CAPPING CARBON

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This Article addresses the problem of how to set caps for a cap-and-trade program, a key problem in pending legislation addressing global climate disruption. Previous scholarship on emissions trading programs focuses overwhelmingly on trading's advantages and sometimes wrongly portrays environmental improvement as an automatic byproduct of adopting a cap-and-trade approach. A trading program's success, however, depends critically upon timely and effective cap setting.

This Article shows that often regulators have employed a best available technology (BAT) approach to cap setting for trading programs, i.e., setting the cap at a level that regulated polluters can achieve with government-identified technology. This descriptive claim suggests that trading does not necessarily provide an antidote to the problems associated with BAT regulation, as the literature often claims; instead, trading programs often constitute a form of BAT regulation in many respects. The rest of the Article explores this insight's implications.

Analytically, this Article reviews three ways to establish aggregate caps: effects-based, cost-benefit based, and technology-based cap setting. It shows that each of these approaches has theoretical and practical advantages and disadvantages, but only effects-based cap setting frees the regulator from the need to evaluate technologies in order to establish a cap.

Since trading does not automatically transcend BAT, this Article provides recommendations on how to improve cap setting both generally and in the climate disruption context. It suggests that in the climate disruption context, a legislative effects-based approach offers an attractive and viable cap-setting method. But normative acceptance of effects-based caps requires some adjustments in how we think about costs—mainly a recognition that they are neither fixed nor predictable, but can change as a result of a cap-and-trade program. This Article also

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shows that auctions can play an important role in facilitating avoidance of the problems of administrative delay and strife that accompanied BAT regulation. While commentators usually agree that auctions offer economic advantages, the literature has not paid sufficient attention to their administrative advantages. We should think of auctions as essential to effective cap setting, not just as a nice way of avoiding unattractive distributional consequences like windfall profits. But this Article also explores how the possibility of BAT-like administrative delay should influence criteria and administrative procedures for agency distribution of allowances to firms. Finally, this Article makes recommendation on how cap-setting decisions can circumvent favoritism toward existing sources and the difficulty of revising limits once establishes—both BAT problems that can arise under trading as well. Thus, jettisoning the notion that trading automatically avoids problems traditionally associated with BAT leads to a set of useful insights about how to set caps.

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I. INTRODUCTION

This Article addresses the problem of how to set caps—limits on the pollution from identified facilities—for cap-and-trade programs, a key problem in pending legislation addressing global climate disruption.[1] Cap-and-trade programs establish caps on regulated polluters' emissions, but allow these polluters to forego meeting their caps if they pay other regulated polluters to go below their assigned cap.[2] This Article describes how we have set caps for trading programs in the past and explains how we can do better in setting caps for the cap-and-trade programs addressing global climate disruption.[3]

This topic has enormous importance.[4] The election of President Obama and a sympathetic Congress makes a national cap-and-trade program

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1 *See* Nathaniel O. Keohane, *Cap and Trade, Rehabilitated: Using Tradable Permits to Control U.S. Greenhouse Gases*, 3 REV. ENVTL. ECON. & POL'Y 42, 43 (2009) (describing a cap as a limit on "[t]otal allowable emissions"). I generally use the term "climate disruption," because scientists expect warmer average surface temperatures to disrupt global ecosystems. *See* Perry Wallace, *An Overview of This Issue: Climate Change in 2009*, SUSTAINABLE DEV. L. & POL'Y, Winter 2009, at 2, 2 (2009) (listing threats to food production, contamination of fresh water, catastrophic flooding, and pests in new terrain as potential consequences of climate change). The literature more often refers to climate disruption as either "climate change" or "global warming." *See, e.g.*, M. Jarraud & A. Steiner, *Foreword* to CLIMATE CHANGE 2007: IMPACTS, ADAPTATION AND VULNERABILITY, at vii (Martin Parry et al. eds., 2007) [hereinafter IMPACTS]. The term "global warming" describes a central scientific finding that human emission of greenhouse gases has raised the earth's average surface temperature, but says nothing about why warming is a problem. The term "climate change" is accurate, but conveys nothing about the change's nature. *See generally id.* at 27, 148–61 (assessing anticipated changes). Hence, the term "climate disruption" more cogently describes the heart of the phenomenon.

2 *See* David M. Driesen, *Is Emissions Trading an Economic Incentive Program?: Replacing the Command and Control/Economic Incentive Dichotomy*, 55 WASH. & LEE L. REV. 289, 290, 325 (1998) (stating that trading allows polluters "to avoid pollution reductions at a regulated source, if they provide an equivalent reduction elsewhere").

3 I use the term "cap-and-trade program" to describe the programs created in pending climate change bills because most environmental lawyers use this term in this way. But this is not a completely accurate description. A pure cap-and-trade program only allows facilities with capped emissions to purchase credits from other facilities subject to caps. *See* Grant Boyle et al., *Transitioning from the CDM to a Clean Development Fund*, 3 CARBON & CLIMATE L. REV. 16, 17 (2009) (describing a cap-and-trade program as one that allows "regulated entities" to "trade . . . among themselves"). The programs in these bills, however, allow offset credits, i.e., credits generated by facilities not subject to caps. These offset credits have been justly controversial, as they greatly magnify the program's potential integrity problems. *See id.* (describing an offset program as demanding proof of environmental integrity on a case-by-case basis). Technically these programs are hybrid programs, because they feature a mass-based cap like a cap-and-trade program, but allow owners of capped facilities to use at least some offset credits from sources without caps.

4 *See* A. Denny Ellerman et al., *The EU ETS Allocation Process: An Overview*, *in* ALLOCATION IN THE EUROPEAN EMISSIONS TRADING SCHEME: RIGHTS, RENTS AND FAIRNESS 3, 4 (A. Denny Ellerman et al. eds., 2007) [hereinafter EU ALLOCATION] (describing "the process of creating and distributing allowances" as "very important"). *See generally* Amy Sinden, *The Tragedy of the Commons and the Myth of a Private Property Solution*, 78 U. COLO. L. REV. 533,

meaningfully addressing climate disruption very likely.[5] The federal government is not alone in embracing this form of emissions trading. The European Union (EU),[6] other developed countries, several U.S. states,[7] and the Kyoto Protocol to the Framework Convention on Climate Change (Kyoto Protocol)[8] have placed variants upon a cap-and-trade program at the heart of international, national, and regional efforts to address climate disruption.[9] This development comports with a vast "instrument choice" literature affirming cap-and-trade's value.[10]

This literature, however, has paid much more attention to the advantages of trading emission reduction obligations than it has to the problem of establishing a cap.[11] Indeed, several commentators have obscured the problem by suggesting, wrongly, that cap-and-trade programs "automatically" reduce emissions.[12] Setting the cap properly matters more to

534 (2007) (describing the question of "[h]ow much pollution" to allow as a "central question of environmental policy").

5 *See* Dean Scott, *Senate Supporters Waiting for House Action; White House Reaching Out to Moderates*, 40 Env't Rep. (BNA) 807 (Apr. 10, 2009) (describing Obama's call for a 14 percent cut from 2005 levels by 2020 and 83 percent cut below 2005 levels by 2050, with all allowances auctioned); KENNETH R. RICHARDS & STEPHANIE HAYES RICHARDS, THE EVOLUTION AND ANATOMY OF RECENT CLIMATE CHANGE BILLS IN THE U.S. SENATE: CRITIQUE AND RECOMMENDATIONS 9 (2009), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1368903 (follow "Download" hyperlink; then follow "SSRN New York, USA" hyperlink) (characterizing the three major Senate climate change bills as "cap-and-trade legislation").

6 *See* European Parliament and Council Directive 2003/87, 2003 O.J. (L 275) 32 (EC) [hereinafter EU Directive].

7 *See* Memorandum of Understanding Among Connecticut, Delaware, Maine, New Hampshire, New Jersey, New York, and Vermont on the Regional Greenhouse Gas Initiative (Dec. 20, 2005), *available at* http://rggi.org/docs/mou_12_20_05.pdf [hereinafter RGGI MOU].

8 Kyoto Protocol to the United Nations Framework Convention on Climate Change, Dec. 11, 1997, 37 I.L.M. 22, *available at* http://unfcc.int/resource/docs/convkp/kpeng.pdf [hereinafter Kyoto Protocol].

9 *See* Ralf Antes et al., *Introduction* to EMISSIONS TRADING: INSTITUTIONAL DESIGN, DECISION MAKING AND CORPORATE STRATEGIES, at xiii, xiv–xviii (Ralf Antes et al. eds., 2008) [hereinafter INSTITUTIONAL EMISSIONS TRADING] (canvassing programs in effect or planned in 2008).

10 *See* Keohane, *supra* note 1, at 42–43 (describing emissions trading as a standard prescription of economists); Marjan Peeters & Stefan Weishaar, *Exploring Uncertainties in the EU ETS: "Learning by Doing" Continues Beyond 2012*, 3 CARBON & CLIMATE L. REV. 88, 89 (2009) (finding that "[s]ignificant academic literatures" support emissions trading); Sinden, *supra* note 4, at 537–38 (describing emissions trading as a preferred policy of "extremists and moderates alike"); *see also* James Salzman & J.B. Ruhl, *Currencies and the Commodification of Environmental Law*, 53 STAN. L. REV. 607, 609 (2000) (pointing out that "every major environmental policy review in the last five years has called for even greater use of" trading).

11 *See* Lesley K. McAllister, *The Overallocation Problem in Cap-and-Trade: Moving Toward Stringency*, 34 COLUM. J. ENVTL. L. 395, 398 (2009) (noting that little has been written about how to set caps); *cf.* Sinden, *supra* note 4, at 566–67 (explaining that trading has been categorized as an example of "privatization," a characterization that ignores the government role in setting caps). Very recently, a narrow empirical literature has developed reporting on the cap-setting experience arising from the EU's emissions trading scheme. *See, e.g.*, Harro van Asselt, Book Reviews, 3 CARBON & CLIMATE L. REV. 124, 124–25 (2009) (reviewing three books on EU emissions trading that include discussion of cap setting).

12 *See* David M. Driesen, *Sustainable Development and Market Liberalism's Shotgun Wedding: Emissions Trading Under the Kyoto Protocol*, 83 IND. L.J. 21, 61 (2008) (noting that trading advocates' assertions that trading "automatically" reduce emissions obscures the cap's

environmental protection than the decision to allow, or not allow, trades.[13] In the climate disruption context an insufficiently stringent cap, or one set too late, can have disastrous consequences because every ton of carbon emitted while governments struggle to establish strict caps remains in the atmosphere for an extremely long time, contributing to future warming.[14] We already live in a much warmer world that has significantly impacted our environment because we have waited so long to set caps.[15] If the world becomes much warmer still while governments struggle to establish meaningful caps, serious irreversible consequences may well occur.[16]

Descriptively, this Article shows that a best available technology (BAT) approach has dominated many efforts to set caps for emissions trading programs. Under this approach, governments establish mass-based caps or rate-based emission limits for a trading program grounded in an evaluation of what the regulated industry can achieve at its own facilities with available government-identified technology. This claim that BAT often controls cap setting for trading raises profound questions about environmental legal theory, for scholars usually describe trading as an antidote to the delay and

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importance); Ruth Greenspan Bell & Clifford Russell, *Ill-Considered Experiments: The Environmental Consensus and the Developing World*, HARV. INT'L REV., Winter 2003, at 20, 24 (showing that proponents of "market-based instruments" claim that they "almost automatically" achieve "desired levels of environmental quality"); *cf.* Lesley K. McAllister, *Beyond Playing "Banker": The Role of the Regulatory Agency in Emissions Trading*, 59 ADMIN. L. REV. 269, 270 (2007) (characterizing the prevailing view of the regulator's role in trading as being a banker).

13 *See* Dallas Burtraw et al., *Economics of Pollution Trading for SO_2 and NO_x*, 30 ANN. REV. ENV'T & RESOURCES 253, 259 (2005) (describing the cap level as the "key factor" in a cap-and-trade program's environmental success); McAllister, *supra* note 11, at 396–97 (pointing out that environmental performance of a cap-and-trade program depends on the cap's level); Byron Swift, *How Environmental Laws Work: An Analysis of the Utility Sector's Response to Regulation of Nitrogen Oxides and Sulfur Dioxide Under the Clean Air Act*, 14 TUL. ENVTL. L.J. 309, 315 (2001) (describing the acid rain program's cap as the program's "most important element").

14 *See* Lisa Heinzerling & Frank Ackerman, *Law and Economics for a Warming World*, 1 HARV. L. & POL'Y REV. 331, 333 (2007) (pointing out that carbon dioxide, the most important greenhouse gas, has a half-life in the atmosphere of a little over a century).

15 *See* U.S. GLOBAL CHANGE RESEARCH PROGRAM, GLOBAL CLIMATE CHANGE IMPACTS IN THE UNITED STATES 9, 12 (2009), *available at* http://downloads.globalchange.gov/usimpacts/pdfs/climate-impacts-report.pdf (explaining that temperatures have already increased by an average of about 1.5°F since 1900, and mentioning effects this warming has already produced).

16 *See* Stephen H. Schneider & Janica Lane, *An Overview of 'Dangerous' Climate Change*, *in* AVOIDING DANGEROUS CLIMATE CHANGE 7, 11 (Hans Joachim Schnellnhuber et al. eds., 2006) (discussing the potential for large nonlinear climate impacts once unknown tipping points are reached); Malte Meinshausen, *What Does a 2°C Target Mean for Greenhouse Gas Concentrations? A Brief Analysis Based on Multi-Gas Emission Pathways and Several Climate Sensitivity Uncertainty Estimates*, *in* AVOIDING DANGEROUS CLIMATE CHANGE, *supra*, at 265, 265; IMPACTS, *supra* note 1, at 11–18 (summarizing future impacts and describing how they vary with temperature increase); CLIMATE CHANGE 2007: MITIGATION OF CLIMATE CHANGE 127–28 (Bert Metz et al. eds., 2007) [hereinafter MITIGATION] (discussing irreversibility and the potential for catastrophe); *see also* Robert L. Glicksman, *Global Climate Change and the Risks to Coastal Areas from Hurricanes and Rising Seas Levels: The Costs of Doing Nothing*, 52 LOY. L. REV. 1127, 1134–57 (2006) (discussing the potential links between climate change and hurricanes); Heinzerling & Ackerman, *supra* note 14, at 334 (discussing the uncertainty of risks of various irreversible catastrophes, including melting of major ice sheets, sudden release of large amounts of methane from tundra, and major shifts in ocean currents).

complexity associated with BAT regulation.[17] My description suggests that emissions trading often becomes a *form* of BAT regulation, rather than an alternative to it. This suggestion implies that cap-and-trade programs do not necessarily deliver better environmental performance than the BAT regulations they aim to replace—a troublesome conclusion given the seriousness of the climate disruption problem.[18] The rest of the Article explores this insight's implications.

Analytically, this Article compares BAT caps to the main alternatives: effects-based caps set to avoid unacceptable environmental consequences and caps set using cost-benefit analysis (CBA) to establish an "efficient" level of reduction. This analysis shows that all of three of these approaches have significant practical and normative advantages and disadvantages. Only an effects-based approach, however, avoids the technology evaluation problems associated with BAT.

Normatively, this Article shows that a legislative effects-based approach offers the potential to vastly improve our effort to avoid dangerous climate disruption. Realizing the potential benefits of effects-based cap setting requires a change in our thinking about how to set environmental goals. Setting caps without consideration of particular technologies will require that we deemphasize cost considerations in setting caps. This suggestion runs against recent trends in environmental law, but this Article defends this step in the climate disruption context.

Trading's susceptibility to BAT-like problems means that legislatures should seek to avoid litigation and delay in establishing caps.[19] Auctioning permits, rather than allocating them through administrative decision making, provides a means of avoiding BAT-like delays in establishing meaningful caps. Many regulators and scholars recognize that auctioning enhances efficiency, avoids windfall profits, and generates revenues that government can spend to further advance environmental or other societal goals, but they have not fully appreciated its importance in avoiding serious administrative difficulties.[20] This insight should lead Congress to view complete early

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17 *See* Bruce A. Ackerman & Richard B. Stewart, *Reforming Environmental Law*, 37 STAN. L. REV. 1333, 1334–41 (1985) (describing BAT as the slow and complicated status quo, and claiming that tradable permits "at one stroke, cure many of" command and control's "basic flaws"); Sinden, *supra* note 4, at 567 (claiming that Ackerman and Stewart's work gave trading "a foothold in environmental policy debates").

18 In saying this, I do not mean to question some of the economic advantages Ackerman and Stewart ascribe to emissions trading. *See, e.g.*, Ackerman & Stewart, *supra* note 17, at 1341–42 (claiming that emissions trading "bring[s] about a least-cost allocation of control burdens, saving many billions of dollars").

19 *See* David M. Driesen & Amy Sinden, *The Missing Instrument: Dirty Input Limits*, 33 HARV. ENVTL. L. REV. 65, 88–90 (2009) (explaining the administrative efficiency advantages of Dirty Input Limits, and pointing out that efficient use of administrative resources is very important to meeting environmental goals).

20 *See* Parliament and Council Directive 2009/29, pmbl., 2009 O.J. (L 140/63) 15 (EC) [hereinafter 2009 EU Amendments] (declaring that auctioning should "be the basic principle" for the revised EU scheme because of its efficiency and the need to "eliminate windfall profits"); *cf. Commission Green Paper on Greenhouse Gas Emissions Trading Within the European Union*, at 18, COM (2000) 87 final (Mar. 8, 2000) (pointing out that "[a]uctioning

auctioning as vitally important to the success of the trading program, not just as an optional improvement to be phased in over time. To the extent that Congress allows administrative cap setting, it should take pains to minimize the potential for those processes to get bogged down in administrative controversies and litigation.

In order to focus on caps, this Article will not address questions about how to design trading properly to realize the goals embodied in caps.[21] While the existence of this enforcement issue shows that the notion that trading automatically generates reductions is wrong, resolution of the question of how to ensure compliance with a cap lies beyond this Article's scope.[22]

This Article begins with background on emissions trading and its role in addressing climate disruption, which establishes some relevant concepts and history. This background information shows that the environmental case for emissions trading relies heavily on viewing it as an antidote to the complexities limiting the efficacy of the BAT approach. Part III lays the analytical groundwork for the normative claims to follow by discussing the possible ways to set caps, and by contrasting BAT, effects-based, and cost-benefit approaches to this task. This section also contains the meat of the descriptive claim, as it examines the BAT approach's role in establishing caps in enacted emissions trading programs. Part IV explains the analysis's implications for trading design, changing our thinking about environmental law, and climate change bills pending in Congress.

II. EMISSIONS TRADING AND CLIMATE DISRUPTION

This Part first discusses how scholars have traditionally viewed trading as an antidote to various problems with BAT. It then discusses trading's applicability to the climate disruption problem. This treatment of trading's intellectual and practical history focuses heavily on the cap's role in trading programs, and introduces some critical distinctions between different types of caps.

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avoids . . . difficult and politically delicate decisions about" allocating allowances to particular companies); Reuven S. Avi-Yonah & David M. Uhlmann, *Combating Global Climate Change: Why a Carbon Tax Is a Better Response to Global Warming Than Cap and Trade*, 28 STAN. ENVTL. L.J. 3, 6 (2009) (recognizing that a cumbersome rulemaking process and litigation can delay operation of a cap-and-trade system, but not an auction's potential for avoiding that outcome); McAllister, *supra* note 11, at 441 (pointing out that an "auction could eliminate many of the opportunities for sources to influence allocations" in ways that raise the cap).

21 *Cf.* David M. Driesen, *Linkage and Multilevel Governance*, 19 DUKE J. COMP. & INT'L L. 389, 389–96 (2009) (explaining how concerns about compliance tend to generate complex rules from numerous governments under the Kyoto Protocol); Lesley K. McAllister, *Putting Persuasion Back in the Equation: Compliance in Cap-and-Trade Programs*, 24 PACE ENVTL. L. REV. 299, 304, 340–41 (2007) (examining differences between compliance assurance in cap-and-trade programs and in the BAT context); Michael Wara, *Measuring the Clean Development Mechanism's Performance and Potential*, 55 UCLA L. REV. 1759, 1795–99 (2008) (discussing "additionality" problems that can interfere with achieving a cap).

22 *Cf.* Ackerman & Stewart, *supra* note 17, at 1344 (pointing out that auction revenue could fund enhanced enforcement).

A. Emissions Trading As an Antidote to BAT

1. BAT

Regulators have traditionally regulated pollution predominantly by establishing uniform performance standards, i.e., standards that apply the same quantitative pollution reduction requirement to each facility within an industry.[23] These performance standards often take the form of a rate-based emission limit, such as a limit on the amount of pollution per unit of output.[24] While commentators often use the word "cap" to refer to a mass-based limit only,[25] this Article will use the term to refer to both mass-based and rate-based limits,[26] as both types of standards arise in trading programs and pose almost identical issues for regulators setting the limits.[27]

Economists have long complained that uniform performance standards use private capital paying for pollution control inefficiently.[28] Facilities within an industry often have widely varying marginal control costs.[29] When marginal control costs vary, regulators can, in theory at least, achieve the same aggregate pollution reduction goal for an industry that a uniform standards realizes far more cheaply through non-uniform standards tailored

23 *See id.* at 1335 (noting uniform standards' prevalence); *cf.* Driesen, *supra* note 2, at 308 n.93 (pointing out that sometimes regulators employ nonuniform standards).

24 *See* D. Dudek & A. Golub, *"Intensity" Targets: Pathway or Roadblock to Preventing Climate Change While Enhancing Economic Growth?*, 3S2 CLIMATE POL'Y S21, S22 (2003) (defining an intensity target as "an emission rate per unit" of production); Benito Müller & Georg Müller-Fürstenberger, *Price-Related Sensitivities of Greenhouse Gas Intensity Targets*, 3S2 CLIMATE POL'Y S59, S72 (2003) (describing emission intensity in its "most basic . . . guise" as "emissions per physical unit of production"); *see, e.g.*, Byron Swift, *Command Without Control: Why Cap-and-Trade Should Replace Rate Standards for Regional Pollutants*, 31 Envtl. L. Rep. (Envtl. Law Inst.) 10,330, 10,330–33 (2001) (reviewing utility standards based on pounds of emissions per British thermal unit of electricity produced).

25 *See, e.g.*, Daniel J. Dudek et al., *Emissions Trading in Nonattainment Areas: Potential, Requirements, and Existing Programs*, *in* MARKET-BASED APPROACHES TO ENVIRONMENTAL POLICY: REGULATORY INNOVATIONS TO THE FORE 151, 160 (Richard F. Kosobud & Jennifer M. Zimmerman eds., 1997) [hereinafter MARKET-BASED APPROACHES] (describing permits based on emission rates as not establishing a firm cap on emissions in the context of contrasting different trading approaches); Carolyn Fischer, *Combining Rate-Based and Cap-and-Trade Emissions Policies*, 3S2 CLIMATE POL'Y S89, S92–93 (2003) (describing a system with a mass-based cap as a "cap-and-trade system" and one based on a rate-based standard as a "tradable performance standard").

26 *Cf.* A. Denny Ellerman & Ian Sue Wing, *Absolute Versus Intensity-Based Emission Caps*, 3S2 CLIMATE POL'Y S7, S8 (2003) (employing the term "cap" to refer to absolute or rate-based limits).

27 *See id.* at S7–9 (pointing out that rate-based "intensity targets" are more common than mass-based caps); Fischer, *supra* note 25, at S89 (pointing out that tradable permits program use both rate-based (intensity) targets and mass-based caps); *see also* DAVID M. DRIESEN, THE ECONOMIC DYNAMICS OF ENVIRONMENTAL LAW 195–97 (2003) (explaining why mass-based limits offer a better economic dynamic than rate-based limits).

28 *See* Ackerman & Stewart, *supra* note 17, at 1335, 1337–40 & nn. 10–16 (finding that "[u]niform BAT requirements waste many billions of dollar annually" and supporting this point with citation of the economics literature).

29 *See* Driesen, *supra* note 2, at 307 (noting that facilities' unequal compliance costs imply that trading will produce significant cost savings).

to each facility's marginal control cost.[30] Facilities confronting relatively high pollution control costs could make fewer reductions than a uniform standard requires and facilities blessed with relatively low costs could make more reductions than a uniform standard requires, while the regulated industry as a whole still achieves the same aggregate reduction level that a uniform standard demands.[31] This sort of fine-tuning would lower the overall cost of achieving an aggregate pollution reduction goal.[32]

Yet, regulators use uniform standards precisely in order to avoid the massive administrative costs involved in tailoring caps to match each facility's individual characteristics.[33] When establishing uniform standards using a BAT approach, regulators begin by identifying technologies capable of reducing targeted pollution. While critics decry regulators' tendency to rely on end-of-the-pipe technologies in establishing BAT standards,[34] regulators may take fuel switching and other kinds of measures into account in setting BAT standards.[35] To establish a BAT standard, regulators must gather some data on the identified technologies' performance and cost.[36] They use this information to evaluate how much reduction is feasible and set limits based on the capabilities and cost of the technologies they evaluate.[37]

When promulgating a uniform BAT standard, they can proceed without good data from every facility in an industry. BAT standard-setting provisions often authorize or require a short cut, a benchmarking procedure where the United States Environmental Protection Agency (EPA) sets its standards at the level that the best performers in the regulated industry have achieved.[38] This benchmarking approach assumes that polluters can use the

30 *See id.* (noting that when control costs vary significantly, tailoring reductions to match facilities' marginal control costs can improve efficient use of private sector resources).

31 *See id.* at 334 (explaining that trading provides incentives for high cost polluters to increase emissions and low cost polluters to decrease emissions).

32 *See* Ackerman & Stewart, *supra* note 17, at 1341–42 (explaining that trading tends to produce a "least-cost allocation of control burdens").

33 *See* Steve Sorrell & Jim Skea, *Introduction* to POLLUTION FOR SALE: EMISSIONS TRADING AND JOINT IMPLEMENTATION 1, 3 (Steve Sorrell & Jim Skea eds., 1999) [hereinafter POLLUTION FOR SALE] (opining that regulators could not fine-tune regulation to realize cost effective abatement because they "would not have access to the detailed cost information that is required").

34 *See, e.g.*, Cass R. Sunstein, *Administrative Substance*, 1991 DUKE L.J. 607, 628 ("[B]y focusing on the technology at the end of the pipe, BAT strategies are aimed at superficial symptoms rather than underlying causes of pollution.").

35 *See* Federal Water Pollution Control Act, 33 U.S.C. § 1314(b)(2)(A) (2006) (requiring consideration of pollution prevention in establishing effluent limitation guidelines); Clean Air Act, 42 U.S.C. § 7412(d)(2)(A) (2006) (allowing consideration of pollution prevention measures); *id.* § 7412(a)(7) (including pollution prevention and fuel treatment); DRIESEN, *supra* note 27, at 199 (explaining that the U.S. Environmental Protection Agency has been reluctant to establish standards based on pollution prevention because of a desire not to interfere with operational flexibility).

36 David M. Driesen, *Distributing the Costs of Environmental, Health, and Safety Protection: The Feasibility Principle, Cost-Benefit Analysis, and Regulatory Reform*, 32 B.C. ENVTL. AFF. L. REV. 1, 12 (2005) (explaining that evaluating feasibility, as one does in writing BAT standards, requires evaluation of technology's performance and cost).

37 *See id.* at 8–21 (describing in detail how one might determine the maximum feasible reductions to choose the BAT level).

38 *See id.* at 44–45 (describing this benchmarking approach as a "follow-the-leader" principle).

technologies that others have used in order to emulate their pollution control achievements.[39] Thus, benchmarking reduces the administrative burdens associated with figuring out a BAT level.

2. Intellectual History of Trading As a BAT

Emissions trading facilitates cost efficient tailoring of emission reduction obligations, the standard account tells us, without requiring the regulator to develop marginal control cost and pollution control performance data for regulated facilities.[40] On this model, regulators impose some sort of performance standard, but they authorize polluters to forego making local reductions if they purchase extra reductions made elsewhere instead.[41] Given this option, polluters facing relatively high marginal control costs will purchase relatively cheap credits reflecting nonlocal reductions, while those enjoying relatively low marginal control costs will make reductions at their own facilities and even make excess reductions there in order to generate saleable credits.[42] The pollution sources themselves rearrange their pollution reduction obligations through trading to reach cost-effective outcomes.[43] Since facility owners have superior information about their own facilities' pollution control technological possibilities and costs, this rearrangement manages cost-effective fine-tuning much more efficiently than a regulator could.

The person most often credited with originating the emissions trading idea, the Canadian economist J.H. Dales, saw it as a way for economists to usefully improve environmental law's efficiency without addressing its goals.[44] He wrote about trading because economics, in his view, had little useful to say about caps.[45] Of course, the economic concept of allocatively efficient (sometimes called optimal) pollution levels does imply a method for setting caps—establishing pollution limits at the level where marginal

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39 *See id.* at 45 (describing benchmarking as based on an assumption "that pollution sources can achieve what the leading companies achieve").

40 *See* Sorrell & Skea, *supra* note 33, at 3 (contrasting cost-effective abatement through trading with the regulator's inability to obtain the information necessary to realize a cost-effective solution himself).

41 James J. Winebrake et al., *The Clean Air Act's Sulfur Dioxide Emissions Market: Estimating the Costs of Regulatory and Legislative Intervention*, 17 RESOURCE & ENERGY ECON. 239, 241–42 (1995).

42 *See id.* at 242 (explaining that plants with lower marginal abatement costs will make extra reductions and "sell their excess allowances for a profit," while those with high marginal abatement costs will buy these allowances).

43 *See id.* at 243 (formally demonstrating the cost savings); Swift, *supra* note 13, at 315 (stating that trading "lower[s] compliance costs by allowing firms to reduce emissions at the generating units where their costs were lowest").

44 *See* MARKETS FOR CLEAN AIR: THE U.S. ACID RAIN PROGRAM 3 (Denny Ellerman et al. eds., 2000) (attributing the insight that tradable permits would reduce pollution—at least cost—to Dales) [hereinafter MARKETS FOR CLEAN AIR]; Keohane, *supra* note 1, at 42 (describing emissions trading as "first proposed by Dales").

45 *See* Lisa Heinzerling, *Selling Pollution, Forcing Democracy*, 14 STAN. ENVTL. L.J. 300, 302–03 (1995) (pointing out that Dales and other economists supporting trading "eschewed cost-benefit analysis . . . and left the choice of an environmental standard to the politicians").

cost equals marginal benefit.[46] Dales's seminal work on trading, however, opined that an economist "is quite unable to draw up a neat table" setting out an environmental regulation's costs and benefits, principally because of the difficulty of estimating and monetizing regulation's environmental benefits.[47]

Dales's work led to a vast economic literature on emissions trading that said little or nothing about setting caps, focusing instead on the effects of allowing trading. This literature models trading's cost-saving potential under various market structures and its effect on innovation.[48] But economics generally separated means and ends pretty neatly.[49]

In the late 1980s, Bruce Ackerman and Richard Stewart produced a landmark article on emissions trading that said more about caps than most of the economics literature had, as one might expect from a work by law professors.[50] This seminal article draws out an implication of Dales's approach that 1980s enthusiasm for economic efficiency had tended to obscure: Trading could increase the efficiency of achieving any environmental goal, no matter how the goal was established.[51] Regulators

46 *See generally* WILLIAM F. BAXTER, PEOPLE OR PENGUINS: THE CASE FOR OPTIMAL POLLUTION 15–16 (1974).

47 J.H. DALES, POLLUTION PROPERTY AND PRICES: AN ESSAY IN POLICY-MAKING AND ECONOMICS 39 (1968).

48 *See, e.g.*, Adam B. Jaffe et al., *Environmental Policy and Technological Change*, 22 ENVTL. & RESOURCE ECON. 41, 51 (2002) (stating that economic incentives stimulate innovation by paying firms to clean up "a bit more"); David A. Malueg, *Emissions Credit Trading and the Incentive to Adopt New Pollution Abatement Technology*, 16 J. ENVTL. ECON. & MGMT. 52 (1989) (pointing out that modeling based only on the credit seller's incentive to go beyond compliance ignores the buyer's incentive to do less); David Popp, *Pollution Control Innovations and the Clean Air Act of 1990*, 22 J. POL'Y ANALYSIS & MGMT. 641 (2003) (finding more patenting of scrubber technology under command and control than under the acid rain trading program, but finding a shift in the type of innovation encouraged under trading); Nathaniel O. Keohane, *Cost Savings from Allowance Trading in the 1990 Clean Air Act: Estimates from a Choice-Based Model*, *in* MOVING TO MARKETS IN ENVIRONMENTAL REGULATION: LESSONS FROM TWENTY YEARS OF EXPERIENCE 19, 23 (Jody Freeman & Charles D. Kolstad eds., 2007) [hereinafter MOVING TO MARKETS] (discussing cost effectiveness and some concerns about market power); Robert Stavins, *Market-Based Environmental Policies: What Can We Learn from U.S. Experience (and Related Research)?*, *in* MOVING TO MARKETS, *supra*, at 194, 194–224; Tom Tietenberg, *Tradable Permits in Principle and Practice*, *in* MOVING TO MARKETS, *supra*, at 63, 74–75.

49 Economists addressed the relationship between means and ends in work, asking whether the initial allocation of allowances affected a trading program's efficiency. Their conclusion that allocation does not influence a program's efficiency under standard assumptions affirms the separation of means and ends. *See* Keohane, *supra* note 1, at 43 (pointing out that regardless of how allowances are "initially allocated," trading will produce the same equilibrium price); W. David Montgomery, *Markets in Licenses and Efficient Pollution Control Programs*, 5 J. ECON. THEORY 395, 404–09 (1972) (showing that in a perfectly functioning allowance market, allocation method does not influence emission trading's efficiency); *cf.* Frank Gagelmann, *The Influence of the Allocation Method on Market Liquidity, Volatility and Firms' Investment Decisions*, *in* INSTITUTIONAL EMISSIONS TRADING, *supra* note 9, at 69, 72 (explaining that under less than ideal market conditions, allocation method can influence trading's efficiency).

50 *See* Ackerman & Stewart, *supra* note 17, at 1351–64 (recommending a variety of reforms in establishing goals).

51 *See id.* at 1352–53 (pointing out that their trading proposal is based on "allowable pollution loads prevailing under existing law," but calling for a system based on public debate on the question of how much pollution to allow (emphasis omitted)).

can, in principle, decouple trading from cost-benefit analysis (CBA) and use trading to pursue goals other than setting allocatively efficient pollution levels.[52] They made this claim in response to an article by Howard Latin, who opposed CBA as an example of the impracticality of pursuing theoretically perfect efficiency.[53]

Ackerman and Stewart subsequently styled their thesis *The Democratic Case for Emissions Trading*, pointing out that we could couple democratic goal setting with efficient achievement of a goal through emissions trading.[54] They argue that EPA could establish a cap for an emissions trading program by determining how much pollution is allowable in a relevant airshed or watershed under existing law.[55] But they argue that Congress, rather than EPA, should set the cap, thereby suggesting an ad hoc approach to goal setting, one unguided by any particular normative commitment.[56]

While Ackerman and Stewart's title focuses on marrying economic efficiency and democratic cap setting, their article is perhaps best known for arguing that emissions trading is easier to establish than traditional BAT regulation.[57] This argument, of course, assumes that emissions trading is different from BAT, an assumption that I will question. Ackerman and Stewart claim that trading avoids BAT's defects.[58] A core defect involves the painstaking pace of regulation. They point out that BAT demands that regulators evaluate the performance and costs of multiple types of

52 *See id.* (repudiating cost-benefit analysis while supporting trading).

53 *See* Howard Latin, *Ideal Versus Real Regulatory Efficiency: Implementation of Uniform Standards and "Fine-Tuning" Regulatory Reforms*, 37 STAN. L. REV. 1267, 1269–70 (1985) (mentioning cost-benefit analysis as an example of regulatory "fine tuning" that "reflects an excessive preoccupation with theoretical efficiency" and "inadequate emphasis on actual . . . implementation constraints").

54 *See* Bruce A. Ackerman & Richard B. Stewart, *Reforming Environmental Law: The Democratic Case for Market Incentives*, 13 COLUM. J. ENVTL. L. 171 (1988); Ackerman & Stewart, *supra* note 17, at 1353 (describing cap setting as "*the* quintessentially political question that should be answered by the legislative process").

55 *See* Ackerman & Stewart, *supra* note 17, at 1347 (describing the regulator's task as "estimating the total allowable wasteload permitted under existing law in each watershed or air control region").

56 *See id.* at 1353 (calling for a congressional decision about the cap and describing such a decision as political). Ackerman and Stewart, however, characterize this as a first-generation reform and go on to support a second-generation reform, in which "Congress would create a statutory foundation for legally constrained cost-effectiveness analysis." *Id.* at 1355 (emphasis omitted). This cost-effectiveness analysis focuses on allocating a fixed aggregate percentage reduction so that more of the reductions came from areas with more serious environmental problems. *See id.* They also envision this sort of analysis supporting better priority setting, apparently by EPA. *See id.* at 1359–64. This second-generation proposal apparently makes secondary goal setting better informed and somewhat flexible. But this stops short of establishing the normative principles that should guide initial goal setting.

57 *See id.* at 1346 (claiming that trading "offers formidable administrative advantages").

58 *See* Ackerman & Stewart, *supra* note 54, at 179 (claiming that "allowing polluters to buy and sell each other's permits" cures many of command-and-control regulation's "basic defects"); *see also* Richard B. Stewart, *Reconstitutive Law*, 46 MD. L. REV. 86, 101–102, 105–06 (1986) (characterizing "command and control" defects as pathologies and offering tradable pollution rights as a cure).

technology in order to set emissions limits, i.e., to establish caps.[59] They describe the information burden of this technological evaluation as overwhelming.[60] They explain that this "massive information-gathering" task generates "massive adversary rulemaking proceedings and protracted judicial review," leading to substantial delay.[61] Furthermore, they cite the difficulty of updating BAT limits in the face of these administrative burdens as a major problem.[62] They also decry BAT for imposing "more stringent controls" on new sources than on existing sources,[63] which presumably discourages introduction of cleaner, newer technology.[64]

They argue that a cap-and-trade system eliminates the need for bureaucrats to engage in "economic and technological assessment"[65] and "greatly reduces litigation and delay."[66] They further argue that trading somehow "eliminate[s] the disproportionate burdens that BAT imposes on new . . . industries."[67] For all of these reasons, and more, they claim that trading offers not only economic, but also administrative and environmental advantages.[68]

3. Emissions Trading in U.S. Law: Aggregate and Individual Caps

Ackerman and Stewart proved prescient in arguing for trading's practicality and legislative cap setting.[69] EPA had begun to experiment with a form of trading called "bubbles" in the late 1970s and began to expand this approach in the 1980s.[70] Under this approach, states would impose individual caps on pollution sources, but allow owners of those sources to forego

59 *See* Ackerman & Stewart, *supra* note 17, at 1336 (stating that BAT involves "complex scientific, engineering, and economic issues regarding the feasibility of controls on hundreds of thousands of pollution sources").

60 *Id.* at 1342 (characterizing BAT as generating "information-processing tasks" that overwhelm regulators).

61 *Id.* at 1337, 1345–46.

62 *Id.* at 1349.

63 *Id.* at 1335–36.

64 *Cf.* Jonathan Remy Nash & Richard L. Revesz, *Grandfathering and Environmental Regulation: The Law and Economics of New Source Review*, 101 NW. U. L. REV. 1677, 1681–89 (2007) (explaining how new source review may apply to existing sources).

65 Ackerman & Stewart, *supra* note 17, at 1343–44 (describing trading as an alternative to "giving the job of economic and technological assessment to bureaucrats" who must defend these assessments in court).

66 *Id.* at 1346.

67 *Id.* at 1342.

68 *See id.* at 1351. My summary of this argument focuses on the aspects of Ackerman and Stewart's work most germane to my effort to improve cap setting.

69 *Cf.* Heinzerling, *supra* note 45, at 323 (arguing that in spite of the legislative cap setting, Congress did not engage in the sort of deliberative discussion of goals Ackerman, Stewart, and others had hoped for).

70 *See* RICHARD A. LIROFF, AIR POLLUTION OFFSETS: TRADING, SELLING, AND BANKING 45 n.1 (1980); RICHARD A. LIROFF, REFORMING AIR POLLUTION REGULATION: THE TOIL AND TROUBLE OF EPA'S BUBBLE 26–27 (1986).

compliance if they made extra emission reductions elsewhere.[71] The bubble programs generated significant cost savings, but did not perform adequately in protecting environmental quality, thereby fueling arguments against trading's practicality.[72] Title IV of the 1990 Amendments to the Clean Air Act,[73] however, inaugurated the first major success with emissions trading, the acid rain trading program, showing that a properly designed trading program could, as Ackerman and Stewart had argued, deliver the environmental goods.[74] Congress established an aggregate goal for electric utilities' sulfur dioxide emissions expressed in tons of reduction below a baseline.[75] This aggregate cap alone, however, would not tell an individual facility owner anything about how much reduction her firm must make or pay for elsewhere.[76] Accordingly Congress, in a detailed table in the legislation, established the number of allowances allocated to each regulated unit in the electricity industry.[77] These individual caps imposed concrete obligations on power plant owners to reduce emissions by a particular amount.[78] Another Title IV provision authorizes the facility owners to forego the local reductions otherwise required to meet their individual caps if they purchase sufficient allowances from overcomplying utilities to make up for the foregone local reductions.[79]

The creation of an aggregate cap adequate to ensure significant progress in addressing acid rain and the translation of this societal obligation into a concrete obligation for each regulated facility proved

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71 *See* Driesen, *supra* note 2, at 312–13 (explaining that bubble programs allowed pollution sources to escape unit-specific constraints and construction bans "in exchange for claimed reductions elsewhere").

72 *See id.* at 314–16 & nn.120–27 (documenting bubbles' environmental failure); *see generally* A. Denny Ellerman et al., *Summary Evaluation of the US SO_2 Emissions Trading Program As Implemented in 1995*, *in* POLLUTION FOR SALE, *supra* note 33, at 27, 31 (describing the experience with emissions trading prior to 1990 as "not . . . particularly encouraging").

73 42 U.S.C. §§ 7401–7671q (2006). Title IV of the 1990 Amendments to the Clean Air Act is at 42 U.S.C. §§ 7651–7651o (2006).

74 *See* Driesen, *supra* note 2, at 317–19; Swift, *supra* note 13, at 315 (pointing out that many regard the acid rain program "as one of the most successful environmental regulatory programs"); *cf.* McAllister, *supra* note 11, at 397, 443 (claiming that the acid rain program suffered from an "early overallocation" of allowances, compromising its environmental effectiveness (internal quotations omitted)).

75 *See* 42 U.S.C. § 7651(b) (2006) (describing the title's purpose as realizing a ten million ton reduction in sulfur dioxide emissions below a 1980 baseline).

76 *See* Paul L. Joskow & Richard Schmalensee, *The Political Economy of Market-Based Environmental Policy: The U.S. Acid Rain Program*, 41 J.L. & ECON. 37, 41 (1998) (describing the acid rain program as establishing an "aggregate cap" on sulfur dioxide emissions).

77 42 U.S.C. § 7651c(e)(3) (2006). This table describes Phase I reductions. The statute provides a table for some emission units in Phase II supplemented by numerical formulas specifying Phase II allowances for most facilities. *See id.* § 7651d.

78 *See* Dallas Burtraw, *The SO_2 Emissions Trading Program: Cost Savings Without Allowance Trades*, CONTEMP. ECON. POL'Y, Apr. 1996, at 79, 80 (1996) (pointing out that the acid rain program establishes performance standards).

79 *See* 42 U.S.C. § 7651b(b), (g) (2006) (authorizing allowance transfers but prohibiting emissions in excess of allowances held).

essential to the acid rain program's success.[80] While the literature often refers to this translation as the allocation of allowances,[81] I have referred to it as the establishment of individual caps, because government trading programs sometimes establish individual limits that facility owners must meet through either local pollution control or credit purchases by allocation of an explicit aggregate cap among sources (as in the acid rain program) and sometimes directly without any explicit prior decision about the total number of allowances (as in the bubble programs). In both cases, however, the individual cap provides the pollution source with the information it needs to proceed with local reductions or purchase of allowances on the open market.[82] Congress could establish individual caps in the acid rain legislation itself because regulators had a fuller understanding of this particular industry than perhaps any other, since utilities' emissions have made them exceptionally important targets for federal air pollution regulation since the modern federal Clean Air Act's advent in 1970.[83]

B. Emissions Trading to Address Climate Disruption

Shortly after the acid rain program became law, delegates from around the world met in Rio de Janeiro to address a new environmental problem, global climate disruption.[84] The United States advanced what might be called a "no cap but trade" approach. The United States favored a new animal, *international* emissions trading, as a method for addressing global climate disruption,[85] but it opposed capping the greenhouse gas emissions causing the climate disruption.[86]

80 *See generally* Peter Zapfel, *A Brief but Lively Chapter in EU Climate Policy: The Commission's Perspective*, *in* EU ALLOCATION, *supra* note 4, at 13, 18 (describing allocation as the decision about the number of allowances given to "each individual installation").

81 *See, e.g.*, MARKETS FOR CLEAN AIR, *supra* note 44, 31–39 (discussing the political economy of "allowance allocations").

82 *See* Tim Denne, *Implementation Issues in International CO_2 Trading*, *in* POLLUTION FOR SALE, *supra* note 33, at 343, 351 (likening allocation of permits to the setting of targets).

83 *See generally* MARKETS FOR CLEAN AIR, *supra* note 44, 13–39 (discussing the intensive work on addressing utility emissions over two decades prior to 1990 and the rich data EPA generated to aid in allocation).

84 *See generally* Daniel Bodansky, *The United Nations Framework Convention on Climate Change: A Commentary*, 18 YALE J. INT'L L. 451, 453–75 (1993) (describing the background to this meeting and analyzing the resulting framework convention).

85 *See* Atle C. Christiansen & Jorgen Wettestad, *The EU as a Frontrunner on Greenhouse Gas Emissions Trading: How Did It Happen and Will the EU Succeed?*, 3 CLIMATE POL'Y 3, 4 (2003) (describing the U.S. as emissions trading's main proponent during the 1990s); David M. Driesen, *Free Lunch or Cheap Fix?: The Emissions Trading Idea and the Climate Change Convention*, 26 B.C. ENVTL. AFF. L. REV. 1, 3 (1998) (characterizing international emissions trading as a "centerpiece" of U.S. climate change policy).

86 *See* James E. Beard, *An Application of the Principles of Sustainability to the Problem of Global Climate Change: An Argument for Integrated Energy Services*, 11 J. ENVTL. L. & LITIG. 191, 203 (1996) (discussing successful U.S. efforts to defeat a proposal to reduce emissions by 20 percent); Bodansky, *supra* note 84, at 468, 475, 490–91 (describing the Framework Convention's "aim" of stabilizing emissions at 1990 levels as a compromise arrived at in response to U.S. opposition to binding emission limits).

The United Nations Framework Convention on Climate Change (Framework Convention)[87] reflected reluctant international adoption of the U.S. position. It embraced an aim, rather than a concrete requirement, to return developed country emissions to 1990 levels by the year 2000, and it provided that countries could achieve this aim "individually or jointly."[88] This reference to "joint implementation" reflected some acceptance of a trading approach, where a country could achieve this aim without reducing its own emissions fully to 1990 levels if it paid foreign countries or polluters to reduce their emissions by an amount sufficient to make up for the national emission reduction gap.[89]

Subsequently, U.S. support for emissions trading played an important role in the Kyoto Protocol's formulation. The United States nearly scuttled the agreement by opposing ambitious caps on national emissions and supporting trading.[90] At the last minute, then Vice President Al Gore brokered a compromise under which the United States accepted a greenhouse gas emission reduction requirement, i.e., a national cap, in exchange for acceptance of broad trading.[91] The resulting Kyoto Protocol authorizes no less than three international emissions trading programs, but also caps national greenhouse gas emissions in developed countries.[92] These national caps, like the aggregate caps for an industry mentioned earlier, do not create individual caps. They serve as goals for national programs to reduce greenhouse gas emissions, rather than as operative directives that governments or citizens can enforce against polluters.[93]

The United States under President George W. Bush famously repudiated the Kyoto Protocol.[94] So, the federal government of the United States established neither caps nor significant trading under President Bush.

The European Union (EU), which had been quite reluctant to embrace emissions trading, created the most important greenhouse gas emissions trading program in the world, the EU Emissions Trading Scheme (ETS), as

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87 U.N. Intergovernmental Negotiating Comm. for a Framework Conv. on Climate Change, *Report of the Intergovernmental Negotiating Committee for a Framework Convention on Climate Change on the Work of the Second Part of Its Fifth Session*, Annex I, U.N. Doc. A/AC.237/18(Part II)/Add.1 (May 15, 1992), *available at* http://unfccc.int/resource/docs/a/18p2a01.pdf [hereinafter *Framework Convention on Climate Change*].

88 *Id.* Annex I, art. 4(2)(b); *see* Bodansky, *supra* note 84, at 515–17 (describing this clause as establishing a "quasi-target").

89 *See* Driesen, *supra* note 85, at 28 (explaining that the Framework Convention's joint implementation provision could be interpreted to authorize trading).

90 *See* Jim Skea, *Flexibility, Emissions Trading and the Kyoto Protocol*, *in* POLLUTION FOR SALE, *supra* note 33, at 354, 366 (explaining that the United States' offer to return its emissions to 1990 levels by 2008 to 2012 instead of cutting them while strongly supporting trading excited outrage from the EU).

91 *See* Driesen, *supra* note 85, at 20 (discussing Al Gore's role).

92 *See* Kyoto Protocol, *supra* note 8, arts. 6(1)(d), 12(3)(b), 17, Annex B.

93 *See* Driesen, *supra* note 85, at 24–27 (discussing the Framework Convention's attempt to foster accountability and compliance through the availability of national information rather than trade sanctions or other mandated enforcement).

94 Christiansen & Wettestad, *supra* note 85, at 6 (referring to "President Bush's repudiation of the Kyoto Protocol").

the Kyoto Protocol entered into force.[95] An EU directive establishes the trading mechanism and specifies which industries it will regulate.[96]

The EU Directive itself, however, does not establish aggregate or individual caps. Instead, it delegates that task to member states, albeit under European Commission supervision.[97] It requires the member states to regulate in two phases, with first phase caps governing potential reductions from 2005 to 2007 and second phase caps governing reductions from 2008 to 2012.[98] These caps have often proven inadequate, producing conflict between the Commission and various member states[99] and contributing to the

95 *See* Joseph Sarkis & Maurry Tamarkin, *Real Options Analysis for Renewable Energy Technologies in a GHG Emissions Trading Environment*, *in* INSTITUTIONAL EMISSIONS TRADING, *supra* note 9, at 103, 106 (discussing the EU's preference for ecotaxes); van Asselt, *supra* note 11, at 124 (describing the EU as "s[k]eptical" about emissions trading "[t]hroughout the Kyoto Protocol negotiations"); CLAUDIA KETTNER ET AL., STRINGENCY AND DISTRIBUTION IN THE EU EMISSIONS TRADING SCHEME—THE 2005 EVIDENCE 1–2 (2007), *available at* http://ssrn.com/abstract=968418 (follow "Download" hyperlink; then follow "SSRN New York, USA" hyperlink) (explaining that serious discussion of an EU emissions trading scheme began in 2000 and that the EU enacted a directive establishing the scheme in 2003).

96 *See* EU Directive, *supra* note 6.

97 *See id.* Annex III; KETTNER ET AL., *supra* note 95, at 2 (explaining that "each Member State decides" on the total number of allowances to allocate to installations using European Commission guidelines).

98 *See* McAllister, *supra* note 11, at 408–09.

99 *See* Karoline Rogge et al., *An Early Assessment of National Allocation Plans for Phase 2 of EU Emission Trading* 18, 36 (Fraunhofer Inst. Sys. & Innovation Research & Ctr. for Energy & Envtl. Mkts. at Univ. of New S. Wales, Working Paper Sustainability and Innovation No. S1/2006, 2006), *available at* http://www.klimaktiv.de/media/docs/Studien/isi_ceem_nap2assessment_final.pdf (finding that the caps "will not require significant reductions" because of a 20 to 30 percent allowance overallocation); KETTNER ET AL., *supra* note 95, at 14–15 (concluding that allowance allocations within the EU exceeded actual emissions and finding it "unlikely" that it provided any incentives for abatement in 2005); *see, e.g.*, Case T-374/04, Germany v. Comm'n, 2007 E.C.R. II-4431, 4493–94 (adjudicating a dispute about whether the European Commission properly limited Germany's provision for ex-post adjustment of its national allocation plan (NAP)); Case T-178/05, United Kingdom v. Comm'n, 2005 E.C.R. II-4807, 4830–31 (adjudicating a dispute about whether the European Commission could prohibit the United Kingdom from amending its NAP to allow for emission increases); Case C-127/07, Société Arcelor Atlantique et Lorraine v. Premiere Ministre, ¶¶ 72–74 (Dec. 16, 2008), http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:62007J0127:EN:HTML (last visited Oct. 13, 2009) (upholding French law implementing EU's emissions trading scheme); Announcement, Case T-499/07, Bulgaria v. Comm'n, 2008 O.J. (C 64) 50–51 (seeking review of European Commission's disapproval of Bulgaria's Phase II NAP); Announcement, Case T-484/07, Romania v. Comm'n, 2008 O.J. (C 51) 57 (seeking review of European Commissions disapproval of Romania's Phase II NAP); Announcement, Case T-368/07, Lithuania v. Comm'n, 2007 O.J. (C 283) 35–36 (seeking review of a European Commission decision about Lithuania's NAP); Announcement, Case T-369/07, Latvia v. Comm'n, 2007 O.J. (C 269) 66–67 (seeking annulment of European Commission decision on Latvia's NAP); Announcement, Case T-263/07, Estonia v. Comm'n, 2007 O.J. (C 223) 12 (seeking annulment of European Commission decision on Estonia's NAP); Announcement, Case T-221/07, Hungary v. Comm'n, 2007 O.J. (C 199) 41 (contesting a European Commission decision on Hungary's NAP); Announcement, Case T-194/07, Czech Republic v. Comm'n, 2007 O.J. (C 199) 38–39 (seeking annulment of European Commission decision on the Czech Republic's NAP); Announcement, Case T-183/07, Poland v. Comm'n, 2007 O.J. (C 155) 41–42 (seeking annulment of a European Commission decision on Poland's Phase II NAP); Announcement, Case T-32/07, Slovakia v. Comm'n, 2007 O.J. (C 69) 29 (contesting a European Commission decision on Slovakia's NAP).

apparent failure of many member states to achieve Kyoto targets.[100] The literature often refers to these government-established individual caps as a type of grandfathering, because facility owners emitting pollution prior to the program's enactment can continue polluting to some degree without paying for allowances after the cap is set.[101] Thus, the EU followed the grandfathering approach of the acid rain program, which also relied on government setting of individual caps.[102]

Meanwhile, alarm grew within the United States about the federal government's inaction in the face of mounting evidence of serious climate disruption flowing from excess greenhouse gas emissions.[103] A group of northeastern states decided to address this problem by adopting a "Regional Greenhouse Gas Initiative" (RGGI), a cap-and-trade program regulating electric utility emissions in the northeast.[104] This program establishes aggregate targets for individual states' utility emissions in a regional agreement.[105] But this program does not depend on government setting individual targets for its electric utility generating units, as the acid rain program and the EU ETS did. Instead, the "Regional Organization" RGGI establishes generally auctions off allowances, limited in amount by the aggregate cap, to the highest bidder.[106] Under this approach, polluters in

100 *See* Rogge et al., *supra* note 99, at 6 (noting that only two member states met the EU's deadline for submission of Phase II caps).

101 The literature traditionally distinguishes grandfathering, defined as a system that allocates allowances for free, from an auction-based allocation where polluters must pay for each allowances. *See, e.g.*, *id.* at 22–23. But some of the recent literature on the EU ETS implicitly employs a narrower definition of grandfathering. *See id.* at 23 (discussing "benchmarking"). This literature subdivides giveaways of allowances into a "benchmarking" approach, where the amount given away corresponds to a BAT or BAT-related benchmark, and "grandfathering," where the amount of allowances given away equals or nearly equals the amount of current emissions. *See id.* at 22–23 (defining grandfathering as a program based on emissions in a recent base period and contrasting this with "benchmarking"). This Article employs the term grandfathering in the broader sense, as a general description of all systems that give away, rather than sell, allowances to polluters.

102 *See* Zapfel, *supra* note 80, at 14–15 (noting that the EU Directive requires member states to allocate at least 95 percent of the allowances free of charge in the first trading period).

103 *See, e.g.*, MATTHIAS RUTH ET AL., UNIV. OF MD., THE US ECONOMIC IMPACTS OF CLIMATE CHANGE AND THE COSTS OF INACTION 3–7 (2007), *available at* http://www.cier.umd.edu/documents/US%20Economic%20Impacts%20of%20Climate%20Change%20and%20the%20Costs%20of%20Inaction.pdf (highlighting the "economic costs of climate change" on the United States and concluding that Congress must act); Press Release, Dep't of Envtl. Conservation, N.Y. State, DEC Announces Final Model Rule to Help States Implement RGGI (Aug. 15, 2006), http://www.dec.ny.gov/press/12440.html (last visited Oct. 28, 2009) (quoting Jim Marston of the Environmental Defense Fund, in response to New York's implementation of the RGGI, as saying that "it's time for federal legislators to take their heads out of the sand and pass federal legislation to cut global warming pollution").

104 *See* RGGI MOU, *supra* note 7, at 2.

105 *Id.*

106 *See* Richard Cowart, *Carbon Caps and Efficiency Resources: How Climate Legislation Can Mobilize Efficiency and Lower the Cost of Greenhouse Gas Emission Reduction*, 33 VT. L. REV. 201, 218 (2008) (reporting auctioning of 90 percent of allowances); Keohane, *supra* note 1, at 47 (stating that "nearly all allowances" have been auctioned under the RGGI program); Daniel P. Schramm, *A Federal Midwife: Assisting the States in the Birth of a National*

effect establish their own caps, rather than depend on government regulators to establish individual caps.[107] To see this point, imagine a utility emitting 100 tons of carbon dioxide (the principal greenhouse gas). A limited supply of allowances becomes available for purchase. If the polluter purchases ninety tons of allowances from the government at auction, it must reduce its emissions by ten tons or pay somebody else for ten tons of allowances (reflecting ten tons of nonrequired reductions elsewhere). If the polluter instead purchases 100 tons of allowances, it may keep its emissions at current levels. If the polluter purchases 110 tons of allowances, it may increase its emissions to accommodate increased production. The aggregate cap, however, provides a real constraint because it limits the total number of allowances the regulator can sell. As long as a well-enforced provision prohibits all emissions not covered by allowances, this approach imposes a real cap on emissions.

This juxtaposition of the RGGI program's auction system with the EU grandfathering system establishes an important conceptual point. Grandfathering implies what we might call "government individual cap setting," requiring governments to set caps for individual facilities. This can take the form of either legislative cap setting, as in the acid rain program, or administrative cap setting, a much more frequently used procedure where an administrative agency establishes an individual cap. By contrast, auctioning produces "market-based individual cap setting," where the auction market translates a previously determined aggregate cap into individual caps.

The RGGI program inaugurated a trend toward greater reliance on market-based individual cap setting. In April of 2009, the EU adopted a proposal to make auctioning the "basic principle" for allocating allowances in a third phase of the ETS, which should take effect after 2012.[108] With some potentially significant exceptions, this 2009 Amendment to the EU ETS envisions full auctioning in the power sector beginning in 2013, a response to large windfall profits in that sector under grandfathering, and a phase in of full auctioning for other sectors by 2027.[109] Auctions have also emerged as a prominent issue in the Congressional discussion of federal cap-and-trade systems for the United States. While the Cap and Dividend Act of 2009[110] immediately moves to full auctioning, the bills that have garnered significant political support so far phase in auctions over time, like the EU's 2009

Greenhouse Gas Cap-And-Trade Program, 22 TUL. ENVTL. L.J. 61, 68 (2008) (discussing the Regional Organization's role).

107 Gagelmann, *supra* note 49, at 71 ("Under auctioning, participants themselves determine their individual allocation . . . .").

108 *See* 2009 EU Amendments, *supra* note 20, pmbl., para. 15.

109 *See id.* pmbl., paras. 19, 21, 25; U.S. GOV'T ACCOUNTABILITY OFFICE, CLIMATE CHANGE POLICY: PRELIMINARY OBSERVATIONS ON OPTIONS FOR DISTRIBUTING EMISSIONS ALLOWANCES AND REVENUE UNDER A CAP-AND-TRADE PROGRAM 8 (2009), *available at* http://www.gao.gov/new.items/d09950t.pdf (noting that European electric utilities receiving free allowances "reaped substantial" windfall profits).

110 H.R. 1862, 111th Cong. § 9903 (2009).

legislation.[111] Thus, while a trend toward auctioning has developed, governments have moved toward auctioning incompletely and, with the exception of the RGGI states, very slowly.

Those involved in establishing trading programs must confront crucial questions about how to establish caps. This Part has already provided basic background, established the concepts of aggregate and individual caps, and distinguished government (both legislative and administrative) from market-based individual cap setting. The next Part discusses the approaches governments employ to determine a cap's level—the amount of pollution to allow.

III. SETTING CAPS

This Part will first discuss possible ways of setting caps and their implications, thus providing an analytical predicate for the normative analysis in Part IV. It will then describe some of the history of cap setting to show how governments have established caps for emissions trading programs. This history establishes that trading often functions as a form of BAT, rather than as a means of escaping its environmental defects.

A. Possible Ways of Setting Caps

In principle, regulators establishing caps face the same basic choices whether they allow trading or not. A key choice involves the costs' role. Sometimes regulators basically ignore costs in setting standards. While this is less common than many observers assume, it is conceptually important both generally and in the climate disruption context. The principle example of cost-blind regulation involves setting national ambient air quality standards under the Clean Air Act. Because the Clean Air Act requires that these standards protect public health, the Supreme Court has held that EPA may not consider cost in establishing these standards.[112]

National ambient air quality standards exemplify what environmental lawyers commonly call effects-based standards, standards aimed at protecting the public from environmental or health effects deemed

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111 *See, e.g.*, MARK HOLT & GENE WHITNEY, CONG. RESEARCH SERV., GREENHOUSE GAS LEGISLATION: SUMMARY AND ANALYSIS OF H.R. 2454 AS PASSED BY THE HOUSE OF REPRESENTATIVES 7–8 (2009) (showing that Waxman-Markey authorizes auction of 16 percent of the allowances in 2016 and 65 percent in 2030); LARRY PARKER & BRENT YACOBUCCI, CONG. RESEARCH SERV., CLIMATE CHANGE: COMPARISON AND ANALYSIS OF S. 1766 AND S. 2191 (S.3036), at CRS-2, CRS-5 tbl.1 (2008) (describing the increase in percentage of auctioned allowances in two major Senate bills introduced in the 110th Congress); *cf.* LARRY PARKER, BRENT D. YACOBUCCI & JONATHAN L. RAMSEUR, CONG. RESEARCH SERV., GREENHOUSE GAS REDUCTION: CAP-AND-TRADE BILLS IN THE 110TH CONGRESS app. A, at CRS-9 to CRS-10 (2008) (describing some bills as delegating auctioning authority to EPA or the President, with others phasing in auctions with varying degrees of completeness over time).

112 *See* Whitman v. Am. Trucking Ass'ns, Inc., 531 U.S. 457, 471 (2001) (holding that section 109(b) "unambiguously bars" consideration of cost in setting national ambient air quality standards).

unacceptable.[113] In principle, a government can establish a cap for an emissions trading program in the same way. Indeed, Ackerman and Stewart's suggestion that EPA establish caps based on the amount of pollution allowed in an airshed or watershed under existing law implies effects-based caps, as both the Clean Air Act and Clean Water Act[114] use effects-based approaches to determining total permissible pollution loadings.[115]

Traditionally, however, environmental law has relied heavily upon standard setting that does consider cost in some fashion. Anytime a regulator considers cost, she must consider technology, directly or indirectly.[116] The cost of making any environmental improvement equals the cost of the technological changes needed to realize that improvement.[117] Thus, it is impossible to responsibly consider costs without doing that which Ackerman and Stewart would like to avoid—evaluating technology.

Generally, economists and regulators constructing cost estimates of trading programs have relied on estimates of the cost of various technological options.[118] Recently, economists have used this "bottom-up" approach to evaluate the cost of addressing global climate disruption.[119] This approach proves data intensive, because it requires estimates of the costs of particular technologies in a variety of industries.[120]

Some economists studying global climate disruption, however, have used a top-down approach to cost estimation, which appears to avoid this

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113 *See* DAVID M. DRIESEN & ROBERT W. ADLER, ENVIRONMENTAL LAW: A CONCEPTUAL AND PRAGMATIC APPROACH 135–52 (2007) (describing the concept of effects-based standards and using national ambient air quality standards as examples).

114 Federal Water Pollution Control Act, 33 U.S.C. §§ 1251–1387 (2006).

115 *See* DRIESEN & ADLER, *supra* note 113, at 143–62, 471–85 (explaining the major requirements for establishing and implementing effects-based standards for air and water quality); Ackerman & Stewart, *supra* note 17, at 1347.

116 *See* Driesen, *supra* note 36, at 49–50 (explaining in detail why cost estimation requires technological assessment).

117 *Accord* MITIGATION, *supra* note 16, at 147 (noting that "the cost . . . of any response to climate change" depends "critically on the cost, performance, and availability of technologies that can lower emissions").

118 *See, e.g.*, Keohane, *supra* note 48, at 195 (discussing cost estimation's dependence on data about scrubber and coal costs); Curtis Carlson et al., *Sulfur Dioxide Control by Electric Utilities: What Are the Gains from Trade?*, 108 J. POL. ECON. 1292, 1293–94 (2000) (estimating the costs of the acid rain program require assessment of the cost of fuel switching and employing scrubbers together with the computation of the "least-cost solution" realizable through rearrangement of these technologies).

119 *See* MITIGATION, *supra* note 16, at 8–9 (explaining the difference between bottom-up and top-down economic models and summarizing some bottom-up modeling results).

120 *See id.* at 8 (describing "bottom-up" studies as "based on assessment of mitigation options, emphasizing specific technologies and regulations"); *see, e.g.*, Donald A. Hanson & John A. "Skip" Laitner, *Technology Policy and World Greenhouse Gas Emissions in the AMIGA Modeling System*, ENERGY J. (SPECIAL ISSUE) 355 (2006) (presenting a model characterizing as many as 200 sectors of various regional economies); *see also* Marilyn A. Brown, *Market Failures and Barriers as a Basis for Clean Energy Policies*, 29 ENERGY POL'Y 1197, 1204 (2001) (showing that consideration of how markets for energy efficient technologies actually work can provide a basis for specific policies to overcome barriers).

BAT problem.[121] Under this approach, modelers rely on data about fuel price increases and simultaneous declining energy use to estimate correlations between fuel price increases and carbon dioxide reduction.[122] This approach, however, often generates much higher cost estimates than bottom-up modeling.[123] A top-down modeling approach based on energy prices does not apply to greenhouse gases other than carbon dioxide or to other environmental problems, because the data to support such an approach just does not exist.[124] Economists increasingly blend top-down and bottom-up approaches, which means that recent modeling, even when it employs some top-down analysis, includes evaluation of particular technologies.[125] Even in the case of greenhouse gases, cost estimation usually requires explicit consideration of technology and when it does not, it involves indirect consideration of technology, just as benchmarking does in establishing BAT.[126]

Ackerman and Stewart correctly identify a BAT approach as the dominant approach to traditional regulation.[127] Regulators can, however, in principle use a BAT approach to establish a cap for a cap-and-trade program—i.e., they can establish the level of performance demanded by a cap-and-trade program by estimating the capabilities of the best available technology.[128] Once regulators establish a BAT-based cap, however, they may

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121 *See* MITIGATION, *supra* note 16, at 8–10 (describing top-down modeling and summarizing some of its conclusions for climate change).

122 *See generally id.* at 8 (describing top-down studies as based on "aggregated information" and including "macro-economic and market feedbacks").

123 *Cf. id.* at 635 (noting that a previous assessment, called TAR, showed that top-down modeling generated higher costs than bottom-up models, but that more recent top-down models assuming cost-decreasing technological changes sometimes produced lower costs than bottom-up models).

124 *See* John P. Weyant et al., *Overview of EMF-21: Multigas Mitigation and Climate Policy*, ENERGY J. (SPECIAL ISSUE) 1, 6 (2006) (noting that "energy economics" provides no basis for estimating non-energy greenhouse gas emissions and that previous studies have not estimated the costs of reducing these emissions because of a "lack of data on engineering solutions").

125 *See* MITIGATION, *supra* note 16, at 8 (noting that top-down and bottom-up models have "become more similar" partly because "top-down models have incorporated more technological mitigation options").

126 *See, e.g.*, K. Casey Delhotal et al., *Mitigation of Methane and Nitrous Oxide Emissions from Waste, Energy and Industry*, ENERGY J. (SPECIAL ISSUE) 45, 46 (2006) (explaining that the study estimates the costs of reductions from specific abatement technologies); Deborah Ottinger Schaefer et al., *Estimating Future Emissions and Potential Reductions of HFCs, PFCs, and* SF_6, ENERGY J. (SPECIAL ISSUE) 63, 81 (2006) (explaining that its analysis includes cost and emission reduction information on 43 emission reduction technologies); Richard S.J. Tol, *Multi-Gas Emission Reduction for Climate Change Policy: An Application of* Fund, ENERGY J. (SPECIAL ISSUE) 235, 238 (2006) (basing some of its cost analysis on EPA analysis).

127 *Accord* Chris H. Schroeder, *In the Regulation of Manmade Carcinogens, If Feasibility Analysis Is the Answer, What Is the Question?*, 88 MICH. L. REV. 1483, 1496 (1990) (reviewing FRANK B. CROSS, ENVIRONMENTALLY INDUCED CANCER AND THE LAW (1989)) (arguing that feasibility analysis has gained a "working hegemony in the world of practical administration").

128 *See* Driesen, *supra* note 36, at 18–19 (explaining that regulators could "employ a technology-based criterion to set the limits" underlying a trading program); *accord* McAllister, *supra* note 11, at 426–27 (agreeing that, in principle, regulators can use the feasibility principle to set a cap); *see also* Driesen, *supra* note 36, at 21 (using the Clean Water Act's BAT standards as an example of a provision basically conforming to the feasibility principle).

allow owners of capped facilities to purchase allowances, rather than employ the technology on which the regulation is based, to meet the cap. Therefore, BAT regulation is a theoretically available option for establishing a cap for a trading program.

While many scholars—including Ackerman, Stewart, and Dales—doubt the practicality of cost-benefit analysis (CBA), it became a frequently employed input to decisions about setting emission limits beginning the 1980s.[129] It, too, requires consideration of cost. It therefore requires consideration of technology.

Each of these three approaches to setting caps—effects-based, cost-benefit based, and technology-based (BAT)—have advantages and disadvantages. Most environmental scholars find a BAT approach much simpler and more practical than the available alternatives.[130] While engineering judgment about various technologies' pollution reduction capabilities and costs introduces complexities, the difficulties appear minor compared to the alternatives.[131]

An effects-based approach requires a regulator to carry out tasks so complicated that this approach has regularly failed in every medium—land, air, and water—as Oliver Houck has explained.[132] For example, the Clean Water Act's Total Maximum Daily Load (TMDL) program requires states to calculate an aggregate cap on water pollution for a watershed based on how

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129 *See* Ackerman & Stewart, *supra* note 17, at 1352 (rejecting considering all costs and benefits to calculate an optimal level of pollution as a "utopian scheme" insufficiently sensitive to "problems of limited information"); David A. Evans, *The Clean Air Mercury Rule*, *in* REFORMING REGULATORY IMPACT ANALYSIS 82 (Winston Harrington et al. eds., 2009), *available at* http://www.iadb.org/intal/intalcdi/PE/2009/03344.pdf [hereinafter RIA] (detailing the role of CBA in a recently created emissions trading program); Nathaniel O. Keohane, *The Technocratic and Democratic Functions of the CAIR Regulatory Analysis*, *in* RIA, *supra*, at 33 (same); Alan J. Krupnick, *The CAMR: An Economist's Perspective*, *in* RIA, *supra*, at 142 (same); Richard D. Morgenstern, *The Clean Air Interstate Rule*, *in* RIA, *supra*, at 20 (same); Catherine A. O'Neill, *The Mathematics of Mercury*, *in* RIA, *supra*, at 108 (same); Wendy E. Wagner, *The CAIR RIA: Advocacy Dressed up as Policy Analysis*, *in* RIA, *supra*, at 56 (same).

130 *See, e.g.*, Howard Latin, *Regulatory Failure, Administrative Incentives, and the Clean Air Act*, 21 ENVTL. L. 1647, 1660–67 (1991) (explaining why BAT standards work better in practice than the alternatives); Sidney A. Shapiro & Thomas O. McGarity, *Not so Paradoxical: The Rationale for Technology-Based Regulation*, 1991 DUKE L.J. 729, 729–30 (arguing that, in contrast to Cass Sunstein's market-based approach, technology-based social regulation is preferable); Wendy E. Wagner, *The Triumph of Technology-Based Standards*, 2000 U. ILL. L. REV. 83, 94–107 (arguing that BAT standards can be established expeditiously, enforced, and made both predictable and adaptable).

131 *See* Adam Babich, *Too Much Science in Environmental Law*, 28 COLUM. J. ENVTL. L. 119, 133–35 (2003) (finding that "[t]he most common criticism of risk-based standards is that they do not work," and providing examples of where they failed).

132 OLIVER A. HOUCK, THE CLEAN WATER ACT TMDL PROGRAM: LAW, POLICY, AND IMPLEMENTATION 136, 165, 194–97 (2d ed. 2002) (making this assertion and providing examples); *see also* Babich, *supra* note 131, at 125 (finding that "rational risk-based standard setting is not possible"); Latin, *supra* note 53, at 1304–14 (summarizing EPA's experience under a harm-based approach); *cf.* Amy Sinden, *In Defense of Absolutes: Combating the Politics of Power in Environmental Law*, 90 IOWA L. REV. 1405, 1487–88 (2005) (arguing that the strict effects-based approach in the Endangered Species Act produces results "closer to where we want to be" than a balancing approach would).

much pollution can occur without jeopardizing beneficial uses of the water.[133] The regulator then should, in principle, establish individual caps adding up to no more than the aggregate cap.[134] Houck explains that serious problems of incomplete information, guesswork, and therefore strife and contention plague every step of this exercise,[135] as pollution loadings' effects depend in part on waterflow characteristics and other natural conditions that can vary over time and space.[136] Indeed, the failure of the effects-based approach employed in the 1960s induced Congress to switch the focus of the federal effort to address water pollution to a technology-based approach in 1972.[137]

CBA combines the complexity of technology-based cap setting with the complexity of effects-based cap setting, and then adds some additional difficult and controversial elements.[138] The cost estimates depend on the same sorts of technological evaluations that Ackerman and Stewart find problematic.[139] Estimating the benefits of particular levels of pollution reduction requires linking particular pollution loading levels to particular environmental outcomes, just as in a TMDL.[140] Moreover, a cost-benefit approach requires regulators not only to figure out what cap will achieve adequate environmental or health protection, but also to quantitatively estimate the effects' magnitude at various unsafe levels. Finally, CBA requires a controversial effort to make dollar estimates of the value of various health and environmental improvements from a proposed cap.[141] Even CBA's staunchest defenders recognize that CBA in practice provides

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133 *See* Federal Water Pollution Control Act, 33 U.S.C. § 1313(d)(1)(C) (2006) (requiring states to "establish . . . the total maximum daily load" of pollutants at the level "necessary to implement . . . water quality standards").

134 *See* HOUCK, *supra* note 132, at 5 (describing the Clean Water Act as expecting that states "would . . . allocate" the TMDLs "among discharge sources in discharge permits and state water quality plans").

135 *See id.* at 49–64, 136–42 (describing how the TMDL process failed, and emphasizing scientific uncertainty).

136 *See id.* at 195 (noting that every water segment has its own "flow regime" and other natural conditions); James S. Shortle et al., *Least-Cost Pollution Allocations for Probabilistic Water Quality Targets to Protect Salmon on the Forth Estuary*, *in* POLLUTION FOR SALE, *supra* note 33, at 211, 212 (explaining that variability in stream flow, temperature, and other natural factors makes it impossible to reliably link discharge amounts to water quality).

137 *See* Weyerhaeuser Co. v. Costle, 590 F.2d 1011, 1042–43 (D.C. Cir. 1978) (recognizing that Congress adopted a technology-based approach in 1972 in reaction to the failed effort to "use receiving water quality as a basis for setting effluent pollution standards").

138 *See* David M. Driesen, *Getting Our Priorities Straight: One Strand of the Regulatory Reform Debate*, 31 Envtl. L. Rep. (Envtl. Law Inst.) 10,003, 10,019 & n.204 (2001) ("CBA requires consideration of almost all of the factors relevant to the technological feasibility inquiry, plus health and environmental factors that are far more difficult to assess . . . .").

139 *Id.* (explaining that "[i]n order to assess the cost of achieving a given level of pollution reduction, an agency must understand the technological options available for meeting" that level).

140 *See, e.g.*, HOUCK, *supra* note 132, at 5 (discussing states' approach of using TMDL to determine what level of pollutants could be permissibly discharged).

141 *See* Christian Azar, *Are Optimal CO_2 Emissions Really Optimal?*, 11 ENVTL. & RESOURCE ECON. 301, 304–05 (1998) (describing the techniques used to value "non-market impacts" as "controversial").

incomplete and unreliable benefits estimates because of data gaps.[142] In any case, CBA provides the most complicated possible method for establishing a cap, and in the climate disruption context, even some economists have begun to doubt its utility.[143]

A number of scholars find either effects-based standard setting or cost-benefit based standard setting more attractive normatively than BAT. Perhaps the best defense of effects-based standards comes from "objectivist" theories in philosophy, which suggest that certain types of goods are fundamental, while others are not.[144] That sort of philosophical perspective suggests that we should not sacrifice fundamental things for the sake of nonessentials, like increased consumption of luxury goods. For example, adequate health is so important to people that just about everything else seems to pale in importance. Cass Sunstein suggests that the goal of avoiding the elimination of a species from the earth might likewise find support in fundamental norms not susceptible to arguments about tradeoffs.[145] This would suggest an effects-based approach simply demanding

142 *See, e.g.*, Keohane, *supra* note 1, at 48 (pointing out that economists' incomplete "estimates of marginal damages vary by a factor of 30"); William D. Nordhaus, *To Tax or Not to Tax: Alternative Approaches to Slowing Global Warming*, 1 REV. ENVTL. ECON. & POL'Y 26, 31 (2007) (providing an estimate of the optimal carbon price, but conceding that this estimate does not "capture all the nonmarket aspects of global warming"); Winston Harrington et al., *Controversies Surrounding Regulatory Impact Analysis*, *in* RIA, *supra* note 129, at 10, 18–19 (detailing the nonquantified impacts in cost-benefit analysis of three different rules limiting air pollution).

143 *See* NICHOLAS STERN, THE ECONOMICS OF CLIMATE CHANGE: THE STERN REVIEW 163 (2005) (characterizing, quantifying, and monetizing the "full range" of climate change effects as "conceptually, ethically and empirically very difficult"); Frank Ackerman, *Climate Economics in Four Easy Pieces*, 51 DEV. 325, 328–30 (2008) (finding CBA useless because it cannot monetize important benefits and its assumptions tend to exaggerate the costs of addressing climate change); Azar, *supra* note 141, at 303 (finding that lack of knowledge of probabilities and the magnitude of potential catastrophes creates indeterminacy that "reduces the usefulness of cost-benefit analysis"); Terry Barker, *The Economics of Avoiding Dangerous Climate Change. An Editorial Essay on the Stern Review*, 89 CLIMATIC CHANGE 173, 191 (2008) (stating that CBA may be "useless" for climate policy because of the uncertainty and risks of catastrophe); Hanson & Laitner, *supra* note 120, at 358 (explaining that the authors "model[] for insights not for numbers" because they consider all existing models highly uncertain and incomplete); Martin L. Weitzman, *On Modeling and Interpreting the Economics of Catastrophic Climate Change*, 91 REV. ECON. & STAT. 1, 18 (2009) (finding that the uncertain probability and scope of climate change catastrophes makes CBA "much more frustrating and much more subjective" than usual); *see also* Douglas A. Kysar, *Climate Change, Cultural Transformation, and Comprehensive Rationality*, 31 B.C. ENVTL. AFF. L. REV. 555, 589–90 (2004) (explaining that scientific uncertainty and other factors imply that "CBA offers only meager assistance to climate change policymaking").

144 *See* MATTHEW D. ADLER & ERIC A. POSNER, NEW FOUNDATIONS OF COST-BENEFIT ANALYSIS 31–32 (2006) (discussing objectivist theory as a potential objection to cost-benefit analysis); Martha C. Nussbaum, *The Costs of Tragedy: Some Moral Limits of Cost-Benefit Analysis*, 29 J. LEGAL STUD. 1005, 1021–22, 1026 (2000) (arguing for the primacy of good health and environmental protection as basic to life).

145 *Accord* Matthew D. Adler & Eric A. Posner, *Rethinking Cost-Benefit Analysis*, 109 YALE L.J. 165, 245 (1999) (recognizing that the preservation of endangered species might have some nonwelfarist intrinsic good not captured by CBA); *see* Cass R. Sunstein, *Congress, Constitutional Moments, and the Cost-Benefit State*, 48 STAN. L. REV. 247, 305–306 (1996) (linking the Endangered Species Act to democratically-chosen goals); Cass R. Sunstein, *Cost-Benefit Default*

that we avoid loss of a species or unacceptable health problems. The species loss argument for an effects-based approach applies to climate disruption, as the Intergovernmental Panel on Climate Change predicts that climate disruption may eliminate twenty to thirty percent of plant and animal species now in existence.[146] I do not have space here to adequately examine the normative arguments for an effects-based approach.[147] But the existence of rather absolutist goals in a number of statutes suggests that these goals may be normatively attractive in some contexts.[148]

By contrast, many scholars find CBA normatively appealing. Economists tend to favor economic efficiency as a goal. They treat all good things, including good health and environmental quality, as fungible commodities and see the proper goal of regulation as establishing the appropriate allocation of societal resources among a large variety of competing goals based upon individual preferences.[149] Perhaps the most thoughtful normative defense of CBA comes from Matthew Adler and Eric Posner.[150] While recognizing many of CBA's weaknesses and doubting that all private preferences aptly measure value, they argue that "overall well-being" matters and that CBA approximates it better than other procedures.[151] They remain open, however, to the possibility that "deontological considerations" may trump overall well-being in some situations.[152] While rationales vary,

Principles, 99 MICH. L. REV. 1651, 1697 (2001) (suggesting that the Endangered Species Act might best be understood as "rooted in a theory of rights" with respect to irreversible losses).

146 IMPACTS, *supra* note 1, at 213; *see also* J.B. Ruhl, *Climate Change and the Endangered Species Act: Building Bridges to the No-Analog Future*, 88 B.U. L. REV. 1, 14–26 (2008) (discussing how climate change threatens species).

147 *Cf.* Sinden, *supra* note 132, at 1411 (arguing that strict effects-based standards help check corporate influence on environmental law).

148 *See, e.g.*, Federal Water Pollution Control Act, 33 U.S.C. § 1251(a) (2006) (establishing a goal of restoring "the chemical, physical, and biological integrity of the Nation's waters," in part through a subsidiary goal of eliminating all discharges of pollutants into waters); *Whitman*, 531 U.S. 457, 471 (2001) (holding that EPA must establish national ambient air quality standards that protect public health regardless of cost); Tenn. Valley Auth. v. Hill, 437 U.S. 153, 187 (1978) (declining to engage in "utilitarian calculations" in deciding whether the Endangered Species Act required the closure of a nearly completed dam because Congress viewed the value of endangered species as "incalculable").

149 *See, e.g.*, BAXTER, *supra* note 46, at 4–7 (explaining in detail why he thinks this perspective should guide environmental policy).

150 *See* Amy Sinden, Douglas A. Kysar & David M. Driesen, *Cost-Benefit Analysis: New Foundations on Shifting Sand*, 3 REG. & GOVERNANCE 48, 50 (2009) (characterizing Adler & Posner's book as representing the most "ambitious and credible effort to date" to theoretically defend CBA).

151 *See* ADLER & POSNER, *supra* note 144, at 6–7; Matthew D. Adler & Eric A. Posner, *Implementing Cost-Benefit Analysis When Preferences Are Distorted*, 29 J. LEGAL STUD. 1105, 1105 (2000); Adler & Posner, *supra* note 145, at 209–216; *cf.* Sinden, Kysar & Driesen, *supra* note 150, at 53.

152 Adler & Posner, *supra* note 145, at 244–45 (noting that CBA does not include deontological and other "nonwelfarist" criteria, and recognizing that it therefore cannot be an "exclusive choice procedure."); *see also* Matthew D. Adler, *Risk, Death, and Time: A Comment on Judge Williams' Defense of Cost-Benefit Analysis*, 53 ADMIN. L. REV. 271, 273 (2001) (raising questions about whether CBA is appropriate for regulations involving a risk of death).

several prominent scholars find economic efficiency or some similar concept attractive as a normative goal.[153]

I have defended BAT regulation normatively on the grounds that it takes the distribution of costs and benefits into account in ways that reflect important and justifiable value choices.[154] BAT regulation reflects a view that often rejects widespread plant closures as unacceptable, but otherwise privileges health, safety, and environmental protection over competing "goods."[155] This value choice may be justifiable, since job losses can undermine individual well-being in a very fundamental way that may justify putting plant closures on a par with health threats.[156] But I suggest that most material losses just do not matter much compared to the value of good health and an ecologically satisfactory environment.[157] Hence, BAT may track our values reasonably well, perhaps better than CBA, which presupposes that no quality of life is truly fundamental.

This brief summary of normative and practical characteristics of cap-setting approaches does not provide a comprehensive theory of which approach is best, but it acquaints the reader with the predominant thinking in the field as a prelude to thinking about improving cap setting. This analysis does, however, help matters considerably by suggesting that cap-setting approaches involve tradeoffs between various normative and practical considerations. I will argue, however, that sometimes the specifics of a situation can influence choices among these approaches and that the specifics of climate change may explain some of the unappreciated characteristics of cap setting. Also, the fact that these basic approaches and all of their dilemmas continue to exist in the trading context has strangely escaped the notice of most scholars, probably because of the overwhelming force of the market metaphor and the interest in the trading that comes after a cap is set.[158] So, this simple contribution of synthesizing some of the field's best thinking about goal setting and explaining that this work does matter for cap setting in the trading context significantly improves our understanding of environmental law.

153 *See, e.g.*, W. KIP VISCUSI, REGULATION OF HEALTH, SAFETY, AND ENVIRONMENTAL RISKS 7 (John M. Olin Ctr. for Law, Econ., & Bus., Harvard Law Sch., Discussion Paper No. 544, 2006), *available at* http://www.law.harvard.edu/programs/olin_center/papers/pdf/Viscusi_et%20al_543.pdf.

154 *See* Driesen, *supra* note 36, at 34–41 (describing and defending these value choices).

155 *Id.* at 3 (describing the "feasibility principle" embodied in BAT as reflecting "a preference for avoiding widespread plant shutdowns" while maximizing protection of health where widespread shutdowns seem unlikely).

156 *See id.* at 37 (describing plant closures as having a potentially "devastating impact on workers' lives").

157 *See id.* at 36 (describing costs that are widely distributed as unlikely to have a meaningful impact on most people's lives).

158 *Cf.* McAllister, *supra* note 11, at 426–31 (comparing feasibility and cost-benefit approaches to cap setting and concluding that adoption of a cap-and-trade approach "does not avoid the classic policy questions of environmental regulation").

B. Cap Setting in Practice

Armed with an understanding of possible approaches to setting caps, we can now ask how regulators have set caps for trading programs. My main claim here is simple, that many trading programs can be characterized as forms of BAT regulation, rather than as means of escaping BAT's alleged pathologies.

In making this claim, I have in mind a more technically accurate and narrower definition of a BAT standard than one sometimes sees in the literature. Some scholars describe BAT standards (and their synonym, technology-based regulations) as dictating the use of a particular technology, characterizing BAT pejoratively as "command-and-control regulation."[159] But traditional BAT standards outside the trading context most often take the form of performance standards—a requirement to meet an individualized cap, thereby allowing polluters to use technologies that the regulator did not necessarily contemplate.[160] While some BAT standards (so-called work practice standards) dictate technologies, others do not.[161] In any case, trading avoids one problem sometimes associated with BAT standards, a lack of technological flexibility.

My claim about the implications of caps often constituting a form of BAT standards, while important, is fairly narrow: Establishing a cap-and-trade program does not necessarily relieve us from the difficulties associated with evaluating technologies and their costs, even for individual facilities, nor from lobbying and litigation aimed at relaxing caps.[162] Whether it does so or not depends on the approach we take to cap setting.

1. BAT Caps

The acid rain program probably appears to most scholars as a product of ad hoc democratic decision making. After all, Congress, not EPA, set the

159 *See* Dudek & Golub, *supra* note 24, at S24 (describing the BAT approach as "a requirement to use predetermined technology"); Sinden, *supra* note 4, at 550 (defining command-and-control regulation "in a strict sense" as regulation requiring specific measures, such as use of a specified pollution control technology).

160 *See* Carlson et al., *supra* note 118, at 1294 (pointing out that an emissions rate standard provides opportunities "to take advantage of technical change"); Driesen, *supra* note 2, at 297–98; Sinden, *supra* note 4, at 550.

161 *See* Driesen, *supra* note 2, at 297–98; *see, e.g.*, PPG Indus., Inc. v. Harrison, 660 F.2d 628, 636 (5th Cir. 1981) (holding that performance standards must take "the form of *emissions limitations*, based on output, . . . not . . . the form of work practice . . . requirements").

162 *See* Zapfel, *supra* note 80, at 28–34 (explaining that both dirty and clean producers lobbied for more allowances); Anja Pauksztat & Martin Kruska, *Product-Based Benchmarks As a Basis for the Rational Use of Energy and Corporate Sustainability*, *in* INSTITUTIONAL EMISSIONS TRADING, *supra* note 9, at 37, 40 (explaining that establishing a cap via a benchmark requires an information intensive assessment of the "technical potential" for carbon dioxide reductions at installations); JON BIRGER SKJÆRSETH & JØRGEN WETTESTAD, EU EMISSIONS TRADING: INITIATION, DECISION-MAKING AND IMPLEMENTATION 175–76 (2008) (discussing lobbying's large negative impact and characterizing it as based on fear of rising abatement costs).

cap, demanding a ten million ton reduction in sulfur dioxide emissions below 1980 levels.[163] This seems like an arbitrary number, but it is not.

Regulators generally derived the final allowance levels in the acid rain program from an emissions limit established in a 1971 BAT-type regulatory proceeding. To be specific, the Clean Air Act requires major new sources to meet a New Source Performance Standard (NSPS), defined as an emissions standard "achievable through the application of the best system of emission reduction which . . . [EPA] determines has been adequately demonstrated."[164] In 1971, EPA determined that coal-fired power plants could achieve an emissions rate of 1.2 pounds of sulfur dioxide emissions per million British Thermal Units (BTUs) of energy produced by using scrubbers or low sulfur coal, and set the NSPS at that level.[165] The ten million ton reduction goal for sulfur dioxide emission reductions approximates the result of multiplying this technology-based emissions rate by the utilities' baseline emissions.[166] In other words, the acid rain program's cap is basically a BAT standard.[167] While the acid rain program allows trading and therefore invites the use of technologies other than end-of-the-pipe controls, its cap, nevertheless, reflects the specific result of a bureaucratic investigation of technologies and their capabilities.[168] And the cost projections made for the program prior to enactment likewise reflect the evaluation of the market costs of the technologies regulators thought utilities would have to rely on to meet the limits.[169]

More recently, EPA employed BAT to establish a trading program to aid state efforts to protect the public from ground-level ozone, a powerful lung

163 *See* Clean Air Act, 42 U.S.C. § 7651(b) (2006); *cf.* Heinzerling, *supra* note 45, at 320 (noting that some of the 10 million ton reduction below 1980 levels called for was achieved prior to the acid rain program's enactment).

164 42 U.S.C. § 7411(a)(1) (2006).

165 *See* Standards of Performance for New Stationary Sources, 36 Fed. Reg. 24,875, 24,879 (Dec. 23, 1971) (codified at 40 C.F.R. § 60.43(b)); Swift, *supra* note 13, at 317 (claiming that meeting this NSPS required either scrubbers, or "compliance coal" with low sulfur content); Edward S. Rubin et al., *Experience Curves for Power Plant Emission Control Technologies*, 2 INT'L J. ENERGY TECH. & POL'Y 52, 54 (2004), *available at* http://gspp.berkeley.edu/academics/faculty/docs/mtaylor/Rubin%20Yeh%20Taylor%20Hounshell%20-%20IJETP%202%20(1-2).pdf (describing the first NSPS for coal-fired power plants that established a 1.2 pounds per million BTU standard).

166 *See* McAllister, *supra* note 11, at 400–01 (describing the rate as the one "required for new coal fired plants . . . under the [NSPS] program" and noting that the "basic formula" for Phase II allocations multiplied this rate by baseline emissions); *see also* MARKETS FOR CLEAN AIR, *supra* note 44, at 44 (showing that some of the departures from the NSPS-based formula to create individual caps were based on "[t]echnical considerations" like those used to form technology-based standards (internal quotations omitted)); *cf.* Joskow & Schmalensee, *supra* note 76, at 55–66 (explaining that the allocation of individual allowances included a lot of special interest variations from the basic rule for setting allowances).

167 *See* A. Denny Ellerman et al., *Unifying Themes*, *in* EU ALLOCATION, *supra* note 4, at 339, 353 (describing the 1.2 pounds per million BTU emissions rate as based on "the best available control technology").

168 *See* MARKETS FOR CLEAN AIR, *supra* note 44, at 23 (describing the acid rain proposal as extending the 1970 Act's NSPS emission rates to all existing generating units).

169 *See* Carlson et al., *supra* note 118, at 1314–15 (explaining that EPA's cost figures depended on estimates of the number of scrubbers deployed and the price of low sulfur coal).

irritant, and particulate matter, which is associated with tens of thousands of annual deaths in the United States.[170] As the D.C. Circuit Court of Appeals explained, EPA calculated the limits for the target pollutants by applying an emissions rate from "'highly cost-effective' emissions controls" to the heat input from electric utility generating units.[171] To be precise, EPA based its cap on flue gas desulfurization to control sulfur dioxide and selective catalytic reduction to control nitrogen dioxide.[172]

In a related rule, EPA developed a technology-based emissions trading program for mercury emissions under the very same NSPS provision that generated the emissions rate undergirding the acid rain program. [173] These standards reflected detailed study of the end-of-the-pipe technologies available to control mercury, both in terms of performance and cost.[174] And, like practically all administrative technology-based regulations, this one produced litigation challenging the standards.[175]

While the prevalence of BAT practices in setting caps for trading programs will surprise readers of the trading literature, a moment's reflection suggests that BAT's role in trading programs should not astonish well-informed environmental law scholars. Regulators must have some basis (and if the regulator is an administrative agency, a legally defensible basis) for setting a cap. Difficult as it may be to evaluate technologies and their costs, cap setting based on technological evaluation usually proves simpler than the alternatives. Hence, Congress and EPA have used technology-based limits even when no law forces them to do so.[176]

2. Effects-Based Caps

BAT regulation may dominate trading programs, but not all trading programs depend upon BAT. Research reveals examples of effects-based trading programs.

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170 *See* North Carolina v. EPA, 531 F.3d 896, 903 (D.C. Cir. 2008).

171 *Id.* at 904 (quoting Rule to Reduce Interstate Transport of Fine Particulate Matter and Ozone, 70 Fed. Reg. 25,162, 25,175 (May 12, 2005)).

172 Keohane, *supra* note 129, at 36.

173 *See* New Jersey v. EPA, 517 F.3d 574, 577 (D.C. Cir. 2008) (describing EPA's mercury rule as establishing performance standards under section 111 and creating "a voluntary cap-and-trade program").

174 *See* Proposed National Emission Standards for Hazardous Air Pollutants, 69 Fed. Reg. 4652, 4670–73 (proposed Jan. 30, 2004) (to be codified at 40 C.F.R. pts. 60, 63) (describing performance levels from technology testing, and assessing technological capability for the industry based on those results); Supplemental Notice for the Proposed National Emission Standards for Hazardous Air Pollutants, 69 Fed. Reg. 12,398, 12,402–03 (proposed Mar. 16, 2004) (to be codified at 40 C.F.R. pts. 60, 72, 75) (concluding that current technologies are capable of achieving a 33 percent reduction in mercury emissions); Memorandum from Clean Air Mkts. Div., U.S. Envtl. Prot. Agency, to Docket 1, 2 tbl.1 (Jan. 28, 2004) (estimating the cost of its identified technologies), *available at* http://epa.gov/interstateairquality/pdfs/tm0009.pdf.

175 *See New Jersey*, 517 F.3d at 578 (holding that EPA had employed the wrong technology-based standard setting provision to write these standards).

176 *See, e.g.*, *North Carolina*, 531 F.3d at 916–29 (holding that EPA's caps were illegal because they focused on technological and equitable concerns rather than the degree of interstate pollution abatement needed to meet air quality standards).

Many ecological trading programs outside the air pollution realm base their caps on the avoidance of undesirable effects. For example, the federal government has adopted a trading approach under the Clean Water Act, which allows, under some circumstances, the destruction of wetlands if other wetlands are created or conserved.[177] The program caps the amount of total wetlands destroyed through a policy of "no net loss" of wetlands, an effects-based goal aimed at guarding against unacceptable ecological consequences.[178]

Similarly, many governments around the world use tradable fishing quotas to protect fisheries.[179] The cap in these programs consists of an allowable catch limit, which fishery managers create to protect the fishery from collapse, i.e., to avoid a particular ecological effect.[180] These caps depend upon mathematical modeling of fishing's ecological effects, rather than upon the evaluation of technology.[181]

Hence, governments sometimes, in spite of the difficulties of effects-based regulation, use trading programs to meet caps designed to avoid some unacceptable environmental outcome. This approach, while difficult to implement in many contexts, does away with the need to evaluate technologies and cost. In other words, because this approach is really not a form of BAT regulation, it avoids BAT flaws.

3. CBA and Cap Setting

While no statutes governing active environmental programs explicitly require CBA, the Office of Management and Budget (OMB), acting under executive orders, has often employed CBA to seek to influence or justify particular caps for trading programs.[182] Examples of caps where CBA played

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177 *See* Royal C. Gardner et al., *Compensating for Wetland Losses Under the Clean Water Act (Redux): Evaluating the Federal Compensatory Mitigation Regulation*, 38 STETSON L. REV. 213, 215–17 (2009) (explaining that "[i]n theory" a requirement to compensate for destroyed wetlands "ensures no net loss of wetland functions," even though in practice it "has been problematic" (internal quotations omitted)).

178 *See* Palmer Hough & Morgan Robertson, *Mitigation Under Section 404 of the Clean Water Act: Where It Comes From, What It Means*, 17 WETLANDS ECOLOGY MGMT. 15, 26–27 (2009) (discussing the adoption of the "no net loss" goal and its ties to trading, i.e., compensation for destroyed wetlands).

179 *See* Alison Rieser, *Prescriptions for the Commons: Environmental Scholarship and the Fishing Quotas Debate*, 23 HARV. ENVTL. L. REV. 393, 406–09 (1999).

180 *See* Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. §§ 1802(34), 1851 (2006) (requiring that management plans prevent "overfishing," defined as creating a "rate . . . of fishing mortality that jeopardizes . . . the maximum sustainable yield"); Maine v. Kreps, 563 F.2d 1043, 1047 (1st Cir. 1977) (stating that the statute requires "scientific appraisal of the safe upper limit" of the catch that allows the stock to remain "inexhaustible and perpetually renewable" (internal quotations omitted) (quoting H.R. REP. NO. 94-445, at 48 (1975))); *cf.* J.H. Miles & Co., Inc. v. Brown, 910 F. Supp. 1138, 1154–55 (E.D. Va. 1995) (stating that efficiency can be taken into account, but is not the program's "primary objective").

181 *See* ORRIN H. PILKEY & LINDA PILKEY-JARVIS, USELESS ARITHMETIC: WHY ENVIRONMENTAL SCIENTISTS CAN'T PREDICT THE FUTURE 6–7, 10–21 (2007) (discussing mathematical models' use in establishing fishing quotas).

182 *See* Harrington et al., *supra* note 142, at 10; Winston Harrington, *The Cooling Water Intake Structures Rule*, *in* RIA, *supra* note 129, at 160, 161.

some role include the mercury rule and Clean Air Interstate Rule discussed above.[183] In none of these cases, however, did either OMB or EPA engage in a serious effort to reach economically efficient pollution levels, as other statutory criteria governed the rulemaking.

4. Caps on Greenhouse Gas Emissions

BAT has played a big role in the greenhouse gas emissions trading programs established to date. But an effects-based approach has also emerged as potentially important.

BAT principles have strongly influenced cap setting for the EU ETS. The EU Directive signals a technology-based approach by authorizing the consideration of benchmarks based on BAT, requiring information on the manner in which clean technology is taken into account and demanding consistency with the potential, including "technological potential," for reductions from covered activities.[184]

Faced with the apparent need to evaluate technologies in order to set caps, BAT defects played a large role in limiting the program's success. Generally speaking, the member states mandated no reductions in Phase I, in part because of the informational demands of assessing technical potential for reductions to establish BAT-like benchmarks for improved performance.[185] These difficulties also played a large role in Phase II, which produced more progress, but not much more.[186] Some member states evaluated specific technologies and set caps by determining the emissions level that could be achieved by application of available technologies (including fuel use changes) to the task of lowering estimated projected or historical emissions.[187] Many states, however, employed benchmarks, requiring a whole group of pollution sources to meet the level many plants within an industry (but not all) had previously achieved.[188] We have already seen that this benchmarking uses existing performance of some plants as a

183 *See* Evans, *supra* note 129, at 82–107 (analyzing CBA's role in this program); Keohane, *supra* note 129, at 33–55 (same); Krupnick, *supra* note 129, at 142–59 (same); Morgenstern, *supra* note 129, at 20–32 (same); O'Neill, *supra* note 129, at 108–41 (same); Wagner, *supra* note 129, at 56–81 (same).

184 *See* EU Directive, *supra* note 6, at 43; Peter Vis, *The First Allocation Round: A Brief History*, *in* 4 EU ENERGY LAW: EU ENVIRONMENTAL LAW: THE EU GREENHOUSE GAS EMISSIONS TRADING SCHEME 187, 193 (Jos Delbeke ed., 2006) (treating the term "benchmark" as a synonym for "performance standards").

185 *See* Rogge et al., *supra* note 99, at 24 (pointing out that benchmarks impose "stringent data requirements" on regulators and that insufficient data prevented benchmarking in establishing Phase I caps); *see also* Ellerman et al., *supra* note 167, at 352–53 (describing the difficulties encountered in trying to establish benchmarks based on BAT or average sectoral performance).

186 *See* SKJÆRSETH & WETTESTAD, *supra* note 162, at 62 (explaining that only four countries produced plans that satisfied the European Commission).

187 *See* Regina Betz et al., *EU Emissions Trading: An Early Analysis of National Allocation Plans for 2008–2012*, 6 CLIMATE POL'Y 361, 373 (2006) (stating that Flanders and Wallonia used "BAT benchmarks").

188 *See id.* at 372–73 (discussing the use of benchmarks based on average activity-weighted emissions for an industry group).

tool for evaluating technological capability for an entire industry, and that benchmarking plays a large role in U.S. BAT provisions.[189] Member states' national allocation plans generally contained fuel-specific limits for new entrants, thereby duplicating a problem sometimes identified as a peculiar failing of BAT regulation—rules favoring dirty, existing fuels.[190] Thus, a BAT approach, or a weaker variant of BAT, dominated EU cap setting.[191] This was true even though the EU guidance required member states to show that their caps were consistent with plans to meet their long-term quantitative reduction targets under the Kyoto Protocol.[192]

While the EU plans to move toward an auction scheme in Phase III of its program, beginning in 2013, its approach to improving free allocation in the years preceding full auctioning focuses on adopting the most stringent approaches associated with BAT. Thus, it requires benchmarks based on "the 10% most efficient installations in a sector or subsector."[193] This approach has much in common with the maximum achievable control technology program for hazardous air pollutants under the Clean Air Act, a BAT program, which requires facilities to at least match the level of emissions of the top 12% of facilities in a category or subcategory.[194]

Policy debate on future aggregate caps, both here and abroad, focuses on the idea of requiring something like an 80% reduction in developed country emissions by the year 2050, with an intermediate cap to assure timely progress toward that goal.[195] For example, the Waxman-Markey bill that passed the House in 2009[196] would generate up to a 33% reduction by 2020 and 81% by 2050 relative to a 2005 baseline.[197] The 80% cap comes from an attempt to evaluate how to meet the Framework Convention's goal of avoiding dangerous climate disruption.[198] Generally speaking, most scientific

189 *See supra* Parts II.A.1, II.B.1.

190 *See* Case T-374/04, Germany v. Comm'n, 2007 E.C.R. II-4431, 4457 (reporting a European Commission decision disapproving German ex-post adjustments of its NAP that favored new entrants); Wolf Fichtner, *The European Electricity Market—Impact of Emissions Trading*, *in* INSTITUTIONAL EMISSIONS TRADING, *supra* note 9, at 121, 130 (pointing out that most countries use fuel-specific benchmarks for new entrants, thereby reducing incentives to use cleaner fuels); Rogge et al., *supra* note 99, at 28–29 (characterizing this approach as favoring coal); *see also* Zapfel, *supra* note 80, at 32 (discussing "heavy political resistance" to "fuel-blind" allocation in the power sector).

191 *See generally* Zapfel, *supra* note 80, at 32 (discussing industry demands that it receive the number of allowances adequate to meet "expected needs").

192 EU Directive, *supra* note 6, at 43.

193 *See* 2009 EU Amendments, *supra* note 20, art. 1(12).

194 *See* Clean Air Act, 42 U.S.C. § 7412(d)(3)(A) (2006).

195 *See, e.g.*, 2009 EU Amendments, *supra* note 20, pmbl., para. 4 (discussing the European Parliament's position that industrialized countries should reduce their emissions by 60 to 80% below 1990 levels by the year 2050).

196 HOLT & WHITNEY, *supra* note 111, at 1; *see also* H.R. 2454, 111th Cong. (as passed by House, June 26, 2009).

197 JOHN LARSEN & ROBERT HEILMAYR, EMISSION REDUCTIONS UNDER CAP-AND-TRADE PROPOSALS IN THE 111TH CONGRESS 1 (2009), *available at* http://pdf.wri.org/usclimatetargets_2009-06-25.pdf. These estimates take into account provisions other than the caps for the general cap-and-trade program, as the bill creates additional emission reducing programs. *Id.*

198 *See, e.g.*, AVOIDING DANGEROUS CLIMATE CHANGE, *supra* note 16, at xi.

studies of this question suggest that the world must reduce its aggregate emissions by at least 50% through 2050 to avoid an unacceptable temperature rise of more than two degrees centigrade.[199] The Framework Convention requires "common but differentiated responsibilities" for greenhouse gas emission reductions,[200] meaning that developed countries must do more than developing countries, which have limited capacity for emission reductions, less historic responsibility for climate disruption, and relatively low per capita emissions.[201] Because of this principle and the political realities underlying it (that developing countries will not act unless developed countries lead), those analyzing the means of avoiding dangerous climate disruption envision uneven distribution of this 50% reduction across the globe, with the United States and other developed countries required to make a reduction of 80% more or less.[202] Hence, the 80% cap is effects-based, focused on the concept of an adequate contribution to a global effort to avoid some of climate disruption's most serious predicted consequences.[203]

The existence of an informal consensus that something like a global 50% target (and by implication the developed country 80% target)

199 Meinshausen, *supra* note 16, at 265 (discussing the scientific literature's conclusion that temperature increases of 2°C and above trigger "potentially large-scale" adverse impacts, and giving examples); MITIGATION, *supra* note 16, at 42 (concluding that 50% reductions from current levels could limit temperature increases to 2–2.4°C); W.L. Hare, *A Safe Landing for the Climate*, *in* WORLDWATCH INST., STATE OF THE WORLD 2009: INTO A WARMING WORLD 13, 18–21 & tbl.2-1, 26 (2009), *available at* http://www.worldwatch.org/files/pdf/SOW09_chap2.pdf (explaining that temperature rise of 2°C or more would likely prove dangerous, and that total cuts of 40 to 60% of total greenhouse gas emissions below 1990 levels by 2050 might avoid this); Joanna I. House et al., *What Do Recent Advances in Quantifying Climate and Carbon Cycle Uncertainties Mean for Climate Policy?*, ENVTL. RES. LETTERS, Oct.–Dec. 2008, at 1, 4, *available at* http://www.iop.org/EJ/article/1748-9326/3/4/044002/erl8_4_044002.pdf (claiming that when a 50% cut by 2050 is followed by an 80% cut by 2100, all models show warming of less than 2°C in 2100); *cf.* H. Damon Matthews & Ken Caldeira, *Stabilizing Climate Requires Near-Zero Emissions*, 35 GEOPHYSICAL RES. LETTERS L04705, at 1 (2008) (suggesting that we need to reduce emissions to zero to stabilize climate).

200 *Framework Convention on Climate Change*, *supra* note 87, art. 3(1).

201 *See* Driesen, *supra* note 85, at 11–15 (explaining why this principle embodies a requirement that developed countries lead by doing more than developing countries).

202 *See* Michel den Elzen & Malte Meinshausen, *Multi-Gas Emission Pathways for Meeting the EU 2°C Climate Target*, *in* AVOIDING DANGEROUS CLIMATE CHANGE, *supra* note 16, at 299, 306 (explaining that a "Contraction & Convergence approach," in which global emissions contract while converging on common per capita emission rate among countries, demands an 80% reduction below 1990 levels by the year 2050 in order to limit atmospheric concentrations to 450 parts per million); Peter G.G. Davies, *Carbon Targets, Carbon Budgeting, and the Committee on Climate Change: The 2008 UK Climate Change Act and the 2050 Vision*, ENVTL. LIABILITY, Mar. 2009, at 3, 4–5 (2009) (showing that a UK scientific advisory committee recommended an increase in the 2050 target from 60 to 80% reductions for all gases because global emissions and ice melt increased more than scientists had predicted); Hare, *supra* note 199, at 28 (offering an estimate of 80 to 95% reductions in developed country emissions by 2050 as an indication of what is needed to avoid exceeding 2°C of warming).

203 *See, e.g.*, Davies, *supra* note 202, at 4–5 (showing that the United Kingdom government endorses the 80% target pursuant to a policy of making a "reasonable contribution to a global objective of cutting [greenhouse gas emissions] by 50% or more below current levels" (quoting COMM. ON CLIMATE CHANGE, U.K., BUILDING A LOW CARBON ECONOMY—THE UK'S CONTRIBUTION TO TACKLING CLIMATE CHANGE 7 (2008)).

approximates what is needed to avoid dangerous climate disruption and suggests that it is possible to set an effects-based cap in this context.[204] In the climate disruption context we know more about this dangerousness issue than we often do. Scientific consensus exists that climate disruption is likely to cause a number of very serious effects, and prominent, peer-reviewed scientific work concludes that stabilization of the climate requires large emission reductions.[205] Moreover, while the decision about how safe is safe requires political judgment under conditions of uncertainty, scientific modeling's predictions of what occurs when temperatures warm above two degrees Celsius powerfully support a social judgment that this level of temperature increase is dangerous.[206]

We can have more confidence in the conclusion that achieving less than a 50% global decrease is dangerous than a conclusion that limiting temperature rise to two degrees Celsius creates safety.[207] The consensus has its basis in model projections of routine warming that leave out important, but nonquantifiable feedback loops that have the potential to make climate disruption much worse than the models predict, and some serious modeled effects occur with even less temperature rise.[208] Still, the existence of any credible, or even semicredible, partial scientific consensus on an effects-based cap is unusual and furnishes an opportunity for progress on climate disruption. For it means that the ideal of having science heavily influence

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204 *See* den Elzen & Meinshausen, *supra* note 202, at 307 (finding that staying below 2°C likely requires 50–55% reductions for all greenhouse gas emissions); Schneider & Lane, *supra* note 16, at 9–13 (summarizing scientific findings about impacts); EUROPEAN COMM'N, EU ACTION AGAINST CLIMATE CHANGE: LEADING GLOBAL ACTION TO 2020 AND BEYOND 5, 9 (2009) (connecting a commitment to 20 to 30% reductions by 2020 and up to 80% by 2050 to the need to avoid a 2°C temperature rise).

205 *See* den Elzen & Meinshausen, *supra* note 202, at 307; Schneider & Lane, *supra* note 16, at 9–13.

206 *See* Rachel Warren, *Impacts of Global Climate Change at Different Annual Mean Global Temperature Increases*, *in* AVOIDING DANGEROUS CLIMATE CHANGE, *supra* note 16, at 93, 98–99 (describing decreased agricultural yields, destruction of 97% of coral reefs, cyclones, sea level rise, ecosystem destruction, water related stress, extinction of species, drought, and other likely consequences at 2°C); MITIGATION, *supra* note 16, at 32 (explaining that any judgment about what effects are dangerous "is necessarily . . . social and political"); Hare, *supra* note 199, at 19 (pointing out that while it is clear that warming greater than 2ºC would be dangerous, there is no "magic number" that can make us completely safe).

207 Meinshausen, *supra* note 16, at 265, 275 (stating that stabilization at 550 parts per million (ppm) carbon dioxide (CO_2) equivalent "is *clearly* not in line" with avoiding a 2°C temperature increase (emphasis added)); John C. Dernbach, *Achieving Early and Substantial Greenhouse Gas Reductions Under a Post-Kyoto Agreement*, 20 GEO. INT'L ENVTL. L. REV. 573, 584–85 (2008) (characterizing the "quest for a 'safe' level" of greenhouse gas emissions as "illusory," but concluding that we need "substantial" short-term reductions to "reduce the risk of very bad outcomes").

208 *See* MITIGATION, *supra* note 16, at 42 (concluding that the model predictions might understate temperature increases because of "climate feedbacks"); James Hansen et al., *Target Atmospheric CO_2: Where Should Humanity Aim?*, 2 OPEN ATMOSPHERIC SCI. J. 217, 229 (2008) (suggesting a 350 ppm target); *cf.* House et al., *supra* note 199, at 3 (pointing out that some feedbacks are taken into account in climate models, but that prior model runs did not combine "high climate sensitivity with high climate-carbon cycle feedback").

fine-grained environmental policy decisions, rarely an easy thing to accomplish, is theoretically possible to some degree in this context.[209]

IV. TOWARD BETTER CAP SETTING

My descriptive claim appears to undermine the Ackerman/Stewart view of environmental law. The message so far appears to be this: Trading does not solve any of the key problems hindering effective cap setting, so while it proves useful in reducing costs, it does nothing to improve on traditional approaches in solving environmental problems.

Indeed, one of the few American legal scholars who have written about caps, Lesley McAllister, argues that caps set in conjunction with trading programs have been insufficiently stringent.[210] This might suggest that trading simply undermines environmental protection and that my apparent message treats trading too kindly.

In fact, however, my view is quite different. I do not deny Ackerman and Stewart's claim that a cap-and-trade approach can aid environmental protection. But for cap-and-trade to affirmatively advance environmental protection to a greater extent than available alternatives, its designers must build on both a sophisticated understanding of the role of costs in setting caps and Ackerman and Stewart's suggestion that allowances should be auctioned, rather than given away for free. Professor McAllister's work does not claim that trading is always bad for the environment,[211] for even if all previous caps have been deficient (and her claim is not quite that broad), it does not follow that all future ones must be. Her work, however, does show that trading does not *automatically* create good environmental protection. My aim here is to consider how governments can avoid BAT defects through an appropriate cap-setting process, both generally and in the context of global climate disruption.

A. Aggregate Caps

Trading proponents frequently suggest that trading's capacity to lower the cost of emission reductions increases the stringency of caps.[212] Yet, well-

209 *See* Wendy E. Wagner, *The Science Charade in Toxic Risk Regulation*, 95 COLUM. L. REV. 1613, 1614 (1995) (claiming that efforts to incorporate science into environmental regulation have failed). I qualify my claim that science can guide aggregate cap setting for climate disruption for several reasons. First, science cannot determine policy in theory, because society must make normative judgments about how to respond to science. A decision to employ an effects-based approach, and more particularly, to try and avoid dangerous climate change while tolerating some ill effects, is an example of that sort of normative judgment. Furthermore, the science is not so clear that it rules out some policy judgment in choosing an effects-based cap guided by an honest assessment of the science.

210 *See* McAllister, *supra* note 11, at 397 (characterizing "several existing cap-and-trade programs" as insufficiently stringent).

211 *See id.* at 444–45.

212 *See, e.g.*, Thomas Sterner & Henrik Hammar, *Designing Instruments for Climate Policy*, *in* EMISSIONS TRADING FOR CLIMATE POLICY: U.S. AND EUROPEAN PERSPECTIVES 17, 18

informed scholars generally agree that the caps undergirding the first phase of the European Union trading scheme and of the California Reclaim trading program were ridiculously weak.[213] So, trading by itself does not guarantee a reasonably stringent approach.[214]

Trading could produce stricter caps than traditional regulation if regulators approach cap setting differently in the trading context than in the non-trading context. A good theory of why trading might lead to superior caps must include some explanation of how regulators should establish caps in the trading context.

The view of trading as *automatically* improving environmental protection undermines regulation. This view tends to focus regulators on the goal of setting up a market, instead of the goal of providing appropriate environmental protection. From this perspective, setting an adequate cap may seem unimportant. Regulators can get carried away with the excitement of creating a market and forget that caps largely determine the level of environmental protection achieved, not the trading.[215]

As should be apparent by now, administrative agencies can avoid BAT defects if they eschew consideration of cost, but not otherwise. This suggests that effects-based caps, such as the eighty percent targets for cap-and-trade programs addressing greenhouse gas emissions, can allow governments to avoid BAT flaws, since these standards do not depend upon costs. While an effects-based cure will, in many contexts, prove worse than the disease, because of effect-based regulation's defects, it offers a plausible way forward in addressing climate disruption.

Trading may contribute something to the case for abandoning BAT in favor of an effects-based approach. Embrace of effects-based caps, even where sufficient scientific information exists to make one feasible, requires an adjustment in normative thinking.[216] Such an approach will prove

(Bernd Hansjürgens ed., 2005) (pointing out that in principle trading makes setting more stringent caps easier for regulators).

213 *See* Betz et al., *supra* note 187, at 361–94 (discussing the Phase I plan); McAllister, *supra* note 11, at 411–12 (describing the EU ETS and the Regional Clean Air Incentives Market (RECLAIM) as exemplars of overallocation); Justin Kirk, Note, *Creating an Emissions Trading System for Greenhouse Gases: Recommendations to the California Air Resources Board*, 26 VA. ENVTL. L.J. 547, 558 (2008) (noting that California's RECLAIM program, a cap-and-trade program dealing with urban smog, "is generally viewed as a failure"); *cf.* Robert N. Stavins, *Addressing Climate Change with a Comprehensive U.S. Cap-and-Trade System*, 39 Envtl. L. Rep. (Envtl. Law Inst.) 10,752, 10,753 (2009) (claiming that RECLAIM, "despite problems," generated significant environmental benefits).

214 *See* Richard F. Kosobud & Jennifer M. Zimmerman, *Introduction to Part 2: From Journal Articles to Actual Markets: The Path Taken*, *in* MARKET-BASED APPROACHES, *supra* note 25, at 49, 59 (stating that a California program for trading VOCs was dropped because of lack of agreement about the cap); William G. Rosenberg, *An Insider's View of the SO_2 Allowance Trading Legislation*, *in* MARKET-BASED APPROACHES, *supra* note 25, at 95, 97 (claiming that Congress adopted the acid rain cap in spite of industry opposition).

215 *See* MITIGATION, *supra* note 16, at 19 (explaining that "[t]he volume of allowed emissions determines" a tradable permit program's "environmental effectiveness").

216 *Cf.* Heinrich Tschochohei & Jan Zöckler, *Business and Emissions Trading from a Public Choice Perspective—Waiting for a New Paradigm to Emerge*, *in* INSTITUTIONAL EMISSIONS

attractive in societies that view environmental protection as something more fundamental than just another good to be traded off against other goods, but not necessarily in societies that view environmental protection as a wholly economic problem, solvable through careful cost calculation.

Trading, however, can increase opportunities for effects-based caps if trading helps regulators accept the idea that guesses about future costs do not furnish a reasonably reliable basis for regulation in the trading context. Congress can adopt this idea by either setting stringent caps that treat cost estimates with a richly deserved grain of salt, or by requiring EPA to set caps without considering costs. While this idea of deemphasizing cost estimates seems radical, there are sound reasons for deemphasizing the use of future cost estimates in designing caps for trading programs.[217] First of all, governments have tended to seriously over predict the regulation's cost.[218] All regulations create markets that tend to stimulate a search for low cost approaches, so it is not surprising that postcompliance studies show that precompliance estimates often prove too high.[219] Trading facilitates a wider variety of low cost solutions than nontrading approaches, so the argument that precompliance estimates will often prove too high appears even stronger in the trading context than outside of it.[220] Also, the insight at the

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TRADING, *supra* note 9, at 21, 32 (suggesting that movement toward a "new paradigm" based on emissions trading will require "a shift in the pattern of thoughts").

217 *See* Carlson et al., *supra* note 118, at 1320 (stating that attempts to estimate the costs of future control programs are likely to prove flawed because of the difficulty of forecasting technological change).

218 *See id.* at 1314 (explaining that both economists and environmentalists have alleged that EPA regularly overestimates compliance costs); Winston Harrington et al., *On the Accuracy of Regulatory Cost Estimates*, 19 J. POL'Y ANALYSIS & MGMT. 297, 313–14 (2000); Thomas O. McGarity & Ruth Ruttenberg, *Counting the Cost of Health, Safety, and Environmental Regulation*, 80 TEX. L. REV. 1997, 2042–44 (2002) (collecting studies); Eban Goodstein & Hart Hodges, *Polluted Data: Overestimating Environmental Costs*, AM. PROSPECT, Nov.–Dec. 1997, at 64, 64; Wagner, *supra* note 129, at 68 (explaining that President Bush's EPA acknowledges that its past RIAs have overestimated costs by as much as 80 percent and that all of its errors in the RIA tended toward overestimation); *see also* Florentin Krause et al., *Cutting Carbon Emissions at a Profit (Part II): Impacts on U.S. Competitiveness and Jobs*, 21 CONTEMP. ECON. POL'Y 90, 91–92 (2003) (showing that most economic models have probably over-predicted costs by not including cost reducing policies that may well be adopted).

219 *See* THOMAS O. MCGARITY, REINVENTING RATIONALITY: THE ROLE OF REGULATORY ANALYSIS IN THE FEDERAL BUREAUCRACY 131 (1991) (finding a consistent pattern of overestimation of costs revealed in retrospective studies); Carlson et al., *supra* note 118, at 1295 (showing that abatement costs for controlling acid rain declined after 1990, even for control under a performance standard); David M. Driesen, *The Societal Cost of Environmental Regulation: Beyond Administrative Cost-Benefit Analysis*, 24 ECOLOGY L.Q. 545, 601 (1997) (explaining that promulgation of a regulation creates an impetus to minimize costs among regulated firms, which tends to falsify even reasonable pre-promulgation estimates); Michael E. Porter & Claas van der Linde, *Toward a New Conception of the Environment-Competitiveness Relationship*, J. ECON. PERSP., Fall 1995, at 97, 107–09 (finding estimates of regulatory compliance costs systematically biased upwards).

220 *See* Dallas Burtraw, *Cost Savings, Market Performance and Economic Benefits of the US Acid Rain Program*, *in* POLLUTION FOR SALE, *supra* note 33, at 45 (claiming that trading "ignite[s]" a search for lower cost abatement techniques); Ellerman et al., *supra* note 167, at 363–64 (explaining that the acid rain program shows that cap-and-trade can make "unexpected forms of abatement appear"); *see generally* Zapfel, *supra* note 80, at 27 (explaining that EU Member

heart of the rationale for trading, that polluters have better marginal control cost information than regulators, suggests that government may have incomplete cost information when it tries to predict future costs. Indeed, regulated parties have an incentive not to reveal their least costly control options to regulators in order to defeat stringent caps. Finally, even BAT regulations, often derided as discouraging innovation, encouraged many cost saving innovations not anticipated by regulators when sufficiently stringent.[221] If trading proponents are correct that trading does a superior job at encouraging innovation, then this becomes an additional reason to consider cost prediction based on existing technologies especially unreliable in the trading context.[222] Hence, there are sound reasons to recognize, especially in the context of cap-and-trade, that future cost guesses provide an unreliable basis for regulation.

The strength of this argument for deemphasizing cost predictions increases with the aggregate cap's scope.[223] When a regulator tries to guess the costs of control at an individual facility or a single industry, it already faces a substantial potential for serious error. But when a regulator sets a cap for most of the economy's emissions, as Congress may do with respect to greenhouse gasses, the potential for error multiplies.[224] For this exercise depends upon predictions of future costs for a variety of polluters, including some polluters that regulators study less frequently than the electric utility

States set their Phase I caps too high based in part on the perception that no reasonably cheap abatement possibilities existed).

221 *See* David M. Driesen, *Does Emissions Trading Encourage Innovation?*, 33 Envtl. L. Rep. (Envtl. Law Inst.) 10,094, 10,103–04 (2003) (reviewing the empirical evidence).

222 *Id.* at 10,094 (pointing out that the "economic incentive" proponents "frequently state that emissions trading promotes technological innovation"); *see* David E. Adelman & Kirsten H. Engel, *Reorienting State Climate Change Policies to Induce Technological Change*, 50 ARIZ. L. REV. 835, 858 (2008) (noting that while Nordhaus predicts modest cost savings from innovation, other economists predict 50% cost savings); Reyer Gerlagh, *Measuring the Value of Induced Technological Change*, 35 ENERGY POL'Y 5287, 5287, 5293 (2007) (showing that the cost savings from innovation induced by a climate policy can be substantial); *see, e.g.*, Ackerman & Stewart, *supra* note 54, at 183; Daniel J. Dudek & John Palmisano, *Emissions Trading: Why Is This Thoroughbred Hobbled?*, 13 COLUM. J. ENVTL. L. 217, 234–35 (1988). I have been recognized as a skeptic of the view that a cap with trading provides better incentives for valuable innovation than an identical cap without trading. *See* Avi-Yonah & Uhlmann, *supra* note 20, at 29 n.105 (discussing and agreeing with my skepticism about trading's superiority as a stimulator of innovation); *see also* Holly Doremus & W. Michael Hanemann, *Of Babies and Bathwater: Why the Clean Air Act's Cooperative Federalism Framework Is Useful for Global Warming*, 50 ARIZ. L. REV. 799, 810–811 (2008) (arguing that the acid rain program produced no innovation and that cap-and-trade to reduce greenhouse gases is unlikely to spur sufficient innovation); David M. Driesen, *Design, Trading, and Innovation*, *in* MOVING TO MARKETS, *supra* note 48, at 436, 442 (showing division on this question among economists).

223 *See* Stephan Alberth & Chris Hope, *Climate Modeling with Endogenous Technical Change: Stochastic Learning and Optimal Greenhouse Gas Abatement in the PAGE2002 Model*, 35 ENERGY POL'Y 1795, 1801–03 (2007) (explaining that with widespread abatement, uncertainty of cost estimation increases because of our lack of knowledge of the "learning investments" that reduce abatement costs over time).

224 *See, e.g.*, MITIGATION, *supra* note 16, at 11 (reporting that economic studies of mitigation estimate the cost at between a 3% decrease and a small increase in global gross domestic product (GDP)).

industry.[225] And the broad trading market implies that unexpected cost-saving innovation in reducing greenhouse gas emissions almost anywhere in the economy can reduce the costs not just for the innovating firms, but also for many other firms, as innovations can reduce the costs of allowances traded in the market.

The strength of this argument against too much reliance on cost predictions also increases when regulators adopt long-term caps, like the 2050 caps in many climate change bills.[226] Bad as we are at predicting short-term compliance costs, we are even worse at predicting long-term costs.[227] In the climate disruption context, for example, we have seen substantial cost decreases in renewable energy.[228] Further decreases in these costs could drastically reduce the anticipated cost of addressing climate disruption.[229] Also, the likelihood of an oil supply shortage raising the costs of not addressing climate disruption (which would lower the incremental cost of addressing it) increases over long timescales.[230] I do not mean to rule out the possibility of unexpected cost increases, but the idea that cost predictions form a reliable basis for regulation appears especially fanciful on long timescales.

In short, an understanding of the economic dynamics of regulation can make trading a tool for setting more stringent caps than might be possible without it. A strong normative case for effects-based regulation can perform

225 *See id.* at 43–76 (summarizing basic information about significant sectors generating greenhouse gas emissions).

226 *See id.* at 150–52 (explaining why technological change over long periods creates enormous uncertainty in cost estimation).

227 *See id.* at 11, 18 (reporting estimates of mitigation costs in 2050 as varying between a 1% and a 5.5% decrease in GDP, a range even wider than that shown in estimates of mitigation costs in 2030); Keohane, *supra* note 1, at 47 (pointing out that the long-term costs of abatement will not be known in advance).

228 *See Commission Report in Accordance with Article 3 of Directive 2001/77/EC: Evaluation of the Effect of Legislative Instruments and Other Community Policies on the Development of the Contribution of Renewable Energy Sources in the EU and Proposals for Concrete Actions*, at 19, COM (2004) 366 final (May 26, 2004), *available at* http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2004:0366:FIN:EN:PDF (finding a 50% drop in wind costs over the previous 15 years); Leonardo Barreto & Socrates Kypreos, *Emissions Trading and Technology Deployment in an Energy-Systems "Bottom-Up" Model with Technology Learning*, 158 EUR. J. OPERATIONAL RES. 243, 248, 257–58 (2004) (estimating an 80% progress ratio for solar photovoltaics, representing the rate of cost decline per doubling of production); Jeffery B. Greenblatt et al., *Baseload Wind Energy: Modeling Competition Between Gas Turbines and Compressed Energy Air Energy Storage for Supplemental Generation*, 35 ENERGY POL'Y 1474, 1474 (2007) (stating that the capital costs of installed wind energy dropped twofold between 1992 and 2001).

229 *See, e.g.*, Terry Barker et al., *Achieving the G8 50% Target: Modelling Induced and Accelerated Technological Change Using the Macro-Econometric Model E3MG*, 8 CLIMATE POL'Y (SPECIAL ISSUE) S30, S42–43 (2008); Claudia Kemfert & Truong Truong, *Impact Assessment of Emissions Stabilization Scenarios with and Without Induced Technological Change*, 35 ENERGY POL'Y 5337, 5343 (2007) (showing that increased research and development tends to increase energy efficiency, thereby achieving climate targets more cheaply through enhanced efficiency rather than production declines).

230 *See generally* MITIGATION, *supra* note 16, at 260 (noting that increases in oil prices might reduce greenhouse gas emissions, but might produce more use of coal).

this function as well. But the mere adoption of trading without such changes in thinking does not produce an escape from BAT-like restraints on caps.

In principle, trading can also facilitate more stringent cap setting if regulators take guesses about the cost savings from trading into account in setting caps. Economists modeling the costs of trading programs typically engage in a BAT-like evaluation. They estimate the control costs from technologies available to the industry.[231] They then project the cost savings available from trading through efficient rearrangement of these technologies, which trading should facilitate.[232] Thus, BAT flaws can infect this approach, as it depends on evaluation of technological options.

Indeed, while considering trading's cost savings can help justify more stringent caps, it can also create additional contentious issues, and, if employed in an administrative cap-setting process, litigable issues. Economists' predictions about future prices in markets generally, or in trading markets in particular, have usually not proven accurate.[233] Any such prediction requires a regulator to endorse a set of debatable assumptions in an economic model.[234] Implementation of the economists' implicit suggestion that regulators should base their regulations on estimates of a trading program's cost, leaves the regulator subject to all of the traditional strife and litigation risks associated with analyzing technologies' costs plus whatever disputes arise about the incomplete information about the projected cost savings from the trading. Thus, the suggestion that trading should facilitate stricter cap setting, while analytically plausible, increases the complexity of the exercise for regulators.

Institutional factors, however, play a very important role in aggregate cap setting. Ackerman and Stewart's seminal work on emissions trading specifically advocates having the legislature, rather than an administrative agency, set the cap in order to democratize goal setting.[235] The possibility that Congress may set a cap itself rather than delegate cap setting to EPA does not justify choosing trading over traditional regulation, but it does offer concrete advice on how to create caps. It does not justify a choice of trading because the legislature can set caps for a trading program or a nontrading

231 *See, e.g.*, Carlson et al., *supra* note 118, at 1299 (describing evaluation of the costs of scrubbing and fuel switching as the first step in constructing marginal abatement cost curves for control of sulfur dioxide).

232 *See, e.g.*, *id.* (describing the second step of estimating trading's cost as figuring out the least cost means of using these technologies to meet the cap).

233 *See id.* at 1314–15 (finding that EPA overestimated the cost of sulfur dioxide control because it anticipated too much reliance on scrubbers rather than fuel switching, and failed to foresee a 50% decline in scrubbing's cost); Keohane, *supra* note 129, at 36–37 (faulting EPA for assuming a perfectly functioning emissions trading market in modeling the costs of a proposed trading program, but acknowledging that predicting the actual performance of such markets lies "at the frontier of economic research").

234 *See* MITIGATION, *supra* note 16, at 79 (finding cost estimates "heavily dependent on approaches and assumptions"); Ellerman et al., *supra* note 72, at 36 (noting that early studies of the acid rain's cost savings potential produced widely disparate estimates partly because they varied in how many trades they anticipated).

235 *See* Ackerman & Stewart, *supra* note 17, at 1353.

program.[236] Indeed, Congress has written emission limits for specific industries into legislation in several cases.[237] Yet, legislative cap setting can avoid some BAT-like problems. In particular, Ackerman and Stewart place some emphasis on litigation and attendant delay as a particularly significant BAT flaw.[238] The litigation they refer to occurs when an administrative agency must follow a statutory command to establish a cap based on a technological assessment. Since the agency must both conform its conduct to a statute and have a reasonable basis for its conclusions about technologies' cost and efficacy, even in the face of substantial uncertainties, this sort of determination creates litigable issues.[239]

A legislative body faces no such constraints. While determining technological feasibility in order to set a cap is no easier for a legislature than an administrative body, it would be a complete waste of money to challenge a legislative decision about a cap as unreasonable in a lawsuit because of the deference courts pay to legislative decisions under the Constitution.[240] Accordingly, while industry litigates just about every agency BAT decision,[241] I am not aware of a single industry challenge to the reasonableness of a legislatively-imposed emission limit. It follows then, that legislative cap setting offers powerful advantages over administrative cap setting. The acid rain program's success may owe a lot to the Congressional decision to set caps itself, rather than to delegate the entire task to EPA.

Unfortunately, legislative cap setting can exacerbate another problem associated with BAT, the difficulty of updating caps. Political deadlock has regularly produced long delays in revising outdated environmental statutes and can stall environmental improvement.[242] Trading may make that problem even more difficult, because it creates expectations that government will not disturb the market it creates by revising caps.[243] One can imagine reforms that might address this problem. For example, Congress could enact a mathematical formula adjusting caps automatically to match substantial

236 *See* Driesen, *supra* note 2, at 305–06 (noting the claim that technology-based standards implicate the complexity, delays, and litigation associated with administrative proceedings does not apply to legislatively set limits).

237 *See* David M. Driesen, *Five Lessons from the Clean Air Act Implementation*, 14 PACE ENVTL. L. REV. 51, 52–54 (1996).

238 Ackerman & Stewart, *supra* note 17, at 1335–36.

239 *See* Driesen, *supra* note 36, at 13 n.73 (collecting cases).

240 Williamson v. Lee Optical of Okla., Inc., 348 U.S. 483, 487–88 (1955) (stressing the deference due legislative decisions); *see* Usery v. Turner Elkhorn Mining Co., 428 U.S. 1, 15 (1976) (stating that economic legislation is presumed to be constitutional); United States v. Carolene Products Co., 304 U.S. 144, 152 (1938) (stating that regulatory statutes will be upheld unless they lack a rational basis).

241 *See, e.g.*, D. Bruce La Pierre, *Technology-Forcing and Federal Environmental Statutes*, 62 IOWA L. REV. 771, 823–24 (1977) (recognizing repeated industry litigation over best available technology standards promulgated under EPA rules).

242 *See, e.g.*, Henry A. Waxman, *An Overview of the Clean Air Act Amendments of 1990*, 21 ENVTL. L. 1721, 1721–42 (1991) (discussing the political forces that delayed amendments to the Clean Air Act).

243 *Cf.* American Clean Energy and Security Act of 2009 (Waxman-Markey), H.R. 2454, 111th Cong. §§ 705–707 (2009) (requiring reports on climate change science and the use of "existing statutory authority" to address shortfalls in obtaining environmental goals).

deviations in climate change metrics, such as temperature, atmospheric greenhouse gas concentrations, or sea level rise, from the expectations prevailing when the legislature established the initial caps.[244] But absent some sort of automatic ratchet in a cap, revision will pose political difficulties.

The foregoing analysis suggests several ways of escaping some BAT defects. Regulators committed to effects-based standard setting can avoid the complexities of BAT analysis by not considering cost, if statutes authorize this.[245] Also, to the extent Congress itself sets caps, it can avoid many (but not all) of the relevant BAT defects, because of the difficulty of a constitutional challenge to legislatively imposed caps. And Congress can incorporate automatic ratchets into caps to avoid the BAT-like difficulties in revision of limits.

The suggestion that Congress set the caps raises an important institutional issue. How much cap setting can a legislature find time for? For trading does not magically do away with the need for delegation of some decisions to administrative agencies. Indeed, administrative agencies have created most trading programs initiated to date in the United States.[246]

The evidence in the climate change bills pending in Congress suggests that Congress may find time to set an aggregate cap but is unlikely to be able to set individual caps on all of the important sources covered under the trading program, for none of the pending bills contain individual caps.[247] The Waxman-Markey bill includes both an annual aggregate cap (which declines after a few years of increases) and detailed decisions allocating percentages of that cap to various sectors.[248] But this bill requires agency translation of these sectoral allocations into caps for individual entities in subsequent rulemakings.[249] This is hardly surprising. Congress has never established individual caps for an economy-wide environmental program. Congress, as we have seen, managed to set individual limits for electric utilities in the acid rain program, a relatively small and very well understood set of

244 I thank Douglas Kysar for suggesting varying the cap with damage estimates, which led to this idea. *Cf. id.* §§ 705(c)(6)(A)–(B), (e), (f), 706(d)(3)(B), 707(a) (requiring agency action if temperature or greenhouse gas concentrations are expected to rise above 2°C or 450 parts per million of carbon dioxide equivalent).

245 An administrative agency, however, may find setting caps through an effects-based approach or a cost-benefit approach even more problematic.

246 *See, e.g.*, U.S. ENVTL. PROT. AGENCY, NO_x BUDGET TRADING PROGRAM—BASIC INFORMATION 4–5 (2009), *available at* http://www.epa.gov/airmarkt/progsregs/nox/docs/NBPbasicinfo.pdf (outlining the history of national and regional nitrogen oxide control programs).

247 *Cf.* Low Carbon Economy Act of 2007, S. 1766, 110th Cong. § 501 (2007) (authorizing the President to require 60% reductions by 2050 if our largest trading partners take comparable actions).

248 *See* H.R. 2454 §§ 721(e)(1), 782. For analysis of the sectoral distribution, see JOHN LARSEN & ROBERT HEILMAYR, WRI BRIEF ASSESSMENT OF ALLOWANCE DISTRIBUTION UNDER H.R. 2454, THE AMERICAN CLEAN ENERGY AND SECURITY ACT (WAXMAN-MARKEY) 1 (2009), *available at* http://pdf.wri.org/usclimatetargets_allowance_distribution_2009-06-25.pdf; Robert Stavins, The Wonderful Politics of Cap-and-Trade: A Closer Look at Waxman-Markey, http://belfercenter.ksg.harvard.edu/analysis/stavins/?p=108 (May 27, 2009) (last visited Oct. 14, 2009).

249 *See* H.R. 2454 §§ 783(b)–(g), 784(b), 785(b), 787(e), 788(b), (c).

facilities in a single industry.[250] But it has always delegated the task of realizing reductions in pollution to achieve broad environmental goals demanding changes in several industries at once to EPA and/or to the states.[251] The unlikelihood of Congressional individual cap setting in the climate disruption context raises the issue considered next: How should Congress address the problem of translating aggregate caps it might set through legislative agreement into individual caps necessary for a successful trading program?

B. Individual Caps

The previous analysis shows that Congress has two options for translating its aggregate caps into individual caps when it cannot accomplish this through specific legislation. It may employ a market-based individual cap setting, in which it directs an administrative agency to auction off the appropriate number of allowances to the highest bidder. Or, it may employ government individual cap setting in which the legislature either establishes individual caps itself or directs an administrative agency to do so. This Part urges use of the market-based approach when the legislature cannot establish the caps itself, for this approach best avoids the BAT-like problems that Ackerman and Stewart cite as a justification for trading. But it also considers how Congress might design administrative processes better if it does not fully adopt auctioning and must delegate individual cap setting to an administrative agency.

1. Market-Based Cap Setting

A market-based, individual cap-setting approach avoids BAT defects. Under this approach, regulators auction off allowances to the highest bidder. In formulating a bid, polluters will likely evaluate their own marginal control costs. A rational polluter will not want to purchase allowances costing more than the marginal control costs at her facility. This implies that polluters facing higher marginal control costs will pay more money for auctioned allowances than polluters enjoying relatively low marginal costs. Hence, a market-based allocation accomplishes cost effective cap setting, since those facing higher marginal control costs will purchase more allowances than those with low marginal control costs. And it does so by relieving regulators of responsibility for evaluating cost and technology, and placing the responsibility for that on owners of polluting facilities.[252]

Having the market rather than the regulator set the individual caps avoids all of the delays and other BAT-like problems associated with cost

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250 *See, e.g.*, U.S. Envtl. Prot. Agency, Continuous Emissions Monitoring Fact Sheet, http://www.epa.gov/airmarkt/emissions/continuous-factsheet.html (last visited Oct. 14, 2009).

251 *See* DRIESEN & ADLER, *supra* note 113, at 501 (comparing state and federal roles under the Clean Air and Water Acts).

252 *Cf.* Ackerman & Stewart, *supra* note 17, at 1343 (claiming that trading transfers the job of technological and economic assessment from “bureaucrats” to “business managers and engineers”).

sensitive administrative cap setting.[253] It frees the regulator from having to gather marginal control cost information from numerous and sometimes uncooperative firms in order to fine-tune individual caps.[254] It avoids the problem of incentivizing firms to exaggerate their costs in order to avoid stringent individual caps. Market-based cap setting also eliminates litigation over administrative decisions about individual caps.

The revenue realized through auctions can help overcome the political inertia that makes caps in a trading program difficult to revise absent adoption of an automatic ratchet. Under RGGI, the states spending auction revenue have devoted the overwhelming majority of these resources to funding energy efficiency measures.[255] The RGGI trading program may well raise the cost per kilowatt hour of electricity, since the program caps the emissions of electric utilities in the region.[256] By financing energy efficiency measures in businesses and households, however, the states can reduce the number of kilowatt hours that people must purchase to meet their needs.[257] This can make it possible to increase the expense of generating electricity while actually reducing the overall costs to energy users, since users face the costs generated by multiplying their cost per kilowatt hour times the number of kilowatt hours used to power their households and businesses.[258] Energy efficiency funding not only generates immediate environmental benefits from avoided greenhouse gas emissions, it also reduces burdens that might otherwise pose an obstacle to further tightening caps in the future. Thus, auctions allow trading to offer an easier path to revision of limits than BAT offers. Environmental scholarship on trading has hitherto largely neglected the idea that auctions may often prove essential to sufficient environmental progress because of its potential to overcome the inertia that has plagued complicated regulatory systems.[259] Managers of polluting firms, however,

253 *Cf.* Rogge et al., *supra* note 99, at 25 ("Auctioning off all allowances could avoid most, if not all, problems . . . which result in inefficient and complex rules . . . .").

254 *Cf.* Nat'l Lime Ass'n v. EPA, 627 F.2d 416, 433 (D.C. Cir. 1980) (discussing industry's failure to respond to a data request and speculating that it may have withheld data unfavorable to its position).

255 *See* Cowart, *supra* note 106, at 218 (concluding that RGGI states will devote as much as 80% of auction revenue to energy efficiency).

256 *See* REG'L GREENHOUSE GAS INITIATIVE, INC., RGGI FACT SHEET 2 (2009), *available at* http://www.rggi.org/docs/RGGI_Executive%20Summary_4.22.09.pdf (projecting that RGGI will modestly increase electricity rates).

257 *See* Cowart, *supra* note 106, at 216–17 & n.51 (predicting reduced consumption and lower power bills for consumers who employ efficiency measures).

258 *See* WILLIAM R. PRINDLE ET AL., ENERGY EFFICIENCY'S ROLE IN A CARBON CAP-AND-TRADE SYSTEM: MODELING RESULTS FROM THE REGIONAL GREENHOUSE GAS INITIATIVE 17 (2006), *available at* http://aceee.org/pubs/e064.pdf (stating energy efficiency can lower consumer electricity bills).

259 This neglect may stem from a broad reading of Ackerman and Stewart. They write, "[M]arketability would immediately eliminate most of the information-processing tasks that are presently overwhelming the federal and state bureaucracies." Ackerman & Stewart, *supra* note 17, at 1342. This statement seems to suggest, incorrectly, that trading by itself, even trading based on administrative cap setting, necessarily allows administrators to avoid consideration of cost and technology in cap setting. *See id.* at 1341–42 (stating that "[a] system of tradeable rights will . . . . reduce the incentives for litigation"). But in the same article, Ackerman and Stewart write that "[*t*]*he auction system* would . . . . reduce the opportunity and incentive of

tend to resist auctions, as they would rather not pay for residual emissions after the cap is met and would like to retain possible windfall profits from allowance giveaways.[260] Some grounds exist, however, for them to rethink their position. The uncertainties and delays from BAT regulation have been a source of considerable expense and irritation for regulated polluters.[261] The combination of industry and environmentalist litigation and lobbying creates substantial delays and uncertainties, which make rational planning difficult for businesses. A market-based individual cap-setting system, i.e., an auction, can avoid substantially all of these delays and uncertainties.[262]

Businesses confronting an administrative cap-setting system may find themselves investing significant resources in lobbying and litigating to try and adjust their individual caps to their liking. They face a prisoner's dilemma, in that any individual firm that refrains from lobbying may find that their competitors wrest allowances from them through their lobbying, thereby obtaining a competitiveness advantage. But this lobbying will produce winners and losers, not just winners. If the aggregate cap is firm, then EPA can only accommodate some firms and must tighten up on the remainder to make up for it.[263] Because business will end up wasting a lot of money and effort creating uncertainties for themselves in a government cap-setting system, even though some will gain cost savings and others will suffer from cost increases, firms would be wise to support auctioning.[264]

Whether or not auctioning advances the regulated firms' interests, market-based cap setting better serves societal needs than administrative cap setting. While the literature recognizes many of auctioning's advantages,[265] it has paid scant attention to auctioning's potential to

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polluters to use the legal system for delay and obstruction by finessing the complex BAT issues." *See id.* at 1345 (emphasis added). This latter statement is more accurate, as it is possible to avoid BAT issues through effects-based aggregate *legislative* cap setting coupled with market-based individual cap setting.

260 *See* Tschochohei & Zöckler, *supra* note 216, at 27 (attributing the EU decision not to auction allowances to "industrial rent-seeking"); Nathaniel O. Keohane, Richard L. Revesz & Robert N. Stavins, *The Choice of Regulatory Instruments in Environmental Policy*, 22 HARV. ENVTL. L. REV. 313, 348 (1998) (explaining that polluters prefer free allocation because it relieves them of the obligation to pay for residual emissions once the cap is met).

261 *See, e.g.*, Nordhaus, *supra* note 142, at 38.

262 *Cf. id.* at 37–39 (discussing allowance prices' volatility); Keohane, *supra* note 1, at 44 (finding volatility fears "overstated").

263 *See* Keohane, *supra* note 1, at 46 (describing allowance allocation as a "zero-sum game").

264 *Cf.* Sigurd Lauge Pedersen, *Denmark*, *in* EU ALLOCATION, *supra* note 4, at 106, 127 (pointing out that major Danish power producers supported 100% auctioning, as long as it applied across the EU); Vis, *supra* note 184, at 191 (reporting that some firms in Europe began to support auctioning because of the potential for competitive advantage).

265 *See* Cowart, *supra* note 106, at 215 (reporting an estimate of one billion dollars in annual windfall profits as likely in the RGGI program under grandfathering); Keohane, *supra* note 1, at 44 (pointing out that revenue from an allowance auction could reach hundreds of billions of dollars a year, about 10% of current tax receipts); Rogge et al., *supra* note 99, at 27 (pointing out that auction revenue could pay for tax reductions that might increase employment); Noriko Fujiwara & Christian Egenhofer, *What Lessons Can Be Learned from the EU Emissions Trading Scheme?*, CEPS POL'Y BRIEF, Feb. 2008, at 1, 2, *available at* http://ssrn.com/abstract=1334060

circumvent BAT defects that otherwise often can delay or even stymie effective cap setting. Recognizing these powerful institutional advantages should justify a move from slow, incomplete auctioning to rapid emulation of RGGI's reform, introduction of widespread early auctioning. Delays at the outset of a program have great potential to hinder the whole program going forward, by introducing uncertainty into the system that weakens economic incentives for the needed long-term investments.

"Auctioning can also help ensure that new entrants . . . face the same emissions reduction costs as existing firms."[266] Government allocation of allowances, by contrast, can easily duplicate the problem of disfavoring new and potentially cleaner production that Ackerman and Stewart associate with BAT.[267] If government, for example, allocates all of the allowances to existing sources, then new firms with carbon emissions can only enter the market if they purchase allowances from existing firms, who may be reluctant to sell at reasonable prices. And the influence of incumbents on legislative and administrative processes makes this sort of favoritism a significant concern. Congress should require 100% auctioning at the outset, rather than employ inevitably uncertain and slow administrative cap setting to initiate the program.

2. Administrative Cap Setting

Nearly all of the climate change bills contain some administrative mechanism for setting individual caps.[268] While recognition of the tendency of cap setting for trading to mimic BAT supports auctioning, this insight can also inform administrative individual cap setting if it persists because of political support for it from industry. A desire to avoid the delays and complexities associated with BAT should lead analysts to evaluate climate change bills and recommend reforms based on the goal of minimizing both.

An administrative approach to individual cap setting may prove prone to BAT-like problems, even when it allocates allowances under an aggregate cap previously set by a legislature. Regulated parties would have an incentive to lobby EPA vigorously to realize their interest in lax individual caps, since more allowances translate into more allowable emissions and less need for potentially costly changes.[269]

(follow "Download" hyperlink; then follow "SSRN New York, USA" hyperlink) (explaining that power generators booked "handsome windfall profits" under ETS grandfathering).

266 U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 109, at 8.

267 BAT by itself does not necessarily disfavor new sources, but the decision in the legislation creating BAT approaches to apply stricter standards to new sources than to existing sources can create this problem. *Cf.* DRIESEN, *supra* note 27, at 187–92 (suggesting economic dynamic analysis as a new method for evaluating the impacts of new source review on modernization and arguing that the gutting of statutory provisions requiring new source controls for modified sources is important).

268 *See, e.g.*, Lieberman-Warner Climate Security Act of 2008, S. 3036, 110th Cong. (2008) (styled a bill "[t]o direct the Administrator of the Environmental Protection Agency to establish a program to decrease emissions of greenhouse gases"); *supra* note 249.

269 *See* Sorrell & Skea, *supra* note 33, at 3 (pointing out that the "initial distribution of permits" has "significant economic consequences" for regulated polluters).

Firms will argue for lax individual caps on the basis of the high costs they might face in complying with a strict one. If the legislation authorizing EPA to set individual caps authorizes consideration of costs or technology, EPA's duty to respond to significant comments will require it to address those arguments reasonably. In order to respond reasonably, EPA may have to assess the costs of technologies available to achieve the individual caps in order to evaluate numerous claims about compliance costs. Once EPA sets individual caps, firms can presumably litigate the question of whether EPA acted reasonably in setting them. Thus, any legislation authorizing EPA to consider costs in setting individual caps and authorizing judicial review of its decisions invites a process that infects trading with BAT defects.

Unfortunately, some provisions in pending climate change bills may open the door to this sort of BAT-like problem in the rulemaking proceedings establishing individual caps. For example, the Waxman-Markey bill and its Senate counterpart, the Kerry-Boxer bill,[270] requires EPA to "consider the relative complexity of refinery processes and appropriate mechanisms to take energy efficiency and greenhouse gas reductions into account" in establishing a formula for allocating allowances to individual petroleum refineries.[271] This language seems to invite arguments about the relative technological potential for greenhouse gas reductions at different types of refineries.[272]

Fortunately, several bill provisions reflect some recognition of BAT's dangers by establishing formulas for administrative allowance allocation.[273] These formulas, however, may also engender litigation and delay, as some of them prove quite complicated and data-intensive. For example, the Waxman-Markey and Kerry-Boxer bills establish a formula for establishing large electric utilities' individual caps that requires that 50% of the allowances correspond to their carbon dioxide emissions and 50% correspond to their electricity deliveries.[274] For existing utility units, the bill allows the utility to select any three year period between 1999 and 2008 as a baseline for purposes of calculating the emissions and delivery numbers.[275] This baseline flexibility increases EPA's burden, leading to a requirement that it determine the amount of emissions and production associated with each utility in each

270 Clean Energy Jobs and American Power (Kerry-Boxer) Act, S. 1733, 111th Cong. (2009).

271 *Id.* § 775(e); American Clean Energy and Security (Waxman-Markey) Act of 2009, H.R. 2454, 111th Cong. § 787(e) (as placed on calendar by Senate, July 7, 2009).

272 The requirement to account for refinery processes' "relative complexity" seems aimed at the idea that facilities whose configurations limit opportunities to make emission reductions should get more allowances than those with more opportunities. *See* H.R. 2454 § 787(e). If so, the agency would have to evaluate these complexities not in the abstract, but as they impact various conceivable technological changes. While the requirement to "take . . . greenhouse gas reductions into account" probably suggests not penalizing and perhaps benefitting refinery owners that provide early reductions, it can also be read to authorize or require assessment of future technological possibilities for emission reductions. *See id.*

273 *See, e.g.*, *id.* §§ 782, 783(b)–(d), 784(b), 785(c); S. 3036 §§ 3401, 3402, 3501, 3502, 3902(b)(2), 3904(c); S. 1733 § 772(b)(2).

274 H.R. 2454 § 783(a)(2), (b); S. 1733 § 772(b)(2)–(3); *cf.* H.R. 2454 § 783(e) (distributing emissions allowances of small utilities based on historic emissions alone).

275 H.R. 2454 § 783(b)(2)(B)(i)(II), (3)(A); S. 1733 § 772(b)(2)(B), (3)(A).

year from 1999 through 2008.[276] The EU experience teaches that the availability of economy-wide fuel use data, which forms the basis for the aggregate cap, does not imply the existence of adequate facility-specific data.[277] The bills recognize this and uses a device familiar to all careful students of command and control regulation: authorization to use the "best available data," in this case when utility-specific fuel use data is missing or incomplete.[278] But this provision provides a nice opportunity for utilities seeking "hard look" judicial review of individual caps by demanding that the emission estimates be "as precise as practicable."[279] This locution invites litigation of the question of whether EPA, in extrapolating from incomplete data, was "as precise as practicable" or arbitrary and capricious.[280] While simpler formulas (which appear in some provisions) and eschewing any demand for precision can help, even simple formulas can give rise to delay and litigation in the contentious environmental law arena.[281]

These bills generally authorize some exceptions to the requirement of maintaining the aggregate cap.[282] For example, Waxman-Markey authorizes a one-time adjustment of the cap if certain assumptions about the baseline emissions employed in creating them prove erroneous.[283] When such exceptions exist, an administrative body may well weaken the aggregate cap to accommodate various industry concerns about individual caps. Congress can provide the regulatory certainty needed to encourage long-term planning to reduce emissions by not providing such exceptions, since Congress can always revisit the legislation if carbon caps create truly unacceptable economic havoc.

If Congress wishes to avoid replicating the difficulties that Ackerman and Stewart claim limited the BAT programs' efficacy, it could limit the tendency of industry to use litigation to obstruct individual cap setting by prohibiting judicial review, except under very narrow circumstances. Congress has prohibited judicial review of other kinds of subsidiary

276 H.R. 2454 § 783(b)(2)(C)(i).

277 *See* Ellerman et al., *supra* note 167, at 339–40 (explaining that in spite of "reasonably good inventories of CO_2 emissions data" derived from aggregate energy use, the lack of specific installation specific data "was perhaps the biggest problem" that confronted member states in allocating allowances).

278 H.R. 2454 § 783(b)(2)(C)(iii)(II); S. 1733 § 772(b)(2)(C)(iii)(II).

279 H.R. 2454 § 783(b)(2)(C)(iii); S. 1733 § 772(b)(2)(C)(iii).

280 H.R. 2454 § 783(b)(2)(C)(iii); S. 1733 § 772(b)(2)(C)(iii); Administrative Procedure Act, 5 U.S.C. § 706 (2006).

281 *See, e.g.*, H.R. 2454 § 783(c)(1) (basing formula on emissions only); *id.* § 783(d)(1), (f)(2) (employing a legislatively-determined 3-year baseline period); U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 109, at 15 (suggesting that even the definition of output in a formula can be "subject to numerous interpretations"). *See generally* Daniel A. Farber, *Taking Slippage Seriously: Noncompliance and Creative Compliance in Environmental Law*, 23 HARV. ENVTL. L. REV. 297, 297 (1999) (explaining that the gap between the law and its implementation "is sometimes a chasm" in the environmental law arena).

282 *See, e.g.*, H.R. 2454 § 721(e)(2) (authorizing adjustment of caps if various assumptions about emission baselines prove erroneous); Lieberman-Warner Climate Security Act of 2008, S. 3036, 110th Cong. § 2604 (2008) (authorizing adjustment of caps based on cost considerations).

283 *See* H.R. 2454 § 721(e)(2)(C).

rulemaking. For example, in the 1990 Clean Air Act Amendments, Congress required EPA, as a prelude to establishing standards for hazardous air pollutants, to set up a schedule for regulating the industries emitting listed pollutants.[284] Congress had already made the most important decisions, having chosen the pollutants EPA must regulate and the normative criterion to guide EPA in capping emissions.[285] While the precise outcome of the scheduling decision has much less public policy importance than these crucial decisions, every industry could save money by trying to get its emissions regulated late in the schedule, so considerable potential existed for industry to delay this essential scheduling step through litigation.[286] Congress, therefore, prohibited judicial review of the scheduling decision.[287]

A similar rationale would justify prohibiting judicial review of the individual cap-setting decisions under an aggregate cap. Congress will likely make the most important decisions, the decisions about the aggregate amount of reductions and their allocation to individual sectors, in the legislation itself. The allocation of these sectoral allowances to create individual caps, while of interest to regulated firms, matters relatively little to the society as a whole. In that context, it might make sense to generally prohibit litigation about the allocation. But Congress should allow challenges to the allocation on the grounds that it does not conform to the aggregate cap. Otherwise, the allocation might circumvent, rather than implement, the cap.

I do not contend that my analysis here of a moving target, climate legislation pending in Congress, exhaustively considers all of the possible avenues for avoiding administrative and judicial mischief as pollution sources seek to reduce their constraints as allowances are allocated. But recognition of the potential for BAT-like delay in emissions trading programs should lead to careful analysis of climate change bills to spot issues producing potential for litigable strife, and an effort to minimize this potential. Of course, the best method for achieving this, by far, is to just auction off all of the allowances.

V. CONCLUSION

Trading owes some of its allure to its apparent ability to automatically accomplish tasks that have proven quite difficult for regulatory systems. Ironically, if we believe that trading automatically generates reductions, it will not. We can only give trading programs a good chance of success if we make wise choices about how to set caps. Trading does not allow us to escape difficult normative choices; general lessons about the normative

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284 *See* Clean Air Act, 42 U.S.C. § 7412(c) (2006).

285 *See id.* § 7412(d)–(f).

286 *See* Driesen, *supra* note 138, at 10,006 (mentioning that Congress realized that exercises in rank-ordering priorities could trigger litigation before any cleanup could occur).

287 *See* 42 U.S.C. § 7412(e)(3) (2006). Congress made a similar decision to exempt scheduling of rulemaking from judicial review under the Resources Conservation and Recovery Act. *See* Driesen, *supra* note 138, at 10,006.

value and practical difficulties of various cap-setting approaches apply to cap setting in the trading context.

The analysis above shows that trading has often been a form of BAT, not an alternative to it.[288] While regulators cannot avoid technological evaluation if they wish to take costs into account in setting caps, an effects-based approach can avoid BAT defects. Furthermore, Congressional cap setting, as opposed to administrative cap setting, can circumvent many of the difficulties that led to criticism of BAT, but can make revision more difficult unless an automatic ratchet is incorporated. While an effects-based approach generates great problems of its own in many contexts, it does offer an attractive available option for legislative action in the climate disruption context. But even if we choose a legislated effects-based approach to an aggregate cap, BAT flaws can infect individual cap setting. We should, however, avoid that problem through a market-based approach to allocation—an auction. To the extent that we continue to rely on administrative individual cap setting, recognition that trading does not circumvent the delays inherent in administrative processes subject to judicial review should lead to careful design of administrative tasks and procedures to minimize difficulties. Auctions also serve to avoid the favoritism to existing sources that characterizes traditional regulation, and creative use of the revenue can make non-automatic cap adjustment more likely. Hence, recognition that trading often constitutes a form of BAT leads to important analytical and normative insights.

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288 *Accord* Tschochohei & Zöckler, *supra* note 216, at 31 (concluding that the European ETS "still reflects a command-and-control approach").