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Fitting the Bill: Proposed Regulatory and Non-Regulatory Approaches to Advancing Green Building Technologies

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FITTING THE BILL: PROPOSED REGULATORY AND NON-REGULATORY APPROACHES TO ADVANCING GREEN BUILDING TECHNOLOGIES

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I. INTRODUCTION

Environmental threats on our nation vary from worldwide issues such as global warming, to more localized issues, such as air and water pollution.[1] Countless scientists, legal researchers, and policymakers have worked to devise laws and regulations to respond to such threats.[2] Green building[3] has been increasingly gaining recognition and popularity in the United States as a way to combat environmental threats.[4] Green buildings, also known as sustainable or high performance buildings, are resource-efficient structures that reduce the overall impact of building on the environment and human health throughout all stages of the building process, including design,

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1. *See* RONALD G. BURNS ET AL., ENVIRONMENTAL LAW, CRIME, AND JUSTICE, 7 (2008).

2. *See id.*

3. Green buildings, also known as sustainable or high performance buildings, are resource-efficient structures that reduce the overall impact of building on the environment and human health throughout all stages of the built environment, including design, construction, operation and deconstruction. *See generally* BASIC INFORMATION, http://www.epa.gov/greenbuilding/pubs/about.htm#1 (last visited Apr. 15, 2010).

4. *See, e.g.*, Keith H. Hirokawa, *At Home with Nature: Early Reflections on Green Building Laws and the Transformation of the Built Environment*, 39 ENVTL. L. 507, 512, 574 (2009).

construction, operation, renovation and deconstruction.[5] In the past fifteen years, the explosion in green building indicates increasing awareness and attainment of the benefits of green building, and the incorporation of green building standards into law.[6]

Employing green building practices and technologies improves environmental quality by lessening harmful pollutive activities and energy use, and reducing reliance on natural resources in the built environment.[7] For example, by implementing green building standards for new and existing buildings, the total greenhouse gas (GHG) emissions could be reduced by 20%.[8] In particular, over the next twenty years, the green building movement will have a greater opportunity to expand since it is projected that seventy-five percent of building stock in the United States will be new or replaced during this time.[9] Yet there is uncertainty as to what implementation strategy will be most effective in advancing this movement.[10] This

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5. BASIC INFORMATION, *supra* note 3. *See, e.g.*, GREEN BUILDING RESEARCH, http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1718 (last visited Apr. 16, 2010) (discussing environmental benefits such as improved water quality, as well as economic benefits such as building operation cost reduction, and health benefits such improved air). *But cf.* Carl J. Circo, *Should Owners and Developers of Low-Performance Buildings Pay Impact or Mitigation Fees to Finance Green Building Incentive Programs and Other Sustainable Development Initiatives?*, 34 WM. & MARY ENVTL. L. & POL'Y REV. 55, 56-57, 111 (2009) (discussing the heavy quantities of waste generated by the building process, such as hazardous material debris, that will continue to threaten future generations, regardless of the positive impacts of green building practices).

6. *See* Hirokawa, *supra* note 4, at 512, 574.

7. For the purposes of this Note, "green building technology" refers to the technologies utilized in green building practices and, specifically, those endorsed by the USGBC in Leadership in Energy and Environmental Design (LEED) rating systems. *See, e.g.*, LEED 2009 FOR NEW CONSTRUCTION AND MAJOR RENOVATIONS RATING SYSTEM, *available at* http://www.usgbc.org/DisplayPage.aspx?CMSPageID=220 [hereinafter LEED NC]; LEED 2009 FOR EXISTING BUILDINGS OPERATIONS AND MAINTENANCE RATING SYSTEM, *available at* http://www.usgbc.org/DisplayPage.aspx?CMSPageID=221 [hereinafter LEED EB].

8. PETER NEWMAN ET AL., RESILIENT CITIES: RESPONDING TO PEAK OIL AND CLIMATE CHANGE 64 (2009) (asserting that green buildings are cleaner energy sources that minimize the carbon footprint of buildings).

9. *See* Sara C. Bronin, *The Quiet Revolution Revived: Sustainable Design, Land Use Regulation, and the States*, 93 MINN. L. REV. 231, 233 (2008).

10. For example, among the various types of government roles, there is support for state governments to enact green building incentives and mandates at state and local levels. *See* Carl J. Circo, *Using Mandates and Incentives to Promote Sustainable Construction and Green Building Projects in the Private Sector: A Call*

Note recommends utilizing strategies specific to green building technologies.

Generally, the government uses a variety of regulatory approaches for environmental conservation and improvement purposes including command and control, incentive-based regulations, or a free market approach,[11] any of which can be used to advance green building technologies.[12] Part I of this note analyzes the development of these strategies and describes characteristic traits and prevalent environmental examples of each approach to determine which environmental issues are best ameliorated by, and therefore most compatible with, each respective regulatory and non-regulatory approach. This analysis allows inferences to be drawn about which green building technologies can be most successfully advanced by each particular approach. Part II then evaluates the command and control approach, and Part III evaluates the incentive-based approach, and Part IV evaluates the free market approach.[13]: Finally, Part V

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for More Stand Land Use Policy Initiatives, 112 PENN ST. L. REV. 731, 732-33, 761-62 (2008) [hereinafter Circo, *Using Mandates*].

11. *See, e.g.*, Daniel Press & Daniel A. Mazmanian, *Conclusion: Toward Sustainable Development*, *in* ENVIRONMENTAL POLICY, NEW DIRECTIONS FOR THE TWENTY-FIRST CENTURY 361 (Norman J. Vig & Michael E. Kraft, eds., CQ Press 7th ed. 2010) (explaining that incentive-based regulations provide incentives for voluntary cooperation and performance by private actors that goes beyond minimum legal requirements); David M. Driesen, *Is Emissions Trading An Economic Incentive Program?: Replacing The Command and Control/Economic Incentive Dichotomy*, 55 WASH. & LEE L. REV. 289, 338-39 n.223 (1998) [hereinafter Driesen, *Emissions Trading*] (describing that the free market provides incentives, without government intervention, for private actors to reduce pollution by reducing the actors' expenses); Aaron Gershonowitz, *Environmental Regulation: Fitting the Pieces Together*, 32 ENVIRONS ENVTL. L. & POL'Y J. 99, 104 (2008) (asserting that the majority of environmental command and control regulations prohibit or require certain actions from regulated entities).

12. *See* BARRY BARTON ET AL., *Introduction*, *in* REGULATING ENERGY AND NATURAL RESOURCES, 6 (Barry Barton et. al. eds., 2006) ("Regulation is a prominent part of the law concerning energy and natural resources. The sector has always been heavily regulated...to protect various aspects of the public interest.").

13. Each Part examines the available government approaches to discern which strategies are best suited to advance the use of the green building technologies under consideration. For purposes of this analysis, the types of green building technology under consideration include: 1) solar thermal technology, 2) green roofs, 3) stormwater management systems, 4) solar photovoltaic (PV) technology, and 5) high-efficiency heating, ventilation and air conditioning (HVAC) units.

concludes by summarizing the findings of this Note and reiterating the key insights ascertained during this analysis.

II. COMMAND AND CONTROL REGULATION

Today, command and control regulation is the most common approach to environmental policy in the United States.[14] In the environmental context, this regulation typically imposes detailed, legal requirements on sources that generate pollution, such as industrial plants.[15] This is often evident in situations where limitations set the amount of pollution emitted in a designated area, technology standards are established, or regulated entities are required to install specific technology equipment.[16] Traditionally, the government develops command and control regulations by setting environmental standards, permit allowances, enforcement procedures, and penalties for non-compliance.[17] These actions flow from the government's examination of a particular environmental concern—such as air pollution, and its determination of what actions industrial emitters must take to maintain or achieve an acceptable level of pollution.[18] Command and control regulation has been the foundation of modern environmental law in the United States,[19] and this

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14. Press & Mazmanian, *supra* note 11, at 224.

15. *See* Rena I. Steinzor, *Reinventing Environmental Regulation: The Dangerous Journey from Command To Self-Control*, 22 HARV. ENVTL. L. REV. 103, 104 (1998).

16. *See* John A. Barrett, Jr., *The Global Environment and Free Trade: A Vexing Problem and a Taxing Solution*, 76 IND. L.J. 829, 834 (2001); Steinzor, *supra* note 15, at 104.

17. GEORGE (ROCK) PRING & RICK A. FEGER, *Alternatives to Conventional Regulation in United States Environmental Law*, *in* REGULATING ENERGY AND NATURAL RESOURCES, 336 (Barry Barton et. al. eds., 2006). Regulatory agencies issue permits or licenses to industrial polluters allowing them to emit a specific amount and type of pollution. *See also* Gershonowitz, *supra* note 11, at 104-05. The terms of permits and licenses are required and enforced under command and control regulation.

18. Barrett, *supra* note 16, at 834.

19. *Id.* at 833-34. The early 1970s mark the principal enactment of environmental laws, many of which are major environmental laws still in effect today. *See, e.g.*, Clean Air Act, 42 U.S.C. §7401 (2009), *infra* notes 21-26 and accompanying text. Since then, the United States has continued to base many environmental laws on the command-control model. PRING & FEGER, *supra* note 17, at 336.

approach enables the government to take immediate action in response to extreme deteriorations in environmental quality.[20]

A. The Clean Air Act: An Example of Command And Control Regulation

A paradigmatic example of the command and control approach to environmental regulation is the Clean Air Act of 1970 (CAA), which mandates pollution reduction and contains an unprecedented number of detailed command and control regulations.[21] The CAA regulates technology used by polluters to achieve pollution reduction goals by enabling the Environmental Protection Bureau (EPA) to set standards for "best available technology," resulting in fines for companies that use technology below that standard.[22] This exemplifies the classic command and control regulation approach of requiring polluting industries to strictly adhere to government directives.[23] Regrettably, this legislation also included significant limitations which ultimately produced negative impacts on the environment.[24] For example, although its "best available technology" standard increased the utilization of the best existing equipment, it also deterred the

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20. For example, sea turtle conservation is governed by command and control regulation in part because there was an urgent need to implement responsive measures immediately because of the significantly small surviving population of sea turtles. Sanford Gaines, *The WTO's Reading of the GATT Article XX Chapeau: A Disguised Restriction on Environmental Measures*, 22 U. PA. J. INT'L ECON. L. 739, 800-01 (2001) (noting that "voluntary and economic incentive approaches rarely yield either rapid or comprehensive changes in behavior.").

21. Clean Air Act, 42 U.S.C. §§ 7401-7671(q) (2006). For example, the amendments made to the CAA in 1990 ("1990 CAA Amendments") imposed emissions limitations on certain pollution sources to try to resolve the problem of regional NO_x transport. Jonathan Remy Nash & Richard L. Revesz, *Markets and Geography: Designing Marketable Permit Schemes to Control Local and Regional Pollutants*, 28 ECOLOGY L.Q. 569, 602 (2001). *See generally* HISTORY OF THE CLEAN AIR ACT, http://www.epa.gov/air/caa/caa_history.html (last visited Mar. 25, 2010) [hereinafter History of the CAA].

22. Blake C. Norvell, *Business Regulatory Lessons Learned from Amusement Park Safety Concerns: An Integrated Approach To Business Regulation,* 27 TEMP. J. SCI. TECH. & ENVTL. L. 267, 270 (2008).

23. Benjamin K. Sovacool, *The Best of Both Worlds: Environmental Federalism and the Need for Federal Action on Renewable Energy and Climate Change*, 27 STAN. ENVTL. L.J. 397, 413 (2008).

24. *See* RICHARD N. L. ANDREWS, MANAGING THE ENVIRONMENT, MANAGING OURSELVES 235 (2nd ed. 1999).

development of more innovative technologies and more efficient production processes.[25] As a result, backlash arose against the CAA from many regulated entities who argued that there were more efficient ways to accomplish the goals set by the federal government.[26]

B. Analysis Of The Effectiveness Of Command And Control Regulation

For the past four decades command and control regulation has significantly reduced pollution and increased protection of valuable environmental resources in the United States.[27] The presence of strong government in the environmental arena at the federal, state, and local level assures that environmental issues will not be overlooked or unaddressed and prevents a "race to the bottom."[28] The command and control approach has proven to be effective partly because of its ability to provide regulated entities with clear instructions for meeting regulatory requirements.[29] Thus, command and control has proven to be effective when regulations involve an efficient technology-based standard that can be easily and quickly understood and implemented by regulated entities.[30]

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25. *Id.* at 235-36.

26. Steinzor, *supra* note 15, at 107.

27. *See* PRING & FEGER, *supra* note 17, at 336.

28. *Id.* at 337-38; *see generally* Richard L. Revesz, *Rehabilitating Interstate Competition: Rethinking the "Race-To-The-Bottom" Rationale for Federal Environmental Regulation*, 67 N.Y.U. L. REV. 1210, 1210 (1992) ("[A]n influential justification for placing responsibility for environmental regulation at the federal level is that otherwise states would engage in a socially undesirable "race to the bottom," making their environmental standards too lax in an effort to attract and retain industry.").

29. PRING & FEGER, *supra* note 17, at 338.

30. *See, e.g.*, discussion *supra* note 20. Sea turtle conservation is governed by command and control regulation because the available simple technological fix to the conservation problem necessitated a technology-based standard, this technology proved to be effective and reliable, and there were no competing technologies at the time. Gaines, *supra* note 20, at 800-01. Moreover, command and control regulation was used for this purpose because it is more reliable, much easier to enforce, and interfered the least with fishing business operations, than the other alternatives for sea turtle protection. *Id.* at 801.

Still, since its inception, environmental command and control regulation has been criticized for its limitations.[31] One significant limitation is the ability to enforce a complex and broad regulation against corporations that are often opposed to the regulation.[32] Thus, command and control is optimal for clear-cut rules that are easy to enforce and address clear and simple substantive matters.[33] This approach is also derided for its inflexibility as it imposes complex and rigid mandatory rules, most of which are technology and performance-based.[34] Consequently, many believe that command and control makes it difficult for regulated entities to adapt to changing circumstances and, therefore, fails to encourage or permit innovation of more efficient means of pollution prevention.[35] This deprives the

31. *See* Barrett, *supra* note 16, at 835. *See, e.g.,* Richard B. Stewart, *A New Generation of Environmental Regulation?*, 29 CAP. U. L. REV. 21, 21 (2001) (failure to prioritize risk management wisely); PRING & FEGER, *supra* note 17, at 338 (disregard of numerous smaller sources, which collectively can cause as much environmental damaging as large sources); ("[a] 'one-size-fits-all' approach, unresponsive to the varying conditions and needs of different industries, regions and ecosystems.") . *Id.* (displacement of damage, for example from air to water). *Id.* at 339.

32. Norvell, *supra* note 22, at 272-73. The rationale is that enforceability decreases as the 1) complexity of the regulation increases, 2) complexity of the entity structure increases, and 3) regulated entities utilize "willful noncompliance" to ambiguous regulations by using the vagueness to their advantage. *Id.* at 272 n.35.

33. *Id.* at 272. An example of such a rule is one requiring car manufacturers to install seatbelts because it is easily detected if the manufacturer fails to comply. Moreover, because there is a clear actor (the manufacturer) and a clear violation (the car does not have seatbelts), fines can be easily issued for non-compliance. *Id.* at 272 n.38.

34. *See* Bradford C. Mank, *The Environmental Protection Agency's Project XL and Other Regulatory Reform Initiatives: The Need for Legislative Authorization*, 25 ECOLOGY L.Q. 1, 32 (1998); J. Jared Snyder, *New York Department of Environmental Conservation Proposed Regulations for a CO_2 Budget Trading Program*, SN062 ALI-ABA 365, 448 (April 3-4, 2008) ("Technology-based standards" establish the specific technological processes or equipment required by regulations, while "performance-based standards" establish a uniform control target for regulated entities and allow some latitude in how this target is met); *see also* discussion *supra* notes 16, 22, 25, 29, 30 and accompanying text.

35. *See* Stewart, *supra* note 31, at 21; *accord* Norvell, *supra* note 22, at 271 (arguing that command and control regulation is often criticized for not creating any motive for innovation). *Contra* Driesen, *Emissions Trading*, *supra* note 11, at 304 (contending that "very rigid regulations that completely banned the production and use of certain chemicals have led to widespread innovation. For example, outright bans of ozone depleting chemicals stimulated the development of substitutes, thereby realizing an enormously important environmental improvement

public of new alternative strategies that would accomplish the same or lower pollution goals, perhaps at a lesser cost, if they do not meet the specified requirements.[36] Further, innovation may not be stimulated because few incentives exist for reducing pollution beyond the legal target levels.[37] Thus, the policy framework of command and control regulation has resulted in unnecessary expenditures by regulated entities and significant deterrence of technological innovation.[38]The rigid technology standards imposed by these regulations produce additional limitations. For instance, there are generally long delays in implementing pollution control technology in a timely fashion.[39] As a result, when the government finally determines the proper technology equipment or processes, the regulated industry often has already adopted a newer, more efficient or a comparable, less costly technology.[40]

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at little or no cost...[M]ore demanding traditional regulation sometimes described as technology forcing often provides significant incentives to innovate.").

36. *See* Gaines, *supra* note 20, at 800; *see also* Janice Gorin, Note, *Caught Between Action and Inaction: Public Participation Rights in Voluntary Approaches to Environmental Policy*, 24 STAN. ENVTL. L.J. 151, 167 (2005).

37. *See* PRING & FEGER, *supra* note 17, at 339; Snyder, *supra* note 34, at 449; *see also* Norvell, *supra* note 22, at 271. *Contra* Driesen, *Emissions Trading*, *supra* note 11, at 305 (stating that "[t]his charge...does not completely survive rigorous analysis. Polluters subject to performance standards usually emit much less than their permits allow in order to make sure that they consistently comply with regulatory standards. Hence, the enforceability of traditional standards can provide an incentive to surpass them to some degree. Moreover, polluters have an incentive to reduce pollution substantially below regulated levels when meeting a more stringent level costs less than meeting the level regulation requires.").

38. *See* Driesen, *Emissions Trading*, *supra* note 11, at 296-97; *see e.g.*, Soo-Yeun Lim, *Mandatory Corporate Greenhouse Gas Emissions Disclosure to Encourage Corporate Self-Regulation of Emissions Reduction*, 17 N.Y.U. ENVTL. L.J. 854, 856 (2008).

39. To implement new pollution control technology, the EPA must first research and determine the proper technology, then begin the process of reformulating or creating new regulation standards. *See* Todd B. Adams, *New Source Review Under the Clean Air Act: Time for More Market-Based Incentives?*, 8 BUFF. ENVTL. L.J. 1, 51-52 (2006). This process can be further slowed by legal challenges made to the regulation by industrial corporations or environmental groups and often a court must timely research the issue because of its lesser familiarity. *See id.*

40. *See* Barrett, *supra* note 16, at 836. This results in costly regulation reform that frequently mandates outdated technology equipment and processes. *See id.* at 836-37.

C. *Analysis Of Green Building Technology In The Command And Control Setting*

Solar thermal technology,[41] a commonly used green building technology, would be best advanced by command and control regulation. Due to the increase of government regulations that advocate the use of solar energy, there has been exponential growth in the development of solar energy technology.[42] Specifically, solar thermal technologies operate by concentrating sunlight with reflective devices, commonly solar panels, to heat a liquid, which in turn creates steam that then powers a generator to create electricity.[43] By generating clean and renewable energy, solar panels improve air quality and reduced GHG emissions, among other environmental benefits.[44]

Currently, restrictions in local ordinances, often inserted for aesthetic purposes, impede the installment and operation of solar panels.[45] Many of these restrictions were developed when the first

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41. Solar thermal technology is a form of solar energy, a renewable resource continuously supplied by the sun, which is generally converted into electricity by solar thermal and photovoltaic technologies. NON-HYDROELECTRIC RENEWABLE ENERGY, EPA, http://www.epa.gov/cleanenergy/energy-and-you/affect/non-hydro.html (last visited Apr. 21, 2010). To meet multiple LEED credit requirements, solar energy technologies are often endorsed. *See, e.g.*, LEED EB, *supra* note 7, at 8-11, 35-36. For example, the covering of a roof of a parking lot with solar panels that produce energy used to offset some nonrenewable resource use is suggested. *See generally* LEED NC, *supra* note 7, at 16.

42. For example, tax credits are available for solar energy investments. *See generally* 26 U.S.C.A. § 46 (2004) (a federal regulation providing a 10% tax credit for commercial businesses that purchase solar energy technology); ARIZONA RESIDENTIAL SOLAR AND WIND ENERGY SYSTEMS TAX CREDIT, *available at* http://windpowerauthority.com/arizona/ (last visited Apr. 21, 2010) (a state regulation providing up to 25% in tax credit for the solar device purchased).

43. *See* NON-HYDROELECTRIC RENEWABLE ENERGY, *supra* note 41.

44. *See, e.g.*, David M. Driesen, *Sustainable Development and Air Quality: The Need to Replace Basic Technologies with Cleaner Alternatives*, 10 BUFF. ENVT'L. L.J. 25, 48 (2002/2003) [hereinafter Driesen, *Sustainable Development*] (In fact, solar power can potentially produce power with no direct air pollution at all); SOLAR ENERGY FOR MEDIA, http:// www.philadelphiasustainabilityawards.org /node/338 (last visited Apr. 21, 2010).

45. These restrictions may take the form of any of the following: "a restriction on the placement of and type of solar power generation allowed, a requirement for approval by an architectural review board, height restrictions, setback requirements." Edna Sussman, *Reshaping Municipal and County Laws to Foster Green Building, Energy Efficiency, and Renewable Energy*, 16 N.Y.U. ENVTL. L.J.

solar panels were large and obtrusive, which may no longer be the case.[46] As a result of solar thermal technology's growing popularity, technological advancements and environmental benefits, government bodies have revised ordinances that restricted this technology[47] and have even enacted direct measures, known as "solar laws," to promote solar energy development.[48]

Solar laws and ordinances demonstrate the increasing adoption of solar thermal technology regardless of its costs and legal restrictions.[49] Moreover, these government actions illustrate a command and control-like approach since governments are specifying a technology-based standard for solar panels and other solar thermal technology in laws and ordinances.[50] Yet, although many government bodies encouraged solar technology use over the past thirty years, only 1% of power generated in the nation is solar.[51] Some argue that this is a consequence of a failure of the legal system

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1, 31 (2008) [hereinafter Sussman, *Reshaping*]. For example, the town of Belle Meade, Tennessee, only permitted solar installations not visible to others. *See id.* at 30; *see also* Bronin, *supra* note 9, at 254-55 (stating that this ordinance has been changed to allow energy-generating equipment on the roofs of homes). Moreover, many ordinances fail to address solar panels directly, causing further impediments to the growing use of these technologies. *Id.* at 253-55.

46. *See* Sussman, *Reshaping*, *supra* note 45, at 30; *see also* Bronin, *supra* note 9, at 251 (explaining that now solar panels are thinner and more inconspicuous).

47. *See, e.g.*, ALBANY, N.Y., CODE §§ 375-93(C)(2) (2008), *available at* http://www.ecode360.com/?custId=AL0934 (stating that this regulation permits solar energy equipment and that "while there are aesthetic considerations, the City has determined that the environmental and economic benefits outweigh potential aesthetic impacts.").

48. Sussman, *Reshaping*, *supra* note 45, at 34.

49. *See id.*

50. *See* discussion *supra* notes 16, 22, 25, 29, 30, and 34 and accompanying text. The similarity to and appropriateness of a command and control approach for solar panels even extends to state governments directing their local governments through regulations to develop implementation plans or take additional steps to ensure the requirement or encouragement and feasibility of the installation and operation of solar panels. *See, e.g.*, *supra* notes 47-49 and accompanying text.

51. *See* Yuliya Chernova, *Shedding Light on Solar*, WALL ST. J. (June 30, 2008), *available at* http://online.wsj.com/article/SB121432258309100153.html (contending that this low percentage of total energy use results from the high costs of solar power relative to traditional fuels like coal and natural gas, even with government financial incentives). *But see* Sussman, *Reshaping*, *supra* note 45, at 34 (describing how solar panel utilization results in overall cost-savings).

to ensure access to, and use of, green building technologies, which can be resolved by reforming land use ordinances.[52]

In the past, mandates for solar panels were highly contested.[53] However, many of the reasons undergirding these contests no longer apply.[54] For instance, command and control regulations for solar panels were opposed because of the assumption that mandates would hinder the fast-growing pace of the solar industry and the resulting desired innovation.[55] However, over the past thirty years, the solar industry has surpassed the time of vulnerability when mandates would substantially threaten industry growth and innovation and, moreover, this technology has largely become cost-effective and efficient.[56]Solar panels have proved to be an advanced technology that can be easily installed and operated, as well as integrated into technology-based standards employed in command and control regulations.

III. INCENTIVE-BASED REGULATION

Although the command and control approach to regulation has clearly been successful in establishing better environmental practices, it is often argued that this traditional approach to regulation is not

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52. *See* Bronin, *supra* note 9, at 269 (quoting W. Wade Berryhill & William H. Parcell III, *Guaranteeing Solar Access in Virginia*, 13 U. RICH. L. REV. 423, 426 (1979)) ("Most authorities agree that the guarantee of solar access is the single most important legal issue concerning solar energy.").

53. Enactment of these mandates was believed to immediately impede solar innovation and impose excessive burdens on regulated entities that must comply with regulations that significantly vary from jurisdiction to jurisdiction. *See, e.g.*, Brian Langston, *Mandating Solar Hot Water Heating in New Residential Construction by Local Governments: Mandates: Unnecessary Burden on Consumers, Industry, and Government*, 1 UCLA J. ENVTL. L. & POL'Y 121, 127-132 (1981). These were substantial concerns because at that time the solar industry needed a "situation in which incentives to innovate are preserved and market requirements are standard enough to facilitate economies of scale and operation over wide geographic areas," which would be greatly deterred by mandates. *Id.* Moreover, the solar industry was experiencing rapid growth at the time, resulting in continuous innovation toward reduced costs and increase efficiency that would have been stunted by a command and control approach. *Id.* at 128-32.

54. For reasons undergirding opposition to solar panel utilization, *see infra* note 55 and accompanying text.

55. *See, e.g.*, *supra* note 47, 49 and 51.

56. *See id.*

optimal for addressing a number of modern environmental issues.[57] A popularly recommended alternative is the use of an economic incentive-based approach to environmental regulation.[58] Regulated entities continually face difficulties in complying with environmental command and control regulations.[59] This may be evidenced by the increasing expense of complying with rigid technology-based rules, which indicate a growing need for alternative, more flexible environmental regulations.[60] These regulations are incentive-based as they encourage regulated entities to voluntarily act to improve environmental quality, such as reducing pollution emissions.[61] As much as twenty years ago, the United States advanced from the dominant method of command and control regulation in the environmental arena to the method of utilizing economic incentives.[62]

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57. *See* Press & Mazmanian, *supra* note 11, at 361 ("[W]e have now moved to a new generation of environmental problems for which the old methods are often ineffective or even counterproductive.") *See, e.g.*, Gershonowitz, *supra* note 11, at 104 (claiming that command and control is not the proper regulation to achieve specific environmental results such as water quality standards); Gorin, *supra* note 36, at 159 (stating that command and control on its own is unable to advance environmental regulation). As a result, command and control has and will likely continue to be supplanted by more progressive regulatory approaches. *See generally* Barry S. Elman, *Emissions Trading and Economic Incentives Under the New Clean Air Act*, 157 PLI/CRIM 351, 423 (1990).

58. For instance, environmental goals have shifted from a primary focus on pollution reduction to pollution prevention, which can be achieved through incentive-based regulation. *See generally* Press & Mazmanian, *supra* note 11, at 226.

59. *See* Gershonowitz, *supra* note 11, at 104.

60. *See* Lim, *supra* note 38, at 856; *accord* Gorin, *supra* note 36, at 166-67 ("Continuous adaptation in environmental policy is necessary... and critics have argued that the rigidity of the command-and-control structure hinders this goal."). Incentive-based regulations are considered "information-forcing instruments," which are proper for "achieving regulatory goals that are designed to (1) target a wide scope of actors; (2) where the regulatory burden of command and control regulation is significant; (3) where the person that bears the least cost of information disclosure is the actor itself; and (4) where external stakeholder pressures develop from the information disclosed." Lim, *supra* note 38, at 856.

61. *See* Lim, *supra* note 38, at 856.

62. *See* Elman, *supra* note 57, at 353. This evolution is exemplified in the 1990 CAA Amendments, which implemented a market-based approach, replacing the traditional command and control approaches. *See also* David M. Driesen, *Sustainable Development and Market Liberalism's Shotgun Wedding: Emissions Trading Under the Kyoto Protocol*, 83 IND. L.J. 21, 31 (2008) [hereinafter Driesen, *Under the Kyoto Protocol*] (stating that the first major success of the market-based incentives approach to regulation in the United States is the Acid Rain Program

A. Using Incentives As Regulation

The incentive-based approach to regulation has been increasingly applied to environmental policy by government and regulatory agencies.[63] Proponents argue that "carrots work better than sticks" wherein incentives, particularly economic ones, are expected to achieve better results than the use of coercive and punishment techniques characteristic of command and control regulation.[64] Incentives encourage regulated entities to voluntarily reduce pollution emissions to achieve desired environmental goals.[65] One method of encouragement is to attach a price to pollution, which causes companies to willingly perform the desired environmental action to lessen this cost.[66] The government and government agencies are also derive value from incentive-based regulations by using them to experiment with new methods for environmental protection, which leads to more informed and innovative environmental policy solutions.[67]

(ARP) enacted as part of the 1990 CAA Amendments). *See generally infra* text discussing the ARP accompanying note 101.

63. The current Obama Administration is supportive of economic incentives as demonstrated by the President's current proposal for a "Home State" program and his repeated requests for Congress to pass incentives for homeowners to make their homes more energy efficient. *See, e.g.*, Katherine Ling, *Democrats to Turn Spotlight on Energy Efficiency Programs This Week*, N.Y. TIMES (Mar. 8, 2010), *available at* http://www.nytimes.com/gwire/2010/03/08/08greenwire-democrats-to-turn-spotlight-on-energy-efficien-54735.html?scp=1&sq=obama%20environmental%20incentive&st=cse (statement of President Barak Obama regarding the "Home Star" program) ("We know this will save families as much as several hundred dollars on their utilities...[and] it will make our economy less dependent on fossil fuels, helping to protect the planet for future generations.").

64. Barry Barton, *The Theoretical Context of Regulation, in* REGULATING ENERGY AND NATURAL RESOURCES 21 (Barry Barton et. al. eds., 2006).

65. *See* Gorin, *supra* note 36, at 153. An example of an environmental goal is a specific level of environmental improvement that is sought by an agency. *Id.* at 155-56.

66. *See* Barrett, *supra* note 16, at 839; BURNS ET AL., *supra* note 1, at 102.

67. Policy solutions are better informed because incentive-based regulations offer the ability to collect information since voluntary participation encourages collaboration for performing research and sharing information that can lead to the formulation of better environmental practices. *See* Gorin, *supra* note 36, at 164. For example, the EPA's "Design for the Environment" program involves collaborating with private regulated industries to design and improve technology processes and equipment that produce less harmful effects on the environment. *Id.* Moreover, the

There is a wide range of incentive-based approaches to environmental regulation, which can improve environmental quality and do so in a more economically efficient manner.[68] Frequently, these approaches are market-based uses of economic incentives to induce regulated entities to perform particular business operations that will achieve specific environmental goals.[69]

B. Market-Based Incentive Approaches To Regulation

In a market-based incentive system, the government establishes financial incentives that compel regulated entities to reduce their aggregate pollution emissions to a desired level, and monitors and enforces compliance.[70] These regulations are flexible, enabling regulated entities to determine the manner of pollution reduction rather than being forced to employ specified technological processes or equipment.[71] Moreover, regulated entities subject to market-based incentive regulations are rewarded for complying with regulations, instead of being penalized for refusing to comply.[72] A well-known example of market-based incentive regulation is the Acid Rain Program (ARP) of the 1990 CAA Amendments, under which pollution emissions were successfully decreased and the regulated industry, as a whole, spent less money.[73]

Market-based incentive regulations use the power of the profit motive that drives free markets to achieve environmental goals with

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value of using regulations experimentally, especially to achieve technology innovation, would be hindered by command and control regulations that dictate the use of specific technologies. *See id.* at 183.

68. Press & Mazmanian, *supra* note 14, at 227.

69. For example, government tax credit programs are aimed at indirectly boosting ethanol use by promoting competitive ethanol pricing, which gives ethanol a market advantage. *See* Brian R. Farrell, Note, *Fill 'Er Up With Corn: The Future of Ethanol Legislation in America*, 23 J. CORP. L. 373, 381-82 (1998).

70. Regulated entities are so compelled because of the significant operating costs of the industry. Robert Stavins & Thomas Grumbly, *The Greening of the Market: Making the Polluter Pay*, *in* MANDATE FOR CHANGE 197, 201 (Will Marshall & Martin Schram eds., 1993).

71. *See id.*

72. Thus, market-based incentive regulation assumes that rewarding positive environmental actions of regulated entities is more efficient than penalizing negative actions. *See* Gaines, *supra* note 20, at 800; Norvell, *supra* note 22, at 273, 273 n.42.

73. *See* Press & Mazmanian, *supra* note 14, at 227.

the highest benefit to society.[74] These regulations use market forces in an attempt to create a free market[75] where regulated entities profit if they comply or lose the opportunity to profit if they fail or refuse to comply.[76] In theory, in a free market, more companies would comply with profitable market-based incentive regulations than would comply with rigid command and control regulations.[77] An example of a market-based incentive regulation that uses the free market in this manner is the Regional Clean Air Incentives Market, the tradable permits program in Los Angeles, CA, which has achieved an overall reduction in emissions and in pollution control costs.[78] This regulatory approach is also employed at the federal level with ethanol.

1. Ethanol: An Example Of Traditional Market-Based Incentive Regulation

Ethanol, a renewable fuel source produced primarily from corn,[79] is currently blended into more than 50% of the fuel supply in the United

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74. Norvell, *supra* note 22, at 273; Stavins & Grumbly, *supra* note 70, at 201. However, this may not necessarily achieve the most environmentally efficient results. *See* Sheila M. Olmstead, *Applying Market Principles to Environmental Policy*, *in* ENVIRONMENTAL POLICY, NEW DIRECTIONS FOR THE TWENTY-FIRST CENTURY 198 (Norman J. Vig & Michael E. Kraft, eds., CQ Press 7th ed. 2010) (asserting that if there is an emissions reduction requirement, regulated entities are very likely to utilize processes and equipment that will accomplish the cheapest abatement first, then utilize more and more expensive alternatives as the amount of required abatement increases).

75. In the environmental context, a free market provides incentives, without government intervention, for private actors to reduce pollution. Driesen, *Emissions Trading*, *supra* note 11, at 338-39 n.223.

76. *See* Inho Choi, *Global Climate Changes and the Use of Economic Approaches: The Ideal Design Features of Domestic Greenhouse Gas Emissions Trading with an Analysis of the European Union's CO_2 Emissions Trading Directive and the Climate Stewardship Act*, 45 NAT. RESOURCES J. 865, 879 (2005). *See also* Norvell, *supra* note 22, at 273 ("[M]arket forces, which utilize profit motive, can act as very powerful incentives.").

77. Therefore, the government would not need to monitor market-based incentive regulations as closely as under command and control regulation because noncompliance is not an important issue. Norvell, *supra* note 22, at 275 n.63.

78. *Id.* at 273; *see also* Press & Mazmanian, *supra* note 14, at 227.

79. *Recession Reshapes US Ethanol Sector*, 4 PETROLEUM INTELLIGENCE WEEKLY 1, January 4, 2010; *e.g.*, Renewable Fuel Standard, 40 C.F.R. § 80.1100 (2007) (stating that 92% of ethanol is produced from corn).

States.[80] The incorporation of ethanol into gasoline results in a cleaner-burning fuel and is therefore one of the best tools used to fight air pollution emitted from motor vehicles.[81] From the energy crisis of the 1970s that triggered a significant increase in incentives to use ethanol as a fuel,[82] to subsequent major federal acts,[83] the federal government has endorsed the use of ethanol. These regulations supported the ethanol industry, requiring the government to provide financial subsidies so immense that if unavailable, no significant market for ethanol would exist.[84] Now that the ethanol industry has significantly increased in efficiency, government financial assistance provided through market-based incentive regulation may no longer be needed.[85] Thus, the progressive increase of ethanol production is greatly attributed to market-based incentive programs, primarily tax

80. *See* Farrell, *supra* note 69, at 378, 388; ETHANOL BASICS, http://www.ethanolfacts.com/ETHL2008/page.php?pgID=1 (last visited Apr. 1, 2010).

81. ETHANOL BASICS, *supra* note 80. *See, e.g.*, RENEWABLE FUELS ASSOCIATION, ETHANOL FACTS: ENVIRONMENT, http://www.ethanolrfa.org/pages/ethanol-facts-environment (last visited Apr. 1, 2010) (noting that "[e]thanol contains 35% oxygen. Adding oxygen to fuel results in more complete fuel combustion, thus reducing harmful tailpipe emissions. Ethanol also. . . .is non-toxic, water soluble and quickly biodegradable.").

82. Jessica Moland, *Robbing Peter to Pay Paul: Why Ethanol Production Must Be Regulated and How to Do It,* 16 U. BALT. J. ENVTL. L. 55 (2008); *accord* Farrell, *supra* note 69, at 374, 377. The energy crisis was initiated by embargos imposed on petroleum by Middle Eastern nations. *See generally* Farrell, *supra* note 69, at 375 (explaining that at that time the United States was heavily dependent on foreign fuels and was therefore forced to design alternative fuels).

83. For examples of such acts, *see generally* ENERGY INDEPENDENCE AND SECURITY ACT OF 2007, 42 U.S.C. § 7545(o)(2)(B)(i)(I) (2007) (requiring that in 2010 sales of conventional biofuels must reach twelve billion gallons); ENERGY POLICY ACT OF 2005, U.S.C. § 15801 (2005); ENERGY TAX ACT OF 1978, PUB. L. NO. 95-618, 92 STAT. 3174 (1978); 40 C.F.R. § 80.1100 (2007).

84. *See* Farrell, *supra* note 69, at 374. For example, if the renewable fuels goal of 7.5 billion gallons by 2012 is met, the cost will be $5.1 billion a year for taxpayers. *See, e.g.*, Arnold W. Reitze, Jr., *Should the Clean Air Act Be Used to Turn Petroleum Addicts into Alcoholics?*, 36 ENVTL. L. REP. 10745, 10760 (Oct. 2006), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1000434. *See generally* Arnold W. Reitze, Jr., *Federal Control of Carbon Dioxide Emissions: What Are The Options?*, 36 B.C. ENVTL. AFF. L. REV. 1, 63 (2009) (adding that such subsidies are used for the production of corn feedstock and the construction of ethanol production facilities).

85. *See* Farrell, *supra* note 69, at 374, 392-93 (asserting that there are few reasons to provide direct financial assistance to an industry that is well established, increasingly competitive, and advancing in technology).

incentives, which create competitive ethanol pricing and result in programs that vary across jurisdictions.[86] Although this allows each jurisdiction to create ethanol legislation that fits its own needs, a lack of uniformity in regulation causes conflict between jurisdictions.[87] In addition, state market-based incentive regulations offering ethanol tax credits are expensive[88] and highly political.[89]

The use of market-based incentive regulations has clearly led to steady increases in domestic fuel ethanol production. As these regulations increasingly require the use of ethanol, the demand and production of corn increases and, as a result, produces detrimental agricultural[90] and environmental[91] effects. Further, the actual use of ethanol as a fuel still produces GHG emissions, which produces other harmful impacts on the environment.[92] Therefore, many assert that the environmental impacts of market-based incentive regulations for ethanol use, in combination with current economic constraints and the present state of the ethanol industry, signify that these regulations

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86. *See id.* at 380-81 (discussing examples of state incentive programs that benefit both ethanol producers and consumers).

87. For example, Ohio adopted a tax credit program only for ethanol-blended gasoline produced in the state or produced in states that had a similar tax credit program. *See* OHIO REV. CODE ANN. § 5735.145(B) (West 1984). Concurrently, Indiana replaced its tax credit program for ethanol producers with direct subsidies, which created legislative difficulties since other states employed tax credit programs; *see generally* Farrell, *supra* note 69, at 383.

88. *See supra* text accompanying note 84. *But cf.* Farrell, *supra* note 69, at 393 (arguing that market-based incentives relieve the burden on state budgets and are therefore preferable to command and control regulation).

89. Politicians are concerned with withdrawing subsidy and tax credit programs for ethanol because of political considerations. Farrell, *supra* note 69, at 392.

90. To meet standards imposed by federal legislation and the corresponding increase in demand for ethanol, farms are allotting more acreage to corn production, which often detracts from other crops, such as cotton, frequently raising costs and reducing supply of these crops. Moland, *supra* note 82, at 29.

91. *See supra* note 81 and accompanying text. Several harmful environmental affects result from waste generated from ethanol production. *See, e.g.*, ETHANOL BASICS, *supra* note 80 at 66 (statement of Maywa Montenegro) ("[O]nly a relatively small portion of each plant [can be used], a lot of biomass goes unused.").

92. *See* Farrell, *supra* note 69, at 378; Moland, *supra* note 82, at 65. For a discussion of the consequences of increased corn production, *see supra* notes 90-91, and accompanying text.

ought to be changed.[93] The Obama administration is currently taking steps to limit emissions of climate-changing gases from the manufacture of ethanol; for example, the administration stated it would help biofuel producers who could not get credit to refinance their operations.[94]

2. Sulfur Dixoide: An Example Of Hybrid Market-Based Incentive Regulation

An emissions trading program is a form of market-based incentive regulation that utilizes command and control regulatory devices.[95] Emission trading involves specifying aggregate emissions limits for each region, set by the government as command and control regulation, which are allocated to individual polluters by region in the form of tradable emission permits, creating a market within a region.[96] Then a cap and trade system for permits,[97] as market-based incentive regulation, allows individual polluters to adjust their pollution limits by trading, selling and buying pollution credits.[98] An example of the cap and trade program can be found in regulations

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93. *See* Moland, *supra* note 82 (explaining that the ethanol industry is large enough to create and maintain competitive prices); *see also supra* text accompanying note 85. This could involve removing regulations, which is easier with incentive regulations rather than mandates.

94. *See* Matthew L. Wald, *Rules to Limit Emissions in the Making of Ethanol*, N.Y. TIMES, May 5, 2009, at B5.

95. However, whether or not emissions trading constitutes an incentive-based approach is debated. *Compare* Robin Kundis Craig, *"Stationary is Dead" – Long Live Transformation: Five Principles for Climate Change and Adaptation Law*, 34 HARV. ENVTL. L. REV. 9, 28 (2010) (contending that cap and trade programs are neither economic incentives or command and control regulations) *with* Driesen, *Emissions Trading*, *supra* note 11, at 290, 338 (arguing that emissions trading should not be considered an incentive-based regulation because it relies on government mandates). For an addition example of a tradable permits program, *see* discussion *supra* note 78 and accompanying text.

96. Sonya Dewan, Note, *Emissions Trading: A Cost-Effective Approach to Reducing Nonpoint Source Pollution*, 15 FORDHAM ENVTL. L. REV. 233, 235, 242 (2004).

97. CAP AND TRADE, http://www.epa.gov/capandtrade/ (last visited Mar. 28, 2010) ("Cap and trade" refers to "an environmental policy tool that delivers results with a mandatory cap on emissions while providing sources flexibility in how they comply.").

98. Dewan, *supra* note 96, at 242. Individual polluters are therefore encouraged to pursue their optimal level of pollution.

relating to sulfur dioxide (SO_2),[99] such as Title IV of the 1990 CAA Amendments,[100] which establishes the Acid Rain Program (ARP),[101] an emissions trading program that reduces SO_2 emissions from large electric utilities.[102] The ARP provides financial incentives to regulated entities by implementing a monetary system wherein SO_2 emission allowances can be sold which motivates allowance owners to reduce pollution emissions to retain allowances and sell them for profit.[103]

This form of market-based incentive regulation promotes innovative environmental technologies because emissions trading programs are technologically flexible and offer incentives for private investment while setting performance-based standards fulfilled by regulated entities in the manner of their choosing.[104] Moreover, this approach allows the regulation to focus on the largest direct and indirect sources of pollution, to target specific entities, and provide

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99. SO_2 is a gas that is largely produced by fossil fuel combustion at power plants and other industrial facilities. SULFUR DIOXIDE, http://www.epa.gov/air/sulfurdioxide/ (last visited Mar. 31, 2010). Emissions of SO_2 produce negative effects on human health and the environment. Margaret R. Taylor et al., *Regulation as the Mother of Innovation: The Case of SO_2 Control*, 27 LAW & POLICY 2, 354 (2005), *available at* http://onlinelibrary.wiley.com/doi/10.1111/j.1467-9930.2005.00203.x/full. For examples, *see generally* SULFUR DIOXIDE: HEALTH, http://www.epa.gov/air/sulfurdioxide/health.html (last visited Mar. 31, 2010) (bronchoconstriction and increased asthma symptoms).

100. 42 U.S.C. §7651 (2006).

101. In 2008, the ARP achieved a SO_2 emissions reduction of 7.6 million tons and 100% participation. *See generally* EMISSION, COMPLIANCE, AND MARKET DATA, http://www.epa.gov/airmarkets/progress/ARP_1.html (last visited Mar. 31, 2010); discussion relating to the ARP *supra* notes 62, 73 and accompanying text.

102. *See* Driesen, *Emissions Trading*, *supra* note 11, at 317. Title VI establishes various emission reduction goals by capping the number of allowances for large utility units that results in a large cut in emissions. *Id.* at 317-18. For example, Title VI requires a ten million ton reduction in SO_2 emissions below 1980 levels. ACID RAIN PROGRAM, http://www.epa.gov/airmarkets/progsregs/arp/basic.html (last visited Mar. 31, 2010).

103. In theory, allowance owners will act accordingly provided the revenue from selling allowances exceeds the costs of using the Title VI voluntary provisions. *See* Juan-Pablo Montero, *Volunteering for Market-Based Environmental Regulation: The Substitution Provision of the SO2 Emissions Trading Program*, available at http://dspace.mit.edu/bitstream/handle/1721.1/45071/97001.pdf?sequence=1.

104. *See* Margaret R. Taylor et al., *Regulation as the Mother of Innovation: The Case of SO_2 Control*, 27 LAW & POLICY 2, 348, 348, 370, 372 (2005), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=684343.

flexibility to allow for broader coverage.[105] However, in regulating for specific geographic areas, this approach often results in hot spots; specific areas where the amount of the regulated pollutant increases as a direct result of the regulation.[106]Overall, an emissions trading program must meet certain criteria to be successful; this includes effective monitoring of pollution emissions[107] and proper management of pollution credit trading.[108]

C. Analysis Of The Effectiveness Of The Incentive-Based Approach

A significant strength of market-based incentive approaches is enforceability because, ideally, regulated entities freely choose to comply with incentive regulations.[109] Further, incentive-based regulations can produce direct environmental benefits.[110] These regulations promote a free market where environmental goals are

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105. *See* John C. Dernbach, *Harnessing Individual Behavior to Address Climate Change: Options for Congress*, 26 VA. ENVTL. L.J. 107, 114 (2008).

106. Norvell, *supra* note 22, at 274. This produces detrimental health affects to those individuals residing in effected areas. *Id.*

107. Good monitoring is critical because emission trading is especially difficult to enforce, resulting from the lack of geographic specificity and the complexity in detecting necessary information, such as the knowledge of whether the claimed reductions occurred at the source of the credits. *See* Driesen, *Emissions Trading*, *supra* note 11, at 319, 333. The lenient monitoring in emissions trading enables regulated entities to pollute more than regulations permit and provides an economic incentive to evade compliance obligations by manipulating the emissions trading system. *See id.* at 311, 319, 333.

108. In a tradable permits program a regulated entity that produces emissions with strong local health effects could obtain a high amount of credits. *Id.* at 310 (quoting Richard B. Stewart, *Controlling Environmental Risks Through Economic Incentives*, 13 COLUM. J. ENVTL. L. 153, 161 (1988)) ("A marketable permit system . . . [may] not be appropriate in dealing with pollutants or chemical risks that have localized 'threshold' effects, causing serious damage only if they exceed a given concentration at a particular location.").

109. *See id.* at 275. This makes incentive-based regulations relatively easy to administer. *See, e.g.*, Choi, *supra* note 76, at 877-78.

110. For example, in the EPA's Climate Leaders program companies voluntarily participate to set GHG reduction targets and receive recognition for their reduction accomplishments. *See* Gorin, *supra* note 36, at 163. As of February 2010, almost 200 companies are partners with the program, up from sixty companies in October 2004 reflecting two years since the program's establishment. *See generally* CLIMATE LEADERS, *available at* http://www.epa.gov/climateleaders/ (last visited Mar. 30, 2010).

achieved through competition which makes it easy and fair for regulated companies to participate because of their preexisting association with the free market and their freedom to choose to participate.[111] By using profit incentives in a free market setting, incentive-based regulations stimulate companies to innovate technology and processes by finding ways to reduce pollution emissions to obtain financial rewards.[112] Additionally, in the environmental arena, these regulations are best suited for complex regulations with broad goals, as regulation enforcement and proving violations are extremely difficult.[113]

Still, market-based incentive regulations are limited in their ability to achieve extensive environmental protection. For instance, these approaches rarely result in quick, comprehensive changes in the behavior of regulated entities.[114] They also encounter valuation problems in establishing prices of fees and penalties that effectively dissuade regulated entities from taking undesired pollutive action and in measuring the environmental damage of such action monetarily.[115] In particular, market-based incentive regulations are not suitable on a regional level with pollutants that have dangerous local effects or great complexity.[116] These regulations are further criticized for resulting in uncertain pollution distribution.[117] Given that regulated entities may determine their own pollution emission levels, technology, and location, it is likely pollution will be concentrated in hot spots, causing these areas to suffer from increased health

111. *See* Norvell, *supra* note 22, at 273-74, 276.

112. *See id.* at 274-75. This overcomes the limitation of the "best available technology" standard set in environmental command and control regulations. *Id.* at 274.

113. Violations of complex environmental regulations are difficult to prove because there is a minimal risk of detection. *Id.* at 275, 275 n.65. *See* discussion *supra* note 107.

114. Gaines, *supra* note 20, at 801.

115. *See* Moland, *supra* note 107, at 80-81 (asserting that fines must be sufficiently substantial so that it is not more lucrative to pay the fine and continue violating environmental standards, especially where the fine is less expensive than changing the technology to meet these standards).

116. Adams, *supra* note 39, at 48, n.218, n.219. For example, this includes the ARP. Norvell, *supra* note 22 at 276; *see supra* notes 62, 73, 118, and accompanying text, for a discussion relating to the ARP.

117. *See* Harry Moren, *The Difficulty of Fencing in Interstate Emissions: EPA's Clean Air Interstate Rule Fails to Make Good Neighbors*, 36 ECOLOGY L.Q. 525, 545 (2009).

problems and environmental damage regardless of the overall emissions reductions obtained by implementing this regulatory approach.[118] Additionally, even though incentives encourage participation, if companies are not motivated to become involved and simply decline to participate, then the environmental goals set in the incentive regulations will not be achieved, at least by the means for which the regulation was designed.[119]

D. Analysis Of Green Building Technology In The Incentive-Based Regulation Setting

The incentive-based approach to regulation is best suited for advancing green roof and stormwater management system technologies. Green roofs are vegetative layers grown on a rooftop that can reduce energy use[120] and are commonly used in urban environments that are heat islands.[121] A green roof reduces air pollution and GHG emissions,[122] and can significantly reduce the heat island effect[123] among other environmental and health

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118. Specific pollutants with very toxic local effects, such as mercury, are more likely to create hot spots, while other pollutants with few or no local effects, such as GHGs, are less likely to create hot spots. *See id.*

119. *See* Gorin, *supra* note 36, at 169-70.

120. When green roofs are wet, they absorb and store heat, and when dry, they act as insulators, decreasing the flow of heat through the roof, thus reducing energy needed to provide cooling and heating. *See generally* Reducing Urban Heat Islands: Compendium of Strategies, U.S ENVTL. PROTECTION AGENCY, http://www.epa.gov/heatisld/resources/pdf/GreenRoofsCompendium.pdf.

121. *See generally* EPA GREEN ROOFS, http://www.epa.gov/heatisld/mitigation/greenroofs.htm (last visited Apr. 20, 2010) (providing information about green roofs) [hereinafter EPA Green Roofs]. For a description of a "heat island," *see generally* URBAN HEAT ISLAND MITIGATION, http://www.epa.gov/hiri/mitigation/index.htm (last visited Apr. 20, 2010) (describing heat islands as built environments that are warmer that nearby rural areas because of the reradiation of the solar heat absorbed by impervious built surfaces such as roads and buildings).

122. *See* URBAN HEAT ISLAND MITIGATION, http://www.epa.gov/hiri/mitigation/index.htm (last visited Apr. 20, 2010) (describing how vegetation removes air pollutants and GHGs as a result of reduced energy demand, specifically air conditioning use, and though dry deposition).

123. *See id. See generally* HEAT ISLAND EFFECT, http://www.epa.gov/heatisld/index.htm (last visited Apr. 20, 2010). As a result, heat islands increase summertime peak energy demand, air conditioning costs, air pollution and GHG emissions, heat-related illness and mortality, and water quality.

benefits.[124] Stormwater management systems reduce, capture, and treat stormwater runoff,[125] and produce benefits such as significant reduced water usage for building operations as well as for outdoor and irrigation purposes.[126]

Both types of green building technology have proven to be successful and are increasingly being adopted and implemented, for instance, the significant benefits and efficiency of stormwater management systems have stimulated the installation of this technology.[127] Green roofs are also increasingly more common in the

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124. Green roofs are encouraged for the attainment of LEED credits, particularly to achieve these benefits. *See, e.g.*, LEED NC, *supra* note 7, at 13, 15-17; LEED EB, *supra* note 7, at 7-11. For example, green roofs are recommended technologies for mitigating the heat island effect. *See generally*, LEED NC, *supra* note 7, at 16; LEED EB, *supra* note 7, at 8-9.

125. Stormwater runoff is generated from rain precipitation that flows over impervious surfaces, such a buildings, and does not percolate into the ground, while accumulating debris, chemicals, and other pollutants that can harm water quality. STORMWATER PROGRAM, http://cfpub.epa.gov/npdes/home.cfm?program_id=6 (last visited Apr. 20, 2010). For example, stormwater runoff containing asbestos, erosion or settlement from rooftops degrades local stream and river quality. *See generally* Sarah B. Schindler, *Following Industry's LEED: Municipal Adoption of Private Green Building Standards*, 62 FLA. L. REV. 285, 288 (2010). Stormwater management systems are encouraged in LEED requirements, for example, *see generally*, LEED NC, *supra* note 7, at 15; LEED EB, *supra* note 7, at 7.

126. *See* California Greening Solutions, Rainwater Harvesting for Changing Water Realities, http://www.californiagreensolutions.com/cgi-bin/gt/tpl.h, content=2177 (last visited Apr. 20, 2010). The increase in water conservation lowers GHG emissions by reducing demands on water treatment and distribution infrastructure. *See* Patricia E. Salkin, *Sustainability and Land Use Planning: Greening State and Local Land Use Plans and Regulations to Address Climate Change Challenges and Preserve Resources for Future Generations*, 34 WM. & MARY ENVTL. L. & POL'Y REV. 121, 163-64 (2009). *See also* Leah Fletcher et al., *A Golden Opportunity: California's Solutions for Global Warming*, SN62 A.L.I.-A.B.A. 45, 66 (2008) (adding that reducing demand for water is cost-effective because costs for extracting, treating and transporting water are lessened as a result).

127. This is evident from reports that have attempted to quantify and monitor green roof performance. An EPA report concluded that green roofs are capable of removing 50% of the annual rainfall volume from a roof through retention and evapotranspiration. *See, e.g.*, Robert D. Berghage et al., *Green Roofs for Stormwater Runoff Control*, U.S. ENVTL. PROTECTION AGENCY (Feb. 2009), http://www.epa.gov/nrmrl/pubs/600r09026/600r09026.pdf. Additionally, the increasing enactment of regulations relating to stormwater management systems reflects their efficacy. For example, *see generally* TUCSON, ARIZ., CODE §§ 6-182

United States,[128] and thus more widely known, which has resulted in government incentive and command and control regulations created solely for green roofs.[129] Although the progress of each technology movement is hindered by the associated costs, such as the high initial costs of installation, utilization of these technologies result in greater long-term economic benefits due to the energy cost savings.[130]

Green roof technology and stormwater management systems are well matched with market-based incentive regulations. Considering the high cost of implementation, these regulations would best foster the development and utilization of these technologies by providing tax credits or other financial incentives that would promote competitive pricing to give each technology a market advantage.[131] Additionally, the difficulty of monitoring would be overcome because it is much easier and more conclusive to determine whether a regulated entity has implemented either of these technologies because it can be observed, unlike an activity such as pollution emissions.[132] In addition, the green roofing and stormwater management industries are still at a stage where effective technology has been developed but is not widely known as compared to solar panels, for instance.[133] Under these circumstances, incentive-based regulations would be

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to 6-184 (2008) (mandating all new commercial developments include rain water harvesting plans).

128. For example, currently the leader in green roofs is Chicago with over seven million square feet of green roofs constructed or underway, which is more than the rest of the United States combined, as a result of mandates and incentives for private and public buildings. *See, e.g.*, THE GREENING OF CHICAGO, http://www.explorechicago.org/city/en/about_the_city/green_chicago/Greening_of_Chicago.html (last visited Apr. 20, 2010).

129. *See* Salkin, *Land Use Planning*, *supra* note 126, at 167-68.

130. For cost-effectiveness discussions regarding stormwater management systems, *see* Charles J. Kibert & Kevin Grosskopf, *Proceedings of the 13th Annual Public Interest Environmental Conference: Envisioning Next-Generation Green Buildings*, 23 J. LAND USE & ENVTL. LAW 145, 153 (2007) (stating that the operation and handling necessary for maintaining stormwater management systems are reportedly difficult and expensive). For cost-effectiveness discussions regarding green roof technology, *see* Colwell, *infra* note 128 (explaining that currently the installation of green roofs is relatively expensive, costing around twice the amount of a conventional roof, which accounts for the availability of green roofing materials, and affirming that the materials necessary for green buildings drive costs for these materials upward).

131. *See* discussion *supra* note 111 and accompanying text.

132. *See* discussion *supra* note 107.

133. *See infra* notes 127-130 and accompanying text.

extremely beneficial as these regulations characteristically achieve major growth and strength in the regulated industry,[134] and also facilitate the continuing innovation with respect to green roofing and stormwater management technologies.[135]

The circumstances most fitting for the implementation of green roofs and stormwater management systems demonstrate that a command and control regulatory approach is improper primarily because mandating these technologies in many areas of the United States would be ineffective and even detrimental.[136] Green roof technology largely operates in the Northeast, particularly in commercial and municipal buildings in high-density urban areas, as a result of its success in mitigating the heat island effect.[137] Stormwater management systems have also proven to be critical stormwater technology in urban areas with limited space.[138] This technology is also vital in water scarce areas.[139] The materials and processes relating to green roof and stormwater management technology are likely better designed for these urban environments, so mandating these technologies in other environments may decrease their respective effectiveness.[140]

Incentive-based regulations would be well suited for these technologies as they allow for regulations to differ among jurisdictions, permitting each jurisdiction to design regulations to fit

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134. *See* discussion *supra* notes 95-108 and accompanying text regarding the regulation of SO_2.

135. *See supra* text accompanying notes 67 and 112.

136. *See* discussion *supra* note 123.

137. *Green Roof Technology Gaining Ground Nationally and Locally*, THE HEAT ZONE (Apr. 23, 2009), http://heatusa.com/blog/us-economics/green-roof-technology-gaining-ground-nationally-locally/. *See* discussion *infra* note 123. For an explanation of the heat island effect, *see supra* notes 121, 123 and 124.

138. *See* Berghage et al., *supra* note 127, at 2.

139. This is especially true for water systems in states such as California, where it uses the most energy in the state (accounting for about 20% of total electricity use and about 30% of natural gas use), largely due to water transportation that involves going over 2,000-foot high mountains to Southern California. *See* Fletcher et al., *supra* note 126, at 66. This and other water conservation resolutions offered by stormwater management systems stimulate the increasing adoption of this technology. For example, states such as Texas have encouraged widespread rainwater conservation systems by recommending that local governments adopt ordinances providing for these systems. *Cf.* Salkin, *Land Use Planning*, *supra* note 126, at 164-65.

140. *See* discussion *supra* notes 121, 123, 125, 137-138 and accompanying text.

its own needs; whereas mandating these technologies across jurisdictions may decrease their respective effectiveness.[141] This further supports the development and expansion of green roof and stormwater management technologies by the use of incentive-based regulations, as ideally those that would benefit most from the utilization of these technologies may elect to adopt them and these regulations would enable regulated entities to choose the manner to implement these technologies when complying with applicable local laws or ordinances in their jurisdiction.[142]

IV. THE FREE MARKET APPROACH TO REGULATION

The free market is a purely voluntary approach where the government and its agencies actively refrain from any regulation, resulting in the absence of any restrictions on private actors, enabling these actors to have sole control of environmental outcomes.[143] Proponents of the free market approach argue that government regulation, particularly that of command and control, is ineffective in resolving particular environmental issues.[144]

A. The Movement Toward The Free Market Approach To Regulation

There is a perceived movement in favor of utilizing a free market approach for improving environmental practices by steering away

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141. *See* discussion *supra* note 87 and accompanying text.

142. *See* discussion *supra* note 112 and accompanying text.

143. *See* Gorin, *supra* note 87, at 153.

144. *See* Jonathan Scott Miles, Note, *Doing the Right Thing for Profit: Markets, Trade, and Advancing Environmental Protection*, 44 DRAKE L. REV. 611, 612 (1996) (asserting that free markets can supplant regulatory schemes). This is not to say that in a free market the government has no role whatsoever, rather most free market advocates recognize the need for some government participation. For instance, government involvement is necessary as an enforcement mechanism. *See* Driesen, *Under the Kyoto Protocol*, *supra* note 87, at 27, 64-65. The government's role is restricted, however. *See* John D. Echeverria, *Regulating Versus Paying Land Owners to Protect the Environment*, 26 J. LAND RES. & ENVTL. L. 1, 9 (2005) (arguing, for example, that under the free market approach the government has no legitimate role in determining land allocation between conservation and development).

from traditional regulation.[145] This movement is considered a return to a prior approach to environmental protection, rather than a new approach, thus creating a paradox: command and control regulation, which has traditionally been employed as the solution to the lack of environmental protection attributed to free markets is charged as being the cause of environmental degradation to which the free market is the remedy.[146] Successful implementation of market-based incentives demonstrates the benefits of utilizing the free market to solve environmental issues. For instance, the free market is expected to better achieve the goal of environmental protection because it is more efficient in calculating the quantity and price of goods, thus, private actors in the free market are better able to allocate goods to their highest value use than the government when employing command and control or incentive-based regulations.[147] As a result of the modern trend encouraging free market approaches, many free market strategies are being employed and tested to resolve numerous environmental issues, such as water markets.[148]

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145. *See, e.g.*, Press & Mazmanian, *supra* note 87, at 226-27 (adding that the first phase following command and control utilized a market incentives approach, followed by the more recent self-regulatory approach).

146. *See* Norman W. Spaulding III, Note, *Commodification and Its Discontents: Environmentalism and the Promise of Market Incentives*, 16 STAN. ENVTL. L.J. 293, 294 (1997). In the environmental context, there is large support for implementing a free market system to resolve problems previously exclusively managed under command and control regulation charged with being "less efficient, less responsive, and less fair than market based approaches." *But see* Tseming Yang, *Melding Civil Rights and Environmentalism: Finding Environmental Justice's Place in Environmental Regulation*, 26 HARV. ENVTL. L. REV. 1, 11 (2002) (arguing that regulation is necessary to correct failures in environmental protection caused by the free market); *cf.* BURNS ET AL., *supra* note 1, at 46 (arguing that the free market does not respond appropriately to environmental issues).

147. *See* Spaulding, *supra* note 87, at 295; *see also* Donald N. Zillman, *Regulation Around the World, in* REGULATING ENERGY AND NATURAL RESOURCES, 397 (Barry Barton et. al. eds., 2006).

148. Free market advocates support the use of water markets and their potential to efficiently reallocate water to its most highly valued use, particularly in the western states. *See* Christine A. Klein, *Water Transfers: The Case Against Transbasin Diversions in the Eastern States*, 25 UCLA J. Envtl. L. & Pol'y 249, 254-56, 256 n.17 (2006/2007) (quoting Andrew P. Morriss, *Real People, Real Resources, and Real Choices: The Case for Market Valuation of Water*, 38 TEX. TECH. L. REV. 973, 974 (2006) (arguing that ". . .[M]arkets provide the only way to value resources, including water, which enables their use without provoking conflicts among those who compete for their use.")). *But c.f., id.* at 271-72 (citing

B. An Example Of The Free Market Approach

The influence of the free market approach is evident where free markets are utilized to allow and encourage competition in the technology market.[149] Private companies and individuals are able to create new technologies and improve existing ones that enhance environmental quality.[150] A recent example is the use of a high-speed centrifuge machine developed by actor Kevin Costner that separates oil from water.[151] In April 2010, the explosion of a BP oilrig off the coast of Louisiana triggered a severe oil spill in the Gulf of Mexico, calling for an array of clean-up technologies, many of which proved unsuccessful.[152] Consequently, BP agreed to test Costner's machine, which claimed to be capable of cleaning up to 210,000 gallons of water per day, significantly faster and more efficient than older centrifuge technology.[153] Costner privately funded the development of the centrifuge machine, including the attainment of a license from the Department of Energy.[154] This exemplifies the free market wherein private actors voluntarily participate in the market with the

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to Joseph A. Dellapenna, *The Importance of Getting Names Right: The Myth of Markets for Water*, 25 WM. & MARY ENVTL. L. & POL'Y REV. 317, 327 (2000)) (stating that true water markets are rare, or even non-existent, citing the anticipating market failure of water markets to be the result of valuation difficulty, high transactional costs, and other such obstacles). For examples of free market proposals currently being tested, *see generally* Spaulding, *supra* note 146, at 295 (commenting that environmentalists may bid alongside industrialists for certain natural resources).

149. *See* discussion regarding use of the free market in market-based incentives regulations *supra* notes 74-78 and accompanying text.

150. *See* discussion *supra* note 112 and accompanying text.

151. *See* Ray Sanchez, *Kevin Costner's Machine Heads to BP's Oil Spill Clean Up*, ABC NEWS, May 19, 2010, http://abcnews.go.com/Technology/kevin-costner-machine-bp-oil-clean/story?id=10689928&page=1 (last visited May 27, 2010).

152. *See id.*

153. Costner's oil extractor is claimed to produce water that is 99% clean of crude. *See id.* (stating that Costner has been funding scientists working for the company Ocean Therapy Solutions for the last fifteen years specifically to develop a technology for cleaning up massive oil spills).

154. *See* Helen Kennedy, *Gulf Oil Spill: Kevin Costner Donates 'Ocean Therapy' Invention to Clean Oil from Sea; BP OK's Tests*, NY DAILY NEWS, May 20, 2010, *available at* http://www.nydailynews.com/news/national/ 2010/ 05/19/ 2010-0519_gulf_oil_spill_bp_oks_tests_ of_kevin_costners_invention__ device_ to_clean_oil_fro.html (last visited May 27, 2010) [hereinafter Gulf Oil Spill].

goal of improving environmental protection.[155] Though at present Costner has lost tens of millions of dollars in this development, this oil spill presents a significant opportunity to expand the use of this technology, potentially leading to substantial financial, educational, and environmental benefits that exemplify the advantages of the free market with respect to environmental technology.[156]

C. Analysis Of The Effectiveness Of The Free Market Approach

In particular, the free market is widely admired for its propensity to simulate technological innovation that is more beneficial for the environment.[157] Emerging and experimental technologies are especially well suited for the free market approach as private actors in this market can best assess which products eventually prove to be beneficial or, conversely, detrimental to the nation as a whole.[158] This system of weeding-out the effective, worthwhile technologies for advancement by private actors in a free market will assure fair judgment.[159] Moreover, the government has elected to deregulate many areas of energy, returning to a free market system to stimulate innovation; the government maintains that a free market system provides an opportunity for more efficient technologies to be developed, as this system instigates deregulated industries to produce technologies at lower costs as a result of increased competition.[160]

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155. *See supra* text accompanying notes 75-77 describing the free market theory.

156. The free market is credited with promoting cleaner and safer economic activity, thus bettering environmental protection by harnessing resources beyond the regulatory reach of the government. *See* Miles, *supra* note 87, at 612.

157. *See* David M. Driesen, *An Environmental Competition Statute*, *in* BEYOND ENVIRONMENTAL LAW 7 (Alyson Flournoy & David Driesen, eds., Cambridge University Press 2009) [hereinafter Driesen, *Environmental Competition*], *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1372289. *Contra* David Aboulafia, *Pushing RBST: How the Law and the Political Process Were Used to Sell Recombinant Bovine Somatotropin to America*, 15 PACE ENVTL. L. REV. 604, 649 (1998) (asserting that new technology is well suited for incentive-based regulation since incentives provided by the government for investment in new technology are legitimate and most effective when the technology is seen as potentially beneficial for the greater nation).

158. *See* Aboulafia, *supra* note 87, at 649.

159. *See id.*

160. *See* Jim Rossi, Note, *Regulatory Law: The Electric Deregulation Fiasco: Looking to Regulatory Federalism to Promote a Balance Between Markets and the Provision of Public Goods*, 100 MICH. L. REV. 1768, 1775 (2002). This further aids

However, the free market approach is also charged with being an inefficient environmental conservation strategy. Critics often cite the need for environmental regulations because the free market is incapable or unconcerned with protecting the environment from pollution and other harms that result from economic growth.[161] The free market provides little incentive for private decision-makers to innovate or take other actions to improve environmental quality because the benefits obtained by the general public, such as improved air quality, typically exceed the benefits obtained by the private actors financing the innovation.[162] Another criticism of the free market approach is that the environment is not easily valued monetarily, which is problematic as market failures occur when there is no mechanism for representing non-economic interests, such as the monetary value of preserving a particular natural resource.[163] In addition, if participants do not have knowledge of the marketplace, the free market will fail to operate successfully.[164]

D. Analysis Of Green Building Technology In The Free Market Setting

Photovoltaic (PV) systems and high-efficiency HVAC unit technologies are currently best left to the free market. PV systems, the other most commonly used technology for the conversion of sunlight into electricity after solar panels, reduces air pollution and CO_2 emissions.[165] PV technology for on-site energy generation is

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to balance out cost variances across states, promoting fairness in ability to obtain various technologies. *See also id.*

161. *See* BURNS ET AL., *supra* note 1, at 119.

162. Driesen, *Environmental Competition*, *supra* note 157, at 1; *see generally* BURNS ET AL., *supra* note 1, at 102-03 (arguing that by limiting the free market through economic instruments that internalize environmental impacts, such as penalties and fees, taxes and subsidies, and flexible market incentives, government regulations restrict environmental pollution and stimulate development and economic growth of new industries).

163. *See* Driesen, *Environmental Competition*, *supra* note 87 at 27. This difficulty is analogous to that of using incentive-based regulatory approaches. *Cf. supra* text accompanying note 115.

164. Moreover, the success of the free market relies on participants to act rationally. *See* BURNS ET AL., *supra* note 1, at 27.

165. PV technologies use wafers made of silicon or other conductive materials that create chemical reaction when hit by sunlight that results in the release of electricity. NON-HYDROELECTRIC RENEWABLE ENERGY, http://www.epa.gov/cleanenergy/energy-and-you/affect/non-hydro.html (last visited Apr. 21, 2010). *See*

recognized as a tool for addressing global warming and meeting future energy demand growth.[166] This common green building technology is promoted in government regulations.[167] Yet, outdated government ordinances impede the growing use of PV technology by not reflecting its technological advancements and environmental benefits.[168] However, as with solar panels, many government bodies have taken steps to provide for PV technologies to take advantage of the energy conservation and environmental benefits attained through the use of these technologies.[169]

Current PV technologies are based on forty years of scientific research, design, and advancement, and remain under constant development.[170] Although PV technology is often associated with high costs, many organizations are working to improve the quality

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GREEN TECHNOLOGY & ALTERNATIVE ENERGY INFORMATION CENTER, http://www.americanelements.com/AEgreentechnology.html (last visited Apr. 20, 2010) (discussing benefits of PV technology). Implementation of PV systems is encouraged to meet certain LEED credit requirements, for example, it is recommended to position PV cells to shade impervious surfaces. LEED EB, *supra* note 7, at 8-9; *see generally* LEED NC, *supra* note 7, at 16.

166. *See* Fletcher et al., *supra* note 126, at 77 (discussing the expectation of Miasolé, a Santa Clara-based manufacturer of solar cell technology, that its PV technology will be cost-competitive with the electricity grid by 2015 or even earlier, which would result in the displacement fossil fuel as energy use, which would correspondingly largely reduce the associated GHG emissions). The environmental impact of this technology is overwhelming: "[f]or every megawatt-hour of electricity generated by PVs in California, nearly half a metric ton of CO_2 is avoided." *See id.*

167. For examples of state regulations mandating or incentivizing PV technologies, *see generally* ARIZONA RESIDENTIAL SOLAR AND WIND ENERGY SYSTEMS TAX CREDIT, *supra* note 42; PA. PUB. UTIL. COMM'N, ALTERNATIVE ENERGY, http://www.puc.state.pa.us/electric/electric_alt_energy.aspx (last visited Apr. 21, 2010).

168. These regulatory impediments mirror those of solar thermal technology. *See* discussion *supra* notes 46–48 and accompanying text.

169. *See* discussion *infra* notes 170-171 and accompanying text. The acknowledgement of this development and resulting benefits are reflected in incentives designed for implementing PV technology. *See also* for examples discussed *supra* note 167.

170. *See* Fletcher et al., *supra* note 126, at 69 (attributing this technological development to drivers in California including "[T]he talented and trained workforce, world-class knowledge infrastructure including universities and research centers, financial and professional resources, and the entrepreneurial and innovative culture.").

and cost-efficiency of this technology.[171] Thus, while sometimes encouraged by government bodies, the rapid innovation and high costs of PV technologies make them unfitting for command and control regulation—which relies on stable, measurable technology-based standards.[172] Similarly, PV technologies are unsuited for incentive-based regulation, which results in piecemeal regulation that creates conflicts among jurisdictions, because this regulation could severely hinder the growth and expansion of PV technology.[173] For instance, state and local regulations in California recognize and endorse PV technology use because the wide majority of its development is taking place in the state; however, the PV industry is must less prevalent in other parts of the country and therefore too unstable for uniform regulation at the current time.[174] Moreover, private companies in California are stimulating the innovation of PV technology and effectively driving the current free market without substantial government assistance.[175] Until the value and market for PV technology becomes more stable and common across the country, it should be left the free market to continue its affirmative advancement.

The free market is similarly well suited for high-efficiency HVAC unit technology.[176] The utilization of a high-performance HVAC

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171. By acknowledging PV installation costs are "highly site-specific and can be greatly reduced through more uniform municipal permitting, standards, and a trained workforce," the businesses and education centers in Silicon Valley work together to ensure the long-term sustainability of the local PV industry. *See id.* at 69. The company Miasolé, for example, strives to decrease the cost of PV technology by simplifying the installation process and broadening the applications of this technology, which lead to the innovation of more efficient PV products. *See id.* at 76-77. This process not only generates emission-free power, greatly benefiting the environment, but also it is less energy intensive to produce and requires less than half of the standard time for the PV technology system to generate the electricity used to produce the system. *Id.*

172. *See* discussion *supra* notes 167, 170-171 and accompanying text.

173. *See supra* text accompanying note 87 relating to ethanol regulation variance among jurisdictions. *See also supra* notes 170-171 and accompanying text.

174. *See discussion supra* notes 167, 170-171 and accompanying text. *See, e.g.*, Fletcher et al., *supra* note 126, at 63. For example, the California Solar Initiative provides state rebates for rooftop solar PV systems to encourage investment in 3,000 MW by 2017 and to reduce the cost of the PV technology.

175. *See id.*

176. HVAC technology maintains indoor air quality as demonstrated by LEED credit requirements that specify, for example, the use of HVAC in new buildings

system can significantly reduce a building's energy consumption and emissions production, as well as lessen operational costs.[177] In the United States, HVAC systems are responsible for thirty-nine percent of the total energy used by commercial buildings, which verifies there is substantial potential to save large amounts of energy by enhancing HVAC system performance.[178] Like PV systems, the government and private entities increasingly recognize the benefits attained from high-efficiency HVAC equipment, which is evident in the regulations relating to this technology.[179] Moreover, the development and utilization of high-efficiency HVAC systems are predicted to progress as more improvements in energy efficiency are expected to occur over the next fifteen years.[180] This advancement is attributed to the rising value of energy that requires more efficient systems and alternative energy generation methods, the benefits derived from optimizing energy consumption (such as environmental quality improvement), and the increasing code and other regulatory requirements requiring improved energy efficiency.[181] These stimulants for high-performance HVAC technology systems are

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for space heating, space cooling, fans, pumps, toilet exhaust, and parking garage ventilation. *See, e.g.*, LEED NC, *supra* note 7, at 31-33.

177. For example, high-efficiency HVAC technology can use natural ventilation, lessening the energy used by the building. Graham, *supra* note 178 (noting reduced pollution emissions as a result of implementing this equipment would lessen the building's negative impact on ozone depletion and climate change).

178. *See* Carl Ian Graham, *Whole Building Design Guide, High-Performance HVAC* (Dec. 7, 2009), http://www.wbdg.org/resources/hvac.php? r=minimize_ consumption.

179. For example, the Energy Policy Act of 2005 provides incentives, such as tax credits, for certain buildings to improve to their HVAC systems. *See, e.g.*, ENERGY POLICY ACT OF 2005, 42 U.S.C. § 15822 (2005).

180. Robin Suttell, *Buildings, Past, Present, & Future: HVAC* (Nov. 2006) http://www.buildings.com/ArticleDetails/tabid/3321/ArticleID/3427/Default.aspx (citing Kent W. Peterson, President-Elect, ASHRAE) (Peterson credits LEED and the green building movement as drivers of high-efficiency HVAC systems).

181. *See id.* (specifying a 70% increase in building efficiency from 2000 numbers in relation to code requirements by 2015). *See, e.g.*, Plant Engineering Live, Interview with Joe Gillespie, ARC Advisory Group Analyst, *ARC Analyst: Energy Issues Spur Changes in HVAC Market* (Jan. 1, 2010), *available at* http://www.plantengineering.com/index.php?id=1792&cHash=081010&tx_ttnews[tt_news]=27167 [hereinafter ARC Analyst] (recognizing energy costs and government regulations as well as economic, social, and environmental benefits of optimal energy consumption).

recent and, consequently, many businesses have been slow to implement these systems.[182]

The more recent progress of the high-efficiency HVAC technology movement indicates that this market too, along with PV systems, is unsteady because it is continuously changing.[183] The fact that PV systems are constantly under development supports continuing the free market approach as it encourages growth and development of technology, guiding it to become more stable and widespread by use of natural market forces.[184] Moreover, the need for high-efficiency HVAC equipment is dispersed because in many parts of the United States climate conditions necessitate HVAC systems for the cooling and heating of indoor air that consequently make the transition to high-performance HVAC systems in these areas more common.[185] Thus, high-efficiency HVAC technology does not justify a command and control regulatory approach[186] nor would incentive-based regulation serve to further the development of high-efficiency HVAC systems, and should presently be left to the free market.[187]

V. CONCLUSION

The availability of regulatory and non-regulatory approaches to promote the growth and utilization of various green building

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182. *See* ARC Analyst, *supra* note 181 (recent environmental changes, such as the current poor economic climate, gave rise to government subsidies for investments in efficient energy technology which encourages private actors to make more efficient long-term decisions, including investing in high-performance HVAC technology).

183. *See* discussion *supra* notes 180-82 and accompanying text.

184. *See discussion supra* notes 157-160, 170-174.

185. *See* discussion regarding PV technology *supra* notes 174 and 184 accompanying text.

186. The progress of the high-efficiency HVAC technology movement demonstrates that this technology is unsuitable for command and control regulation as it is too complicated of a system based on its incorporation of various technologies, to form rigid, technology-based rules under this regulatory system. *See also* HEATING, VENTILATION, AND AIR CONDITIONING (HVAC) SYSTEMS, http://www.epa.gov/iaq/schooldesign/hvac.html (last visited Apr. 21, 2010).

187. This is because the associated complexity and the various ways of implementing these systems make it difficult to monitor and enforce because these factors greatly vary across different areas of the country, preventing easy and definite methods for monitoring and enforcement. *See* discussion *supra* text accompanying note 185.

technologies provides the opportunity to significantly advance the green building movement. Increasing environmental threats require long-term feasible resolutions that are devised and pursued by government entities. Thus, government action is essential in formulating resolutions that will ensure the protection and improvement of the environment, namely, those attributed to green building. These resolutions include regulatory approaches, such as those that are command and control and incentive-based, as well as non-regulatory approaches, such as the free market, that are available to the government. Each approach has been demonstrated to be effective under different circumstances, which take into account attributes from geographic areas to technological advancement. Insight gathered from examining each regulatory and non-regulatory approach to environmental conservation can be used as viable means for identifying the pairing of government approaches and green building technology. These pairings promise to lead to the most effective environmental resolutions by advancing the green building movement.