifying the limitations of other market intervention mechanisms.⁴²²

Monetized externality adder programs like California's and Massachusetts', although meant to correct the failings of the market, are themselves essentially market-based mechanisms.⁴²³ Environmental adder programs attempted to adjust the mix of electric generation/conservation options used by assigning an additional environmental cost

the clock electricity availability and reliability is taken as a given by regulators and market advocates alike. See, e.g., Rodgers & Schuler Jr., *supra* note 175, at 28–29 (quoting executive director of National Association of Regulatory Commissioners' observation that reliable service will continue to be a goal for restructured industry); see also Southern Cal. Edison Co., 71 F.E.R.C. ¶ 61,269, at 62,081, 62,082 (June 2, 1995) (Massey, Comm'n, concurring in part and dissenting in part) (a ruling eliminating consideration of environmental non-price factors, if strictly construed, might prevent consideration of range of other non-price factors that are important but very difficult to assign a dollar value to, such as fuel diversity).

⁴¹⁸ See, e.g., *supra* notes 64–71, 319, 340–48 and accompanying text.

⁴¹⁹ See, e.g., *supra* notes 357–93 and accompanying text.

⁴²⁰ See *infra* notes 421–79 and accompanying text.

⁴²¹ See generally *supra* notes 260–68.

⁴²² See *infra* notes 423–60 and accompanying text.

⁴²³ See, e.g., D.P.U. 89–239, 116 Pub. Util. Rep. 4th (PUR) at 97, 98.

factor.⁴²⁴ The decision between options, however, was still made on a cost-benefit basis.⁴²⁵ In discussing how to value environmental adders, for example, the Massachusetts DPU suggested that if the price advantage of a more polluting electricity option is greater than the value of environmental damages caused by that option, "it would be to society's net benefit to prefer the dirtier resource."⁴²⁶ This type of cost-benefit calculation is, in essence, a market approach. Thus, paradoxically, while the need to create adders was an implicit criticism of the market's failure to address certain environmental problems, certain difficulties with environmental adders may be due to the fact that they were themselves market-based mechanisms.⁴²⁷

Beyond the narrow critiques the Supreme Judicial Court and FERC levied against utility commission externality adder programs, wider criticisms were made.⁴²⁸ Some critics argued that by insisting on such environmental adders for electricity, but not for other competing industries—e.g., heating oil for heating buildings, gasoline for powering cars, etc.—the adders may have actually harmed the environment by making electricity seem more costly in environmental terms than other industries which simply had not been scrutinized.⁴²⁹ Thus, arguably, adders might have shifted investment and consumption to dirtier industries.⁴³⁰ This problem exists whenever alternative products are not simultaneously and uniformly regulated.⁴³¹ The fact the regulation of powerplant smokestacks under the Clean Air Act may cause some to heat with polluting woodstoves rather than electricity, for example, is

⁴²⁴ See *supra* notes 203–21 and accompanying text.

⁴²⁵ See, e.g., D.P.U. 89–239, 116 Pub. Util. Rep. 4th (PUR) at 89, 92. As the DPU claimed: Economic theory posits that it is appropriate to value the avoidance of environmental externalities at the intersection of the marginal cost and marginal benefit curves of pollution abatement. It is at the intersection of the marginal cost and marginal benefit curves of pollution control where societal value is maximized and, thus, defines the market-clearing price or equilibrium value of avoiding environmental externalities.

See D.P.U. 89–239, 116 Pub. Util. Rep. 4th (PUR) at 92. The DPU suggested that where pollution control was occurring in excess of the optimal—indicated by the intersection of the marginal cost and benefit curves—"societal value" would be enhanced by reducing the amount of pollution control being practiced. See *id.*

⁴²⁶ *Id.* at 90.

⁴²⁷ See generally *supra* notes 423–26 and accompanying text.

⁴²⁸ See, e.g., Joskow, *supra* note 8, at 1, 21; Black & Pierce, *supra* note 80, at 1398–1430; Gary & Teague, *supra* note 238, at 870–75.

⁴²⁹ See Black & Pierce, *supra* note 80, at 1406; see also Joskow, *supra* note 8, at 19 (piecemeal control of utilities only may shift production to another economic sector, reducing or reversing environmental gains).

⁴³⁰ See Black & Pierce, *supra* note 80, at 1402, 1406.

⁴³¹ See, e.g., H.R. REP. NO. 91–1146 (1970), reprinted in 1970 U.S.C.A.N. at 5358 (promulgation of federal emissions standards under Clean Air Amendments will preclude efforts on part

not sufficient reason to abandon the regulation of powerplants.⁴³² Rather, it argues for equivalent regulation of the substituted forms of energy as well.⁴³³ Consumer substitution of dirtier energy sources can be avoided in future regulatory efforts through consistent regulation of CO₂ throughout the restructured electricity industry and in alternative energy forms as well.⁴³⁴

Similarly, some criticized state regulation because the higher costs caused by state-imposed environmental adders may have put a given state's utilities at a disadvantage relative to out-of-state generators who may have been causing even more pollution.⁴³⁵ Notably, however, state adder programs, which often dealt with CO₂ emissions, were installed in the absence of any federal emissions control over CO₂.⁴³⁶ Thus, at least in terms of CO₂, this criticism is misdirected—the problem was not state regulation, but lack of national regulation.⁴³⁷ Nevertheless, state-by-state regulation of air pollutants is problematic in an industry, like electricity, that will be shipping its product interstate.⁴³⁸ This problem could be corrected by national CO₂ emissions standards, interstate compacts or other mechanisms that prevent states from gaining competitive advantage by weak emissions regulation.⁴³⁹

Opponents of adders complained that calculating a dollar value for externalities is difficult and necessarily speculative.⁴⁴⁰ It is true that

of states to compete with each other to attract new plants without assuring adequate control of large-scale emissions).

⁴³² See generally William Funk, *When Smoke Gets in Your Eyes: Regulatory Negotiation and the Public Interest—EPA's Woodstove Standards*, 18 ENVTL. L. 55, 62, 68 (1987) (discussing addition of woodstove air emissions regulations under the Clean Air Act nearly two decades after power-plant emissions were regulated; noting that, other than cars and trucks, no consumer goods were previously regulated by EPA under the Clean Air Act); see also 40 C.F.R. § 60.530 et seq. (1997) (air emissions standards for woodstoves made after July 1, 1988; provisions do not apply to woodstoves made previously nor to masonry fireplaces).

⁴³³ See generally Black & Pierce, *supra* note 80, at 1406, 1407 (discussing problem of substitution of dirtier, less regulated fuels when emissions of competing power sources are not similarly regulated).

⁴³⁴ See generally *supra* notes 429–33 and accompanying text.

⁴³⁵ See D.P.U. 86–36-G, at 81; see also Joskow, *supra* note 8, at 15 (mixing states with adders and states without adders could have unintended adverse consequences); Black & Pierce, *supra* note 80, at 1415–16 (geographic substitution where consumers relocate to less regulated state limits effectiveness of some local environmental regulation; solution may require regional, national or international regulation).

⁴³⁶ See, e.g., Joskow, *supra* note 8, at 9, 11, 18.

⁴³⁷ See generally *supra* note 436 and accompanying text.

⁴³⁸ See generally H.R. REP. NO. 91–1146 (1970), reprinted in 1970 U.S.C.C.A.N. at 5358.

⁴³⁹ See, e.g., *infra* note 492.

⁴⁴⁰ See generally D.P.U. 89–239, 116 Pub. Util. Rep. 4th (PUR) at 90 (costs of environmental damages are difficult to estimate); Black & Pierce, *supra* note 80, at 1427 (estimating marginal harm attributable to emissions of various pollutants an “extraordinarily difficult task”). The proxy method for calculating externalities—cost-of-control (implied valuation)—used in many adder programs is even more speculative, and drew the sharpest condemnations by critics. See, e.g.,

the calculation of externalities is inherently difficult, given the difficulty of tallying the actual environmental damages attributable to a given powerplant or fuel.⁴⁴¹ The difficulty of professionally estimating appropriate price signals for these costs underscores the improbability that individual consumers, unaware of the possible environmental costs of electricity production, could determine the appropriate price to pay for that electricity.⁴⁴² The fact that the rational price for electricity from a given source, accounting for all of its indirect, multi-variable and long-term consequences, may be difficult or impossible to calculate suggests that the market price of that electricity may not always be a rational price.⁴⁴³ This potential irrationality of the market price of electricity provides another reason for skepticism regarding the use of the market alone to allocate resources in the electricity industry.⁴⁴⁴

Two widely cited critics of environmental adders/externality programs, Professors Bernard Black and Richard Pierce, have argued that at the level of a given state there was little cost-benefit rationale for substantial adders to control greenhouse gases.⁴⁴⁵ They suggest that any factor for the fraction of the total harm from such emissions actually experienced within the state would be minuscule.⁴⁴⁶ Consequently, the net in-state benefit to be realized from each ton of greenhouse gas emissions reduced would be relatively small.⁴⁴⁷ Thus, they argue that any case for state environmental adders for greenhouse gases rests almost entirely on altruism.⁴⁴⁸

In terms of global warming, they assert, one state acting alone, or even one country acting alone, can accomplish little except self-improvement.⁴⁴⁹ This argument is unconvincing, however, when applied to this country and its electricity industry.⁴⁵⁰ The United States is the source of over a fifth of the world's CO₂ generation and its electricity production is responsible for approximately seven percent of the world

D.P.U. 89-239, 116 Pub. Util. Rep. 4th (PUR) at 71, 90-93; Joskow, *supra* note 8, at 16; Black & Pierce, *supra* note 80, at 1402, 1420-21, 1422.

⁴⁴¹ See D.P.U. 89-239, 116 Pub. Util. Rep. 4th (PUR) at 90.

⁴⁴² See generally PIGOU, *supra* note 1, at 195 (in certain planning contexts expecting coherent plan from independent activities of isolated speculators is like expecting satisfactory painting to be made if each square inch is painted by an independent artist).

⁴⁴³ See generally *supra* notes 440-42 and accompanying text.

⁴⁴⁴ See generally *supra* notes 440-43 and accompanying text.

⁴⁴⁵ See Black & Pierce, *supra* note 80, at 1416-18.

⁴⁴⁶ See *id.* at 1417.

⁴⁴⁷ See *id.*

⁴⁴⁸ See *id.*

⁴⁴⁹ See *id.* at 1418, 1425; see also Joskow, *supra* note 8, at 11 (suggesting nothing a single state alone can do to significantly affect global warming).

⁴⁵⁰ See *infra* note 451 and accompanying text.

CO₂ output.⁴⁵¹ Thus, although it is true that world cooperation on the problem is needed, the United States and its electricity industry bear tremendous responsibility for global warming compared to other nations and industries.⁴⁵²

Black and Pierce's criticism on this point implies that if environmental adders for greenhouse gases were priced in market terms, to reflect the marginal harms actually experienced in-state for every additional ton of greenhouse gas emitted, the adders would drop to an extremely small value.⁴⁵³ The marginal harm of global warming to the consumers of a state, they imply, would be so small that the correct price for an additional ton of CO₂ emitted by the electricity purchases of those consumers in the state would be next to nothing.⁴⁵⁴

If Black and Pierce are correct, their analysis points to a more fundamental problem with environmental externality programs: if priced by market rules they might not be able to deal effectively with global environmental problems.⁴⁵⁵ The implication is that any correctly priced adder for CO₂'s environmental costs would be so small it would not deter consumers from selecting electricity from a high CO₂ output fuel or facility.⁴⁵⁶ But pricing adders by market rules confines them to harms and benefits cognizable in economic or price terms.⁴⁵⁷ The non-price advantages of centuries-long global sustainability or respect for small island states' traditional homelands, for example, would still go unrecognized in selecting electricity generation options.⁴⁵⁸ When Black and Pierce and other critics point to the infinitesimal global warming costs of the CO₂ emissions for a given power plant, they may be right that any substantial environmental adder would overstate the correct market price of the CO₂ emissions.⁴⁵⁹ But this observation just confirms that the market is not an adequate mechanism for recognizing and addressing certain types of socially-borne harms.⁴⁶⁰

⁴⁵¹ See *supra* notes 190-91 and accompanying text; see also Joskow, *supra* note 8, at 11 (U.S. electric industry accounts for about 6% of world CO₂ emissions).

⁴⁵² See *supra* notes 450-51 and accompanying text.

⁴⁵³ See Black & Pierce, *supra* note 80, at 1416, 1417.

⁴⁵⁴ See generally *id.*

⁴⁵⁵ See generally *id.* at 1416-18.

⁴⁵⁶ See generally *id.*

⁴⁵⁷ See generally PIGOU, *supra* note 1, at 11-13 (distinguishing between economic and non-economic welfare).

⁴⁵⁸ See generally *supra* notes 187-88 and accompanying text.

⁴⁵⁹ See, e.g., Black & Pierce, *supra* note 80, at 1416-17, 1425.

⁴⁶⁰ See *supra* notes 455-59 and accompanying text.

2. Advantages and Disadvantages of Emission Taxes and Subsidies for Renewables and Conservation

Absent taxes on CO₂ emissions, or subsidies or other supports for renewable energy, environmentally preferable power options may have difficulty making progress in a competitive electricity market.⁴⁶¹ It is widely expected, for example, that renewable power from solar, wind, geothermal and other sources will cost more than conventional power—perhaps ten to twenty percent more.⁴⁶² Although some niche marketers may sell their power based on its renewable energy content, most electricity will be marketed and purchased on the basis of low price rather than environmental considerations, if California is any indication.⁴⁶³ Subsidies for renewable energy and emissions taxes on combustion-based power sources could be used, however, to adjust market prices enough that price-based consumer choices harmonize with national environmental objectives.⁴⁶⁴

Even some of the critics of adders are interested in the possibility of emissions taxes (i.e., Pigovian taxes) as a market-based mechanism for addressing externalities like the impacts of CO₂.⁴⁶⁵ Tax structures have long been used to encourage various types of energy development—the depletion allowance for oil, natural gas and coal, for example, cost the federal government an estimated \$745 million in lost tax revenues in 1992.⁴⁶⁶ CO₂ emissions taxes would likely encourage renewable energy and conservation, and discourage polluting fossil fuels, such as coal, oil and to a lesser extent, natural gas.⁴⁶⁷

A distinct advantage to emissions taxes, if applied across all sources and not just to electricity generation stations, is that they would prevent the substitution of dirtier, unregulated forms of energy for heavily

⁴⁶¹ See, e.g., Johnson, *supra* note 327, at D4 (battle over California's electricity market will be waged mostly on price). But see *id.* (surveys suggest that 70% of Americans might embrace green power if prices not too far out of line; early reports suggest green power marketing tests drawing 20% of customers).

⁴⁶² See, e.g., Steinman, *supra* note 256, at B1; Natural Resources Defense Council, *supra* note 278 (noting price of selected low environmental impact electricity offerings is 10–20% above current consumer rate).

⁴⁶³ See, e.g., Johnson, *supra* note 327, at D4.

⁴⁶⁴ See *infra* notes 475–79 and accompanying text.

⁴⁶⁵ See, e.g., Joskow, *supra* note 8, at 3; see also *supra* note 2. But see Karen Tumulty, *A Treaty Meets a Sour Congress*, TIME, Dec. 22, 1997, at 27, 27 (White House has “completely ruled out” use of taxes to meet climate treaty goals).

⁴⁶⁶ See Union of Concerned Scientists, *Unequal Tax Burdens* (visited Feb. 10, 1998) <<http://www.ucsusa.org/energy/barriers/taxes.html>>; Energy Info. Admin., *supra* note 10, at 117; see also Energy Info. Admin., *supra* note 1, at 1 (long history of government intervention to stimulate oil and gas production dates back to World War I).

⁴⁶⁷ See generally *supra* notes 107–08 and accompanying text.

environmentally regulated electricity.⁴⁶⁸ Similarly, if the taxes were national in scope, and not just state-imposed, environmental controls would not act as an incentive to relocate energy facilities to other, less-regulated jurisdictions.⁴⁶⁹ Taxes would also have to be applied to older facilities, and not just newly built facilities, or they would act as an incentive to overuse older, dirtier generating stations.⁴⁷⁰

One difficulty with taxes, however, is determining the level of taxation necessary to achieve the desired level of pollution reduction.⁴⁷¹ Moreover, monitoring emissions to determine the appropriate level of taxation may lead to many of the bureaucratic intrusions and record-keeping problems critics of command-and-control hoped to avoid with a market-based approach.⁴⁷² Monitoring numerous small sources of CO₂ emissions could prove more costly than conventional command-and-control regulation.⁴⁷³ In addition, if such taxes are not made "revenue neutral" by corresponding cuts in other taxes, they might act as a general drag on the economy, and not just on the dirtiest portions of the economy.⁴⁷⁴

Subsidies of conservation measures and electricity generated using renewable energy would accomplish the same ends as emissions taxes, but by using opposite means.⁴⁷⁵ Such subsidies would increase consumer purchases of renewables-based electricity, while emissions taxes would decrease consumer purchases of fossil-fuel fired electricity. There certainly can be no complaints from the other power sources about subsidizing renewable energy—most other methods of generating electricity, such as nuclear, coal, oil and large-scale hydroelectric, have received extensive subsidization from the federal government.⁴⁷⁶

⁴⁶⁸ See generally Joskow, *supra* note 8, at 18 (optimal solution to externalities might be through emissions fee if applied to all sources of a given pollutant).

⁴⁶⁹ See Joskow, *supra* note 8, at 19 (state commissions not well-suited to regulate emissions with global and regional impacts); see also H.R. REP. NO. 91-1146, *reprinted in* U.S.C.C.A.N. at 5958 (giving rationale for federal as opposed to state-by-state air emission regulation under Clean Air Act).

⁴⁷⁰ See generally Iribi, *supra* note 13 (older plants have been allowed to pollute at higher rates than new plants; restructured power market should not allow older plants a pricing edge simply because have largely avoided pollution controls).

⁴⁷¹ See PLATER ET AL., *supra* note 4, at 51.

⁴⁷² See generally, Black & Pierce, *supra* note 80, at 1392.

⁴⁷³ See *id.*

⁴⁷⁴ See generally Biewald, *supra* note 308, at 42 (suggesting revenue-neutral taxes that reduce tax on income while increasing taxes on air emissions).

⁴⁷⁵ See generally *infra* notes 476-78.

⁴⁷⁶ See, e.g., Union of Concerned Scientists, *Commercialization Barriers to Renewable Energy* (visited Feb. 10, 1998) <<http://www.ucsusa.org/energy/barriers.commercial.html>> (citing U.S.

At first glance subsidization appears to conflict with the goal of least-cost power, because it would prop up expensive energy sources.⁴⁷⁷ There is some hope, however, that further subsidies of solar and other renewable energy forms may create a large enough market for these forms of energy that economies of scale and further technical innovation may actually bring down their cost per kWh generated.⁴⁷⁸ Furthermore, by reducing environmental externalities, renewably generated electricity may actually be least-cost power from a societal standpoint.⁴⁷⁹

D. Using Price and Non-Price Mechanisms to Eliminate Externalities in the Context of Electricity Restructuring in California and Massachusetts

The analysis above suggests that the market is likely to be a weak method of addressing environmental impacts, particularly where, as with the problem of CO₂ emissions and global warming, the impacts are fully manifest only in the distant future, the impacts are diffused geographically and over millions of persons, the complexities of causation may make the information costs too high for optimal consumer choice and significant non-market social goals are involved.⁴⁸⁰ Implicitly realizing the limitations of a pure market approach to environmental issues, the Massachusetts and California electricity restructuring statutes have numerous provisions that soften, constrain or correct the shortcomings of the market.⁴⁸¹ The statutes, however, do not go as far as they should in addressing the public objectives of least-cost power and environmental protection.⁴⁸²

First, the statutes ignore some of the problems whose market-invisibility triggered externality programs in the first place, notably the CO₂ emissions problem of an electricity generating system based on fossil-fuel combustion.⁴⁸³ The plans will, for example, likely result in increased natural gas use, and possibly greater coal use, both sig-

Dept. of Energy study showing \$29.5 billion in federal research and development expenditures for nuclear power, \$12.9 billion for coal and \$2.8 billion for oil and natural gas compared with \$9.3 billion for renewable energy and \$4.7 billion for energy efficiency); ENERGY INFO. ADMIN., *supra* note 10, at 44 (nuclear and coal absorbed two-thirds of 1992 federal applied research and development expenditures).

⁴⁷⁷ See generally *supra* note 462.

⁴⁷⁸ See, e.g., Union of Concerned Scientists, *supra* note 476 (noting 20-25% reduction in cost for each doubling of production volume of photovoltaic units; without government support of such renewables, ability to reap economies of scale likely to be delayed).

⁴⁷⁹ See, e.g., *supra* notes 206-08 and accompanying text.

⁴⁸⁰ See *supra* notes 357-417 and accompanying text.

⁴⁸¹ See, e.g., *supra* notes 260-68 and accompanying text.

⁴⁸² See *infra* notes 483-98 and accompanying text.

⁴⁸³ See, e.g., *supra* note 291 and accompanying text.

nificant sources of CO₂ emissions.⁴⁸⁴ Reduction in the price of electricity—a fundamental goal of deregulation—could, in itself, spur increased consumption of electricity.⁴⁸⁵ Any resulting increase in electricity consumption, absent other compensating changes, will likely increase CO₂ emissions.⁴⁸⁶

Second, particularly in light of the CO₂ problem, it is not enough to use renewable energy and conservation subsidies or portfolio mandates to change the ratio of fossil-fuel generation to renewables or conservation in the electricity resource mix.⁴⁸⁷ The ratio of fuel types *within* the fossil-fuel component needs to be altered if we want to reduce CO₂ emissions from the electricity-generation sector.⁴⁸⁸ More coal-fired generation, even if it is cheaper than gas-fired generation, is not desirable, even if the sum of the two goes down slightly due to subsidized renewables-based electricity generation.⁴⁸⁹ Coal produces more CO₂ per unit of energy than natural gas does and, unfortunately, it currently fuels more than three times the electricity generation that gas does.⁴⁹⁰ Without environmental adders, carbon emissions taxes or other penalties on CO₂ output, cost advantages for coal could maintain or increase its use, thereby increasing global warming.⁴⁹¹ Thus, electric-

⁴⁸⁴ See generally Woolf & Biewald, *supra* note 107, at 66, 64 (in restructured industry natural gas likely to be main source of new generation and CO₂ emissions will continue to climb).

⁴⁸⁵ See generally Cushman, *supra* note 335, at A22 (relatively low energy prices are one cause of growing U.S. energy use in 1996, suggests director of American Council for an Energy-Efficient Economy).

⁴⁸⁶ See *id.* This tension points to certain contradictions in the simultaneous goals of least-cost electricity generation and generation that protects the environment. The details of the balance between these two goals will need periodic readjustment as our understanding of global warming increases.

⁴⁸⁷ See generally D.P.U. 89-239, 116 Pub. Util. Rep. 4th (PUR) at 92 (estimation of externalities also essential for comparing different generating facilities whose fuel and other differences lead to different pollution impact and not just for comparing non-polluting and polluting options).

⁴⁸⁸ See generally *id.*

⁴⁸⁹ Cf. Woolf & Biewald, *supra* note 107, at 67 (if gas-fired generating facilities replace older, less efficient coal plants, CO₂ emissions would likely decline because gas plants have lower CO₂ emission rates).

⁴⁹⁰ See WORKING GROUP II TO THE SECOND ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *supra* note 184, at 14 (natural gas has lowest CO₂ emissions per unit energy of any fossil fuel, emitting only 14 kg of carbon per gigajoule (GJ) of energy while coal produces 25 kg of carbon per GJ); INTERNATIONAL ENERGY AGENCY, *supra* note 110, at 671. Oil, though not as attractive as coal due to its price, is still being used for electricity generation and also produces more carbon dioxide per unit of energy than natural gas. See *id.*

⁴⁹¹ See generally Biewald, *supra* note 308, at 42-43; Milford, *supra* note 181 (retail competition will likely dislodge some, but not majority, of old, more polluting coal- and oil-fired generating plants). Denmark began a CO₂ tax in 1992, and the Netherlands, Norway and Sweden also now have such a tax. See International Energy Agency, *Climate Change Policy*, *supra* note 189, at 21, 22.

ity restructuring statutes may need to be coupled with additional statutorily enacted intervention mechanisms, probably at the federal level, such as carbon taxes, mandatory CO₂ emission limits or national renewable energy requirements.⁴⁹² State-specified emission performance standards, as allowed under the Massachusetts statute, will probably be too weak a mechanism for addressing the CO₂ problem.⁴⁹³ As critics of environmental adder programs have observed, in a deregulated national electricity market consumers or power companies could simply shift production to other, less-regulated states.⁴⁹⁴ Similarly, as critics of adder programs suggested, emissions regulations applied solely to the electricity industry, and not to substitutable energy products such as gasoline or home heating oil, may have the undesirable effect of encouraging consumers to shift their purchases away from low CO₂ electricity to higher CO₂ alternatives.⁴⁹⁵ Thus, in terms of CO₂, consistent emissions regulation should be applied to as many energy sources as practicable—for example, through a carbon tax on all fuels or similar mechanism—and not just to electricity.⁴⁹⁶ Third, the subsidies for renewable energy and energy efficiency measures⁴⁹⁷ are overly mod-

⁴⁹² See, e.g., Union of Concerned Scientists, *supra* note 380 (policies to combat global warming might include subsidizing renewable energy and requiring some percentage of its use in electricity generation); Woolf & Biewald, *supra* note 107, at 70 (recommending renewable portfolio standards for regions coupled with tradable renewables permit system for flexible implementation of standard); Biewald, *supra* note 308, at 42 (suggesting revenue-neutral pollution taxes). Combining market approaches with regulation or absolute prohibition is not a new strategy in dealing in commodities with severe unwanted side-effects. It is already used with scores of commodities, cigarettes being one obvious example. Minors are not allowed to buy them at any price (non-price limits on allocation). Cigarettes are taxed heavily for adult users, in part to discourage consumption. Endless media campaigns and smoking ban regulations are employed to curtail and channel use. It would be inconceivable to use market price alone to keep cigarettes out of the hands of minors; not even market price with a costly "adder" thrown on for minors. Price is simply not the right regulatory or allocational mechanism for certain commodities in certain contexts.

⁴⁹³ See *infra* note 494 and accompanying text.

⁴⁹⁴ See generally *infra* note 435.

⁴⁹⁵ See *supra* notes 429–30 and accompanying text.

⁴⁹⁶ See generally *supra* notes 429–32 and accompanying text.

⁴⁹⁷ See Woolf & Biewald, *supra* note 107, at 70 (transition policies have focused on maintaining historic levels of support for conservation and renewables, but to stabilize or reduce New England's CO₂ emissions these alternatives must play larger role than have to date). In terms of mandating minimum usage of renewables, the Massachusetts restructuring statute mandates a five percentage points increase in renewables over current levels by the end of 2010. See Mass. GEN. LAWS ch. 25A, § 11F(a). Other than hydropower, current levels of renewable energy generation of electricity in New England, for example, are negligible. See Woolf & Biewald, *supra* note 107, at 67 fig.4. Nationally, the combination of solar, tidal, wind, fuel cells, geothermal and waste-fueled power accounted for about 2% of electricity generation in 1995; hydropower accounted for about 9%. See International Energy Agency, *supra* note 110, at 671. In comparison, Woolf & Biewald's "zero carbon option," based on energy efficiency and renewably generated

est. In the Massachusetts case, after an initial period they decrease over time and are not guaranteed beyond five years.⁴⁹⁸

In general, for critical resources, and for activities that pose the risk of substantial, widespread or irrevocable harm, the best approach may be to set environmental goals politically and then to use market and non-market mechanisms to achieve those goals.⁴⁹⁹ The decision between market and non-market mechanisms should not be based on an ideological commitment to state regulation nor to an unregulated market, but rather on which mechanism works best.⁵⁰⁰ For example, with global warming we may need to set stringent national targets for CO₂ emissions and determine how much of that target must be met from the power generation sector.⁵⁰¹ Then regulators could use market mechanisms, like subsidies for energy efficiency or emissions taxes, or non-market mechanisms, like mandatory emissions standards, to achieve the target, depending on which works best and quickest.⁵⁰² In broad outline, this is the approach recently agreed to at the Climate Change summit in Kyoto.⁵⁰³

Finally, where catastrophic consequences like global warming are threatened, or essential infrastructure like electricity is involved, planning should be done on the basis of long-term sustainability.⁵⁰⁴ In such

electricity, suggests that to stabilize CO₂, New England would have to answer 17% of electricity demand by means of renewables and conservation by the year 2010. See Woolf & Biewald, *supra* note 107, at 69.

⁴⁹⁸ See MASS. GEN. LAWS ch. 25, §§ 19, 20 (1997). The surcharge on electricity to support these subsidies totals 3.0 to 4.1 mills per kWh (\$0.003–0.0041/kWh), depending on the year involved. See *id.*

⁴⁹⁹ Compare Bruce A. Ackerman & Richard B. Stewart, *Reforming Environmental Law*, 37 STAN. L. REV. 1339, 1343, 1353 (1985) (level of pollution reduction is quintessentially political question that should be answered by legislative process rather than cost-benefit analysis; method used to achieve level should include marketable pollution rights), with Joskow, *supra* note 8, at 6 (optimal emissions level for pollutant should be selected by balancing incremental benefits against incremental costs of reduced emissions).

⁵⁰⁰ See generally Coase, *supra* note 2, at 18 (problem is one of choosing appropriate social arrangement for given harmful effects; no reason to suppose government regulation called for simply because market has failed; satisfactory policy can only come from study of how the market and governments handle harmful effects); Ackerman & Stewart, *supra* note 499, at 1343, 1353.

⁵⁰¹ See generally Biewald, *supra* note 308, at 42 (regional or national caps should be implemented for carbon dioxide and other emissions with emission credit trading or alternatively revenue-neutral pollution taxes; these mechanisms would use market forces to work out specific abatement response).

⁵⁰² See, e.g., *supra* note 501.

⁵⁰³ See, e.g., Lemonick, *supra* note 193, at 23 (Kyoto Protocol dictates 7% U.S. CO₂ emissions reduction below 1990 levels by year 2012); Tumulty, *supra* note 465, at 27 (U.S. administration has ruled out use of taxes to achieve Kyoto target, but will propose subsidies aimed at increasing energy efficiency).

⁵⁰⁴ See generally *supra* notes 357–74 and accompanying text.

circumstances, society cannot afford the myopic five- to fifty-year horizon and heavily discounted future of the current market approach.⁵⁰⁵ For critical issues like global warming, decisions should be based not just on the choices of individual market actors, not just on price, but on the basis of society's undivided and long-term interests.⁵⁰⁶

IV. CONCLUSION

From the earliest days of electricity regulation, the twin objectives of least-cost power and environmental protection began to emerge in the structure of the industry.⁵⁰⁷ The co-evolution of these social goals began to surface distinctly with the passage of PURPA, and was clearly evident in EPAct and in the restructuring statutes of states leading the move towards deregulation, like Massachusetts and California.⁵⁰⁸ Least-cost power was probably never the sole goal of electricity regulation.⁵⁰⁹ But since the 1970s it certainly has not been.⁵¹⁰ It would thus be inappropriate to assess new proposals for the industry solely in terms of the cost of the electricity produced. The question instead, as we renegotiate the legal bases for the industry, is how best to reconcile society's goal of low-cost power with its goal of reducing the environmental externalities of electricity production.

Some of those environmental goals may be achieved simply by the functioning of the competitive market for least-cost power. The phase-out of nuclear power, for example, ending additional radioactive waste, is probably dictated simply by conventional price considerations.⁵¹¹ Certain environmental impacts of the electricity industry, however, are unlikely to be addressed by the functioning of price in an unadjusted market.⁵¹² Environmental impacts that are dispersed beyond the borders of the American consumer's transactions and consciousness, or whose consequences are sufficiently postponed into the future, like the impact of CO₂ emissions, are particularly unlikely to affect the price of electricity.⁵¹³ Thus, the market on its own will probably not address the

⁵⁰⁵ See generally *supra* notes 357-74 and accompanying text.

⁵⁰⁶ See, e.g., *supra* notes 357-74 and accompanying text.

⁵⁰⁷ See, e.g., *supra* note 77 and accompanying text.

⁵⁰⁸ See, e.g., *supra* notes 123, 143, 160-61 and accompanying text.

⁵⁰⁹ See, e.g., *Calumet Service Co. v. City of Chilton*, 135 N.W. 131, 140, 142 (Wisc. 1912) (describing goals of early Wisconsin electricity regulation as including "efficient service" and "best service practicable").

⁵¹⁰ See *supra* notes 89, 123, 143, 160-61 and accompanying text.

⁵¹¹ See *supra* note 80.

⁵¹² See, e.g., *supra* notes 337-417 and accompanying text.

⁵¹³ See *supra* notes 357-93 and accompanying text.

electricity sector's contribution to global warming nor other similar externalities.⁵¹⁴ These failures of price consequently require legal interventions to correct the shortcomings of the market.

States leading the deregulatory movement, like Massachusetts and California, have incorporated many such interventions into their restructuring statutes in an effort to constrain and soften the environmental impacts of electricity deregulation.⁵¹⁵ But more may be necessary, particularly to deal with difficult externalities like the climate impacts of CO₂ emissions.⁵¹⁶ In developing further corrective interventions in the market, both non-market mechanisms, like national CO₂ emissions standards, and market-like mechanisms, such as carbon taxes for most fuels, should be explored.⁵¹⁷

After setting emission reduction targets through domestic or international political processes, market-oriented mechanisms may be particularly helpful in achieving those targets in the most cost-effective manner. In the face of the repeated failure of price to properly guide environmental practices in the electricity sector, however, policy-makers should be wary of conventional cost-benefit analysis as the sole arbiter of appropriate actions on the environmental front. Some interventions in the electricity market that are not "cost-effective" may be appropriate on other valid grounds and deserving of subsidy—preservation of a healthy planet many centuries into the future, for example.⁵¹⁸ The market is, ultimately, simply a tool to achieve human ends.

It may be impossible to properly price the fair distribution of burdens between rich nations and poor, the health of the planet 300 years hence or the preservation of the last surviving members of a remote alpine wildflower species. Just because something has no price does not mean it has no value.⁵¹⁹ What the market cannot recognize, we should still have the political wisdom to see.⁵²⁰

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⁵¹⁴ See generally *supra* notes 337–417 and accompanying text.

⁵¹⁵ See, e.g., *supra* notes 260–68 and accompanying text.

⁵¹⁶ See *supra* notes 483–98 and accompanying text.

⁵¹⁷ See PIGOU, *supra* note 1, at 203 (no tax can provide a complete remedy for certain negative activities, thus absolute prohibition is required); *supra* notes 499–502 and accompanying text.

⁵¹⁸ See, e.g., *supra* notes 406–10 and accompanying text.

⁵¹⁹ See, e.g., *Massachusetts Elcc. Co. v. Department of Pub. Utils.*, 643 N.E.2d 1029, 1032 (Mass. 1994) (DPU set externality value on "non-priced goods" such as damages to species and natural systems).

⁵²⁰ See generally GORE, *supra* note 5, at 182–83.