



**CEEPR**

**Center for Energy and Environmental Policy Research**

Allocation in Air Emissions Markets

by  
Denny Ellerman

09-016

November 2009

**A Joint Center of the Department of Economics,  
MIT Energy Initiative, and Sloan School of Management**



# ALLOCATION IN AIR EMISSIONS MARKETS

*Denny Ellerman  
Massachusetts Institute of Technology*

*November 2009*

## INTRODUCTION

The past two decades have witnessed the increasing use of a new form of environmental regulation, cap-and-trade, that consists of creating limited property rights in emissions, known as allowances, and organizing a market for their exchange. Public policy attention has been directed principally to the two features emphasized by the catchy label, that is, the cap—the limit on aggregate emissions—and trading—the flexibility and least-cost properties associated with this instrument. Until recently, relatively little interest has been directed to the creation and distribution of the property rights, more commonly known as allocation, which is the essential mechanism by which cap-and-trade systems operate.

This paper focuses specifically on allocation in the spirit of Libecap's *Contracting for Property Rights* (1989). A central theme in Libecap (1989) is that the creation of property rights in common pool resources is a response to the losses being incurred through overuse on the part of those benefiting from open access. This paper argues that air emissions markets are different from other common pool resource problems and that this difference explains the evolution in the assignment of property rights that can be observed from the early US programs, through the EU ETS, to the current debate in the US concerning a cap-and-trade program for greenhouse gas emissions.

The following section of the paper explains how air emissions markets are different. The next section seeks to clarify the nature and possible uses of the allowance value that is created by these systems. The following section, which constitutes the bulk of the paper, describes and analyzes the evolution in the assignment of these property rights in the early US programs, the EU ETS, and in actual and proposed US GHG programs. The final section summarizes and concludes.

## HOW AIR EMISSIONS MARKETS ARE DIFFERENT

Air emissions markets are different in that their motivation is the avoidance of harm instead of the preservation of profit. In the usual common pool resource problem, developing property rights and facilitating exchange is a means of tapping, maintaining, or increasing the profits that can be obtained from exploitation of the resource. Typical examples are fisheries, grazing and timber lands, and mineral deposits. In the case of air emissions, the motivation is avoiding the harm to others that occurs as a result of over-exploitation of the common pool resource, in this case, the use of the atmosphere as a repository for emissions streams. An important characteristic of this problem is that the firms whose production processes contribute significantly to the over-use of the resource, and whose use is to be restricted, draw little if any profit from its exploitation. Their profits come from the successful organization of the requisite factors of production to provide something of value. Use of the common pool resource is accidental and rarely if ever the motivation of the economic activity that causes the harm. At least as a first approximation in a competitive economy, the cost savings from not charging for access are passed on to consumers in lower product prices.

This sets up a very different institutional dynamic from other common resource problems. First, those who are harmed by overuse—the public—are not those whose access is to be rationed, at least directly. Second, these latter—producing firms—have little interest in constructing a market since they draw no profit from the use of the resource. They are more likely to be concerned with the consequences on existing profits of pricing their current and expected continuing access to the common pool resource. Third, those demanding action will as often as not fail to perceive that the public, as the ultimate consumers of the goods being produced, receive a compensating benefit in the form of lower prices for the harm being caused by overuse. The common slogan that the “polluter should pay” misses this point in not realizing that the firm is only the agent of consumers’ desires for goods at the lowest possible price. The agency problems created by this circumstance are quite unlike those in other common resource problems where existing use and benefit are more closely aligned.

Two other aspects complicate the creation of air emissions markets. The first is that the value to be distributed in the creation of an air emissions market is an accidental

but unavoidable consequence of removing the harm. Creation of this value is not the purpose of the cap and the absence of obvious claimants for that value can greatly complicate the assignment of property rights and the creation of air emission markets. The firms whose emissions create the harm invariably adopt a defensive posture with respect to the imposition of the constraint and those advocating action do so for reasons typically unrelated to the value created by the cap.

The second complicating factor is that a market-based approach is not the only or necessarily the preferred means of removing the harm. The harm from air emissions has been an observable problem calling for collective action from as early as the thirteenth century with the formation of cities and limitations on coal-burning, but the first impulse for dealing with the problem has been prohibition or some other form of legal prescription that seeks to limit emissions to a tolerable level.

Although air emissions markets are increasingly being proposed and adopted for dealing with air pollution, they remain the exception. The usual and still dominant way of dealing with these problems is legal prescription, or what is somewhat pejoratively known as “command-and-control.” This approach may not be as effective environmentally or as efficient economically as an air emissions market (Ellerman, 2006), but it is an always available default if the distributional problems involved in allowance allocation cannot be solved and the demand for avoidance of the harm must be met.

## **THE POTENTIAL RECIPIENTS OF ALLOWANCE VALUE**

Allowance value is the scarcity rent created by a cap-and-trade program and it is equal to the total number of allowances (= the cap) times the market price of allowances. Since a binding cap creates a price, allowances are valuable and their assignment endows the recipient with some expected value. One common way of thinking about the distribution of this value is that it can be either auctioned by the government or allocated for free, typically to the owners of the covered facilities that will henceforth be required to surrender allowances equal to their emissions. This is an oversimplified picture in focusing more on the means of distribution than on the ultimate recipients, but it captures the main line of debate. In thinking about recipients, we must look beyond the legal

entities of corporations and government to the households who are the ultimate recipients of allowance value.

When allowances are assigned for free to a corporate owner of a covered facility, profits are increased by approximately the value of the endowment, and a third or so of that increment is returned to government as corporate profit tax and the rest to shareholders either as dividends or increased equity value. If the corporate entity is price-regulated on a cost-of-service basis, the value of the free allocation is presumed to be passed through to rate-payers since no cash cost is incurred for these allowances. Rate payers are also the presumed ultimate recipient when allowances are assigned to non-profit owners, such as rural coops, municipalities, and government-owned corporations. Thus in either the cost-of-service or non-profit cases, households capture the allowance value as ratepayers instead of as shareholders and no allowance value is returned to the government since there is nothing to tax.

The auctioning alternative potentially involves four sets of recipients. One frequent proposal is to use the revenue to reduce existing taxes on the returns from labor and savings in order to encourage a greater supply of these factors of production to help to pay for the costs of the constraint on emissions. This approach is said to produce a “double dividend” since a “bad” is taxed and taxes on a “good” are reduced. Most economists are thinking of this approach when they argue that auctioning would be more efficient than free allocation (Goulder *et al.*, 1997; Parry *et al.*, 1999). It is the only use of allowance value that has these efficiency attributes, but it is not the only use for auction revenues. All the other public uses of auction revenues share the lump-sum inefficiency that is attributed to free allocation.

A second possible use of auction revenue is a per capita distribution of the auction revenues to citizens, now called “cap-and-dividend.”<sup>1</sup> To many, this approach is seen as advantageous in that it comes closer to offsetting the regressive effect of a carbon price on lower income quintiles. From this standpoint, neither free allocation nor the double dividend is attractive. Stockholders are predominantly in the upper income quintiles as are those who pay most of the taxes that would be reduced to obtain the double dividend

---

<sup>1</sup> This idea was first advanced in Barnes (1999) with the label of “SkyTrust.” It has re-emerged in the current US debate (see <http://www.capanddividend.org>) and received serious consideration as a viable alternative for allocation in, for instance, Congressional Budget Office (2007) and Orszag (2007).

(Dinan and Rogers, 2002). Serious proposals have been made to reduce taxes only for the lower income quintiles (Metcalf, 2007); however, these proposals implicitly introduce the further issue of the progressivity of the tax code and at best they would increase only the supply of labor.

A third use of the allowance value created by a cap is increased government expenditure typically for some use related to the environmental problem being addressed. In proposed U.S. climate change legislation, examples are R & D incentives, promotion of new lower-carbon technologies, and adaptation including transitional payments to workers who are adversely affected by the introduction of a carbon price. The ultimate recipients would be households employed or investing in these activities or receiving some direct payment. Payments could also be made to the corporate entities who are the usual recipients of free allowance allocations, but this alternative never figures in arguments concerning the use of auction revenues.

The final potential recipient of auction revenues is the Treasury, thereby reducing deficits, borrowing needs, and interest rates currently, as well as reducing the tax burden on future generations.

## **THE EVOLUTION OF ALLOWANCE ALLOCATION**

Three distinct phases can be identified in the evolution of the assignment of emission rights in cap-and-trade programs. The first phase includes all of the early US cap-and-trade programs targeting conventional emissions. Their distinguishing characteristic is the non-controversial assignment, usually in perpetuity, of all the allowance value to the emission sources that were required to surrender allowances against emissions. The second phase is best represented by the EU's CO<sub>2</sub> Emissions Trading Scheme in which allowances were initially assigned almost entirely to emission sources, albeit with increasing controversy, which led to the phasing-out of free allocation. The third phase is represented by the current proposals in the US for a GHG cap-and-trade program in which whether allowances are auctioned or allocated for free is almost an after-thought as the debate focuses on the intended recipients of the allowance value being created by the cap.

## ***The Age of Innocence: The Early US Programs***<sup>2</sup>

All of the early US programs—the Acid Rain SO<sub>2</sub> Trading Program, beginning in 1995, the Los Angeles RECLAIM Programs for NO<sub>x</sub> and SO<sub>2</sub> beginning in 1994, and the Northeastern NO<sub>x</sub> Trading Program beginning in 1999 that became the larger national NO<sub>x</sub> Budget Program in 2004—assigned 100% of the allowances to the emissions sources required to surrender allowances. Moreover, these assignments were of indefinite duration with no scheduled phase-out, although the right of the regulator to change the allocation subsequently was always implicit and sometimes explicitly asserted.<sup>3</sup> Finally, these early assignments of allowance value were non-controversial, at least compared to what would appear later.

Several reasons can be adduced for the non-controversial aspect of the early allowance allocations. The first is that allocation was poorly understood by the general policy community, even if participants, including the legislators or regulators who enacted the programs, were aware of the distributive aspects. The arguments for adopting the early cap-and-trade programs emphasized their least-cost aspects and their potential effectiveness in addressing the pollution problem.

A second reason for the lack of controversy was the regulatory precedent. The value created by prescriptive, source-specific limits on emissions was rarely an explicit issue in regulatory proceedings and it was invariably assigned to the incumbent often by the imposition of more stringent standards on new entrants. This feature was pointed out by economists, as well as the potential for regulatory capture and manipulation, but the emphasis was more on the inefficiency and perverse effects of these provisions than on their distributive aspects. An important exception was Buchanan and Tullock (1975) who hypothesized that the capture of this value was the reason that emission sources preferred

---

<sup>2</sup> The SO<sub>2</sub> trading program is by far the most studied of the U.S. programs. The standard reference is Ellerman *et al.* (2000) and useful shorter summaries are provided by Stavins (1998), Schmalensee *et al.* (1998), Ellerman (2004), and Burtraw and Palmer (2004). Harrison (2004) provides a good summary of the RECLAIM programs. The NO<sub>x</sub> programs are the orphans from the standpoint of academic research. Aulisi *et al.* (2005) provides a useful summary. The interested reader is well served by consulting the Annual Progress Reports published by the U.S. Environmental Protection Agency for both the SO<sub>2</sub> and NO<sub>x</sub> programs (US EPA, various). General reviews of early U.S. experience with emissions trading are provided by Tietenberg (2006) and Ellerman, Joskow and Harrison (2003).

<sup>3</sup> For instance, sec. 403(f) of the 1990 Clean Air Act Amendments authorizing the SO<sub>2</sub> Trading Program states that “an allowance...is a limited authorization to emit sulfur dioxide...(which) does not constitute a property right”. This wording protects the government from charges of an unconstitutional taking when modifying the program without preventing allowances from being treated as de facto property rights.



command-and-control to the usual economic prescription of a Pigouvian tax. The command-and-control precedent, which had always obscured the magnitude and value of the scarcity rents created by the constraint on emissions, predisposed most to ignore the distributive aspects of allocation.

This regulatory precedent was also an important factor in explaining the generally favorable attitude of emitters towards cap-and-trade. Not only did allowances preserve the rent for those who would have received it under an alternative command-and-control approach, but the value of that rent could be more easily monetized. The value that was otherwise attached to the facility, and that would be captured only by sale of the facility, could now be separated and turned into avoided cost or cash to be used for other financial purposes. For instance, in the SO<sub>2</sub> program, scrubbers were financed in part by the sale of the allowance streams that would no longer be needed once the scrubber was installed and operating.

A third and final reason for the non-controversial nature of the allowance assignment was the regulatory status of the recipients. Nearly all of the recipients in the three major US programs were electric utilities subject to cost-of-service regulation. In theory, a free allocation of allowances meant that electricity prices for the rate-payers of the recipient electric utilities would be lower. Whether this was the reality of electric utility regulation is another thing, but this idealized picture of regulation was firmly fixed in most people's minds and it put to rest any queasiness that might have been felt by those thinking more profoundly about the ultimate recipients of the allowance value being created by the cap.

In these early programs, cap-and-trade provided a welcome alternative to the conventional regulatory approaches that were becoming increasingly unable to effect further emission reductions. The clearest example of this is the RECLAIM program. The regulatory authority, the South Coast Air Quality District, had developed a detailed source-specific, command-and-control program to reduce NO<sub>x</sub> and SO<sub>2</sub> emissions sufficiently to bring Los Angeles into compliance with the National Ambient Air Quality Standards, but the plan was viewed as very costly and infeasible politically. Cap-and-trade provided the answer with a cap equal to the emissions level that would have been achieved by this prescriptive plan and the flexibility that would avoid the outlandish

instances of impracticality that could be used politically to weaken the program if not to block its implementation entirely.

The issue here was not legal authority. The Clean Air Act endowed regulators with plenty of authority in theory; the issue was always the practicality of exercising that authority. Cap-and-trade provided a preferred approach both to the regulators, who were more interested in achieving the emission reductions than in the distribution of allowance value, and to the regulated, who realized that cap-and-trade provided better protection against the potentially adverse effects of further regulation on existing profits than the always possible command-and-control alternative.

A similar situation obtained with the nearly contemporaneous Acid Rain SO<sub>2</sub> Trading Program. The 1970 Clean Air Act was not well designed for dealing with interstate pollution and a decade of failed legislative proposals in the 1980s for controlling acid rain precursor emissions, all of the command-and-control variety, prepared the way for the acceptance of this radically different approach when advanced in 1989 by the newly elected Bush Administration. As was the case with RECLAIM, legislators and the owners of affected facilities seemed to value the ability to deal with distributional and equitable concerns through allowance allocations.

The preference for cap-and-trade is also evident in the NO<sub>x</sub> Budget Program where states were given the choice of submitting a conventional State Implementation Plan in which they would have assigned the usual emission rate restrictions to affected sources or of adopting a common Model Rule and participating in the regional NO<sub>x</sub> emissions trading program. In both cases, states were assigned a “budget,” or limit on NO<sub>x</sub> emissions from within-state sources, that would have to be met. All but one state chose the trading alternative and the exception proved the rule. The few sources in New Hampshire were already in compliance with the assigned budget so that there was no need to take additional measures. Although the conventional regulatory alternative was an option in the NO<sub>x</sub> Budget Program, the actual choice of instrument indicates a clear preference for the cap-and-trade approach when further emission reductions were required.

A striking feature of all of these early US programs is the identical assignment of the allowances regardless of the process by which the program was created. The

allowances and the value embodied by them were granted for free to those required to surrender allowances equal to emissions. This assignment met the concerns of all involved. For the regulated, their essentially defensive concerns about the effect of an emissions constraint on their profits were met in a manner that was as good as if not better than the usual command-and-control alternative, and certainly better than a tax. For the legislators and regulators, allowances provided a quickly appreciated means of solving problems of equitable treatment without detracting from achievement of the environmental goal. Distributing allowances to those who could be expected as a whole to undertake the desired abatement was a lot easier than issuing a prescriptive rule and then having to amend it to fit the heterogeneous circumstances of the real world in which the rule had to be applied.

Some degree of innocence is displayed in the assignment of property rights in the early US programs. At a time when the dominant regulatory mode was command-and-control, with its proclivity for imposing obligations directly on emitting sources and not thinking about the distribution of a scarcely perceived scarcity rent, assigning both the obligation to surrender allowances and a certain number of free allowances to firms seemed an obvious way to proceed. The newly affected sources had been freely exercising the right to emit before and they would be the entities requiring allowances afterwards. These firms were not clamoring for the cap, but given its adoption, the receipt of free allowances calmed their justifiable fears about the effects of the new policy on their profits. Moreover, since nearly all the affected sources were in the cost-regulated electric utility sector, this arrangement was the more acceptable for being seen as lightening the cost burden on rate payers.

#### ***The Loss of Innocence: The EU ETS***<sup>4</sup>

The innocence that characterized allowance allocation in the early US programs was stripped away as using cap-and-trade came to be viewed as the means of limiting

---

<sup>4</sup> A symposium in the initial issue of the *Review of Environmental Economics and Policy* provides a good introduction to the EU ETS (Ellerman and Buchner, 2007; Convery and Redmond, 2007; and Kruger, Oates and Pizer, 2007). Other summary introductions are Ellerman and Joskow (2008) and Ellerman (2008). A comprehensive evaluation of the early years of the program is provided by Ellerman, Convery and de Perthuis (2010). The experience of allocating allowances is the subject of ten member-state case studies in Ellerman, Buchner and Carraro (2006). Delbeke (2006) provides a clear and thorough explanation of the development and resolution of issues that arose in implementation. The political context and history is superbly presented in Skjærseth and Wettstad (2008).

GHG emissions. The European Union's CO<sub>2</sub> Emissions Trading Scheme (EU ETS) marks the transition. It was the first cap-and-trade program to address GHG emissions and also the first to include sources outside of the electricity generation sector in a significant manner (about 40% of covered emissions). The EU ETS started out in 2005 with virtually 100% free allocation to incumbents, but auctioning was an issue from the beginning and it soon became the basic rule.

In response to initial stakeholder consultations, the European Commission did not include auctioning at all in the initially proposed trading system. However, in the next step in the EU legislative process, the European Parliament insisted upon some degree of mandatory auctioning with amendments that went so far as to make auctioning the only means of distributing allowances in the second (2008-12) period. In the subsequent back-and-forth between the Council of Ministers and the Parliament, the percentage of auctioning was whittled down and in the end, the mandatory inclusion of auctioning fell victim to mandatory participation in the first (2005-07) period. At the urging of strong industry lobbies, both the UK and Germany held out for member-state opt-outs for the first period based upon their own climate-change programs that relied largely on voluntary agreements with industry. In the final agreement, these two largest countries agreed to mandatory participation in the first period, but the price was the ability to issue all allowances free of charge (Skjærseth and Wetttestad, 2008, p. 126-132).

As a consequence, auctioning was only an option in the final Directive (European Union, 2003). Member states could auction up to 5% of the member-state total for the first period (2005-07) and up to 10% in the second period (2008-12). In other words, free allocation was mandatory for 95% and 90% of the member state's allowances and 100% free allocation was not precluded. The member state uptake of the auctioning option was not overwhelming. Only four member states (Denmark, Ireland, Hungary and Lithuania) choose to auction in the first period for a total of 0.13% of the total cap. In the second period, four more member states (Germany, the U.K., the Netherlands and Austria) auctioned some allowances and the percentage rose to 3.0%.

The combination of free allocation and high prices in the early years of the first trading period creating a huge outcry over the windfall profits received by electric utilities (although curiously not industrials). As a result, the Commission's proposal to

amend the Directive, which was based on the first period's experience, included provisions (European Commission, 2008) that

- established auctioning as the basic principle of allocation for the EU ETS,
- prohibited free allocation to electric utilities beginning in 2013,
- phased out free allocation to industrial facilities from 80% of baseline in 2013 to 0% in 2020, and
- allowed up to 100% free allocation for facilities in industrial sectors found to be trade-impacted.

The subsequent legislative process softened these provisions by allowing some East European countries to phase-out free allocation to electric utilities between 2013 and 2020 and extending the industrial phase out from 2020 to 2027. Still, about half of the allowances issued in 2013 will be auctioned and the remaining free allocation progressively phased out in favour of auctioning.

The most striking feature of the final compromise (European Union, 2009) is that mandatory auctioning, which was not possible politically when the initial Directive was debated in 2003, became so five years later. Although the attention given to windfall profits no doubt fuelled the demand for a change in allocation and provided political cover for those advocating auctioning, a more nuanced view would stress the issues at stake in the debates of 2003 and 2008.

The main issue in 2003 was whether to adopt a system and especially whether it would be mandatory for all member states in the first period. From the standpoint of the proponents of cap-and-trade, compromising on allocation was the price of enacting a system that would apply for all EU member states from the beginning. In 2008, when the system was established and had even become the source of some pride, the issue was no longer whether to continue it, but how to amend it in light of the experience in the first few years. The controversy over windfall profits helped ensure the adoption of auctioning as the basic principle of distribution, but not having to battle over whether the system should be continued made it possible to focus on these details of system design.

A notable feature of allocation in the EU ETS is the deference given to industries presumed to be subject to extra-EU competition. In both the first and second periods, industrial concerns were generally allocated enough allowances to meet their expected

needs and all the expected shortage was assigned to the electricity sector (Ellerman, Buchner, and Carraro, 2007, pp 357ff). This is readily evident in any ex post examination of the differences between allocations and emissions at affected facilities and of the flows of allowances for compliance, generally from East to West and from industry to the electricity sector (Ellerman and Buchner, 2006; Kettner *et al.*, 2007; Ellerman and Trotignon, 2009). Moreover these patterns will likely be continued in the post-2012 period because of the differentiation in member-state allocations favoring the poorer East European countries and the criteria for determining trade impact. The latter appears now to qualify virtually all industrial facilities as trade-impacted and therefore qualifying for 100% free allocation according to yet-to-be-determined industry benchmark emission rates.

Distributing auction rights among member state governments turned out to be easier than determining member state totals for emission rights. Among other things, the 2008 amendments did away with the entire structure of decentralized allocation that had been used in the first and second periods. Instead of the EU-wide cap being the sum of the emission rights distributed by each member state to sources within its jurisdiction, the amended Directive establishes an EU-wide cap effective in 2013 and it apportions auction rights among the participating member states. This latter provision reflects the understanding in the European Union that the central institutions (in particular, the Commission) cannot raise revenue through taxes or other means or determine how member states use their revenue. Accordingly, member states retain the right to distribute auction revenues however they wish.

The EU ETS marks the formal loss of innocence regarding the assignment of the property rights created by cap-and-trade systems. Although allocation was more controversial from the beginning in the EU than in the US, the initial assignment of rights reflected many of the same conditions that prevailed in the early US programs: the practical exigencies of getting a program started, a dominant command-and-control model, and a regulatory structure that in many countries implied that the allowance value would flow through to consumers. The difference was that wholesale generation markets were deregulated in many important member states and industrial customers purchased their power in the wholesale market without the buffering effect of retail regulation.

Perhaps predictably, industrial customers were the loudest in protesting the effect of carbon prices on electricity prices as a result of what came to be called windfall profits.

A mandated review of the program provided the opportunity to fine-tune the rules based on the early experience; and the form of allocation is one of the most important of the changes made. In contrast to the early American programs in which the rights have been granted in perpetuity, public auctioning is established as the basic principle of distribution and free allocation is to be phased out fairly rapidly. This dramatic change in form is however incomplete in that the ultimate recipients of the allowance value have yet to be determined. That choice will be made by each of the 27 participating member states as they start to auction sizeable numbers of allowances beginning in 2013. Whether this will prove easier than the allocation of free allowances in the first two periods is yet to be seen. To get a better sense of the possible assignment of allowance value with auctioning, we must turn to the currently debated proposals for a US GHG cap-and-trade program.

Still, and despite the significant movement away from free allocation, the concern for the effects of pricing access to the commons on existing profits is readily evident. The EU ETS was the first system to include industrial sectors and to draw the distinction in allocation based on potential trade impact. Whatever the theoretical or empirical justification, where pre-existing profits are viewed as being threatened, a claim for allowance value is clearly recognized. At the same time, it has become equally unacceptable that the profits of affected firms would be increased by the assignment of allowance value.

### ***The True Claimants Finally Emerge: The US GHG Proposals***

The debate concerning allocation in the U.S. has gone a step further in getting beyond the sterile dichotomy of auctioning vs. free allocation to confront openly the identity of the final recipients of the newly created allowance value. As the debate has moved from the Regional Greenhouse Gas Initiative (RGGI) in the north-eastern states to the legislative proposals developed in the Senate in the last Congress (2007-08) and then to the still more serious proposals in the present Congress (2009-10), a new but perhaps not surprising claimant has appeared—direct compensation to households.

RGGI entered into effect at the beginning of 2009 and it is the only state or regional cap-and-trade program implemented so far in the US. Although the Model Rule, which was developed to guide participating states in implementing the program, called for reserving 25% of allowances for public auction to be used for “consumer benefit or strategic energy purpose” (RGGI, 2006, p. 43), the final choices of all the participating states has been to auction 100% (or slightly less in some cases) of the allowances and to use the revenue exclusively for funding energy efficiency and renewable energy programs. The reasons for 100% auctioning and assignment to public uses from the beginning reflect three factors:

- the complete liberalization of the markets for electricity generation in the Northeast which implied that free allocation to generators would result in windfall profits,
- the greater awareness of the allowance value, in part because of the experience in the EU ETS, and
- the difficulty of continuing the funding of energy efficiency and renewable energy programs in a deregulated environment where the charge shows up as a separate line item on customers’ bills instead of being hidden in the costs of service to be recovered.

The GHG cap-and-trade measures that were considered by the Senate in the past Congress presented a compromise in splitting the anticipated allowance value approximately equally between the RGGI example of auctioning with revenue assigned to public uses and the practice in past cap-and-trade systems of free allocation to covered sources. These proposals failed to gain a majority, mostly because little effort was made to achieve regional compromise, but also due to the unprecedented expansion of government expenditure outside of the usual budgetary and appropriations process.

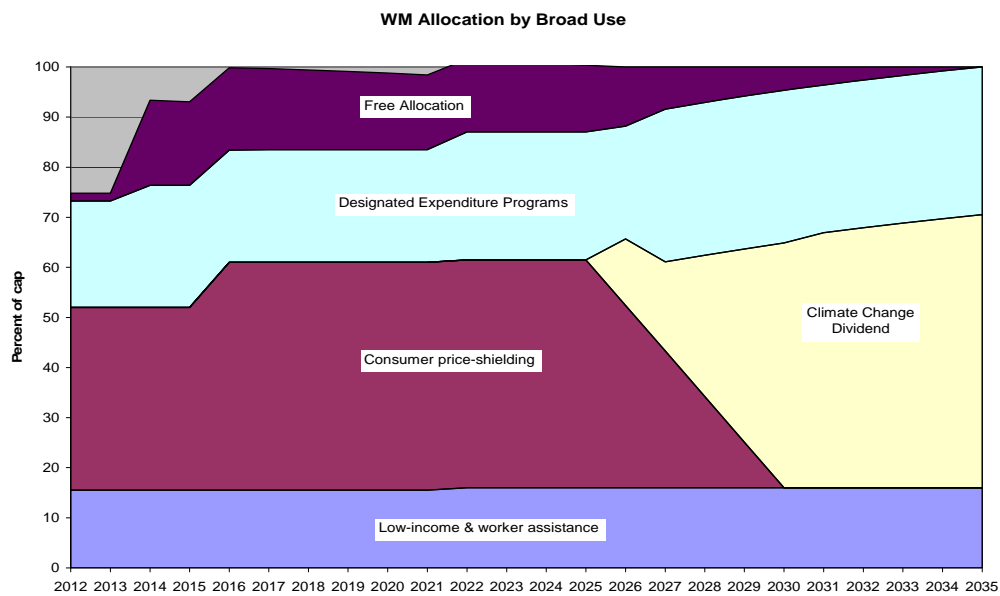
Subsequent proposals in the current Congress differ significantly.

- Free allocation to firms required to surrender allowances is limited to trade-impacted industry
- Funding of climate-related programs is scaled back considerably from the RGGI example or what had been proposed earlier in the US Senate.



- The majority of allowance value is dedicated to compensating consumers directly for the effects of a carbon price

These intended uses of allowance value are illustrated in the following figure which depicts these broad categories as embodied in the Waxman-Markey legislation that was approved by the House of Representatives in June 2009.



The most striking feature of this proposal is the extent to which direct compensation to consumers has replaced free allocation to incumbents and the funding of climate-related programs. Consumer compensation is represented by the lower three areas in this figure, with climate-related programs and free allocation occupying the top two bands. Consumer compensation starts out at 52% of allowance value and rises to 71% by the end of transition period, while special expenditure programs start out at 21% and rise eventually to 29%. Free allocation starts out with 1.5% of the cap, rises to a maximum of 17% when the industrial sector enters the program in 2014, declines to 12% in 2026, and is then phased out in 10% increments by 2035.<sup>5</sup> The Senate version of the legislation largely follows this pattern of allocation except that the shares apply to a smaller pie since 25% of the allowances are initially set aside for auctioning to reduce the federal deficit

<sup>5</sup> The unallocated shares in the early years reflect the delayed entrance of the industrial sector and the natural gas distribution companies prior to 2016.

Consumer compensation is accomplished through an unchanging 15% allocation in favor of low income households and a much larger share of allowance value that is distributed to households without regard to income level. The 15% tranche is aimed at countering the regressive effects of higher energy prices by auctioning these allowances and distributing the proceeds through direct cash transfers to low-income households. The much larger component of consumer compensation operates initially by passing the allowance value through to households by means of existing regulatory institutions governing the retail distribution of electricity and natural gas.<sup>6</sup> The mechanism then changes to a federal auction and the direct distribution of the proceeds to households on a per capita basis.

Special expenditure programs are all climate-related but broader in scope than the energy efficiency and renewable energy uses that were featured in RGGI. Other designated purposes are avoidance of tropical deforestation, domestic and international adaptation, international technology transfer, carbon capture and sequestration, advanced automobile technology, and clean energy research and development

Free allocation to entities required to surrender allowances against emissions is to be made only to industrial installations based on potential international trade impact. In fact even among this group, free allocation cannot be taken for granted. The remaining free allocation to industrial installations of approximately 15% of the cap is mediated through an allowance rebate program in which eligible industrial sectors will be defined by rule based on the trade and carbon intensity of each sector's output.<sup>7</sup> Installations in eligible sectors would then be rebated annually on a product-output basis. This program may continue beyond 2026 if a Presidential determination is made that less than 70% of the global output of the sector is subject to comparable greenhouse gas controls.

The current proposals for a US GHG program move beyond the familiar auctioning vs. free allocation debate with the unspoken presumption that auctioned allowances would be used for public uses and that freely allocated allowances would be

---

<sup>6</sup> How this distribution will actually work depends on state public utility commissions who regulate the prices of electricity and natural gas distributed to retail household customers.

<sup>7</sup> The only exception would be the refining sector whose allocation of two percent from 2014 to 2026 is not dependent on a determination of trade impact. The allocation represents process emissions and it is a small proportion of the total number of allowances that refineries will be required to surrender since they must also cover the carbon content of all refined products sold for domestic consumption.

awarded only to corporate entities. Whether to auction or to allocate freely has become a technical detail as the debate focuses squarely on the intended recipient of allowance value. Perhaps not surprisingly, free allocation to public entities, which would sell the allowances and use the revenues for designated public purposes, has given conservatives reason to oppose free allocation with the same intensity that liberals have inveighed against free allocation to private entities. The beneficiaries of this emerging stand-off will be consumers, who are after all the origin of the demand for the goods and services that cause the harm and those who will bear the final cost of measures taken to reduce these harmful effects. This consumer interest in compensation has been slow to assert itself, but it appears finally to have done so.

## **CONCLUSION**

If the final U.S. GHG cap-and-trade program resembles the current lead proposals in the Congress, the assignment of property rights in air emissions markets will have undergone a complete transformation in form. From being assigned entirely to the emitting sources included within the program through free allocation, allowances are now to be mostly auctioned and the proceeds returned directly to households. This evolution reflects both an increasing awareness of the distributional issues involved when value is created without obvious claimants and a continuing concern to avoid radical changes in the ex ante positions of entities and persons most affected by the change in policy.

The evolution of these assignments of allowance value reflects the special characteristics of air emissions markets. When a market is to be created from scratch and the motivation is the avoidance of social harm, there are no obvious claimants for the value created. The early claims of producing firms for free allocation were motivated not so much by attempts to draw benefit from the exploitation of the common pool resource as by an essentially defensive concern for the effects of the proposed constraint on their pre-existing profits. While this concern is justifiable and one that must be and is addressed, free allocation is in most cases double compensation since competitive markets can be assumed to reflect the new cost of emissions. Those benefiting from the removal of the harm have been long in perceiving their rightful claim to allowance value, mostly because the compensating value in lower product prices has not been widely recognized. The slow but inevitable recognition of this circumstance is forming the basis

for assigning most of the allowance value directly to consumers, who are both those who ultimately pay and those who are the ultimate source of the harm.

At a deeper level, the evolution in the assignment of property rights in air emissions markets represents a return, after some stumbling, to the principle recognized by Libecap. The motivation for creating air emissions markets has not been maintaining profits from the exploitation of a common pool resource, but something very similar is proving to be needed for the further development of these markets. Allocation is evolving towards preserving the unrecognized benefits of free access for those whose over-use of the common pool resource now requires charging for that access. To quote the immortal words of Pogo: “We have met the enemy and he is us.”

## REFERENCES

- Aulisi, Andrew, Jonathan Pershing, Alexander E. Farrell, and Stacy VanDeveer (2005). *Greenhouse Gas Trading in U.S. States: Observations and Lessons from the OTC NOx Budget Trading Program*. Washington, D.C.: World Resources Institute.
- Barnes, Peter (1999). "The Pollution Dividend" *The American Prospect* 44 (May/June), pp. 61-67.
- Buchanan, James M. and Gordon Tullock (1975). "Polluters' Profits and Political Response: Direct Controls versus Taxes," *American Economic Review* 65(1):139-47.
- Burtraw, Dallas and Karen Palmer (2004). "SO<sub>2</sub> Cap-and-Trade Program in the United States: A 'Living Legend' of Market Effectiveness" in Harrington, Winston, Richard D. Morgenstern, and Thomas Sterner (eds). *Choosing Environmental Policy: Comparing Instruments and Outcomes in the United States and Europe*. Washington: Resources for the Future.
- Congressional Budget Office (2007). *Trade-offs in Allocating Allowances for CO<sub>2</sub> Emissions*. Economic and Budget Issue Brief dated April 25, 2007.
- Convery, Frank J. and Luke Redmond (2007). "Market and Price Developments in the European Union Emissions Trading Scheme" *Review of Environmental Economics and Policy* I(1)(winter): 88-111.
- Delbeke, Jos (ed.) (2006). *EU Environmental Law: The EU Greenhouse Gas Emissions Trading Scheme* (volume IV of EU Energy Law). Leuven, Belgium: Claeys & Casteels.
- Dinan, Terry and Diane Lim Rogers (2002). "Distributional Effects of Carbon Allowance Trading: How Government Decisions Determine Winners and Losers," *National Tax Journal* 55:2 (June), pp. 199-221.
- Ellerman, A. Denny (2004). "The U.S. SO<sub>2</sub> Cap-and-Trade Programme" *Tradeable Permits: Policy Evaluation, Design and Reform*. Paris: OECD. pp. 71-97.
- Ellerman, A. Denny (2006). "Are cap-and-trade programs more environmentally effective than conventional regulation?" in Kolstad, Charles and Jody Freeman (eds.) *Moving to Markets in Environmental Regulation: Lessons from Twenty Years of Experience*. Oxford and New York: Oxford University Press.
- Ellerman, A. Denny (2008). "Lessons for the United States from the European Union's CO<sub>2</sub> Emissions Trading Scheme" in *Cap-and-Trade: Contributions to the Design of a U.S. Greenhouse Gas Program*. Cambridge, MA: MIT Center for Energy and Environmental Policy Research.
- Ellerman, A. Denny, Paul L. Joskow, Richard Schmalensee, Juan-Pablo Montero and Elizabeth M. Bailey (2000). *Markets for Clean Air: The U.S. Acid Rain Program*. Cambridge and New York: Cambridge University Press.

- Ellerman, A. Denny, Paul L. Joskow, and David Harrison, Jr. (2003). *Emissions Trading: Experience, Lessons, and Considerations for Greenhouse Gases*. Washington, D.C.: Pew Center on Global Climate Change.
- Ellerman, A. Denny and Barbara K. Buchner (2007). "The European Union Emissions Trading Scheme: Origins, Allocation and Early Results" *Review of Environmental Economics and Policy* I(1)(winter): 66-87.
- Ellerman, A. Denny, Barbara K. Buchner and Carlo Carraro (eds.) (2007). *Allocation in the European Emissions Trading Scheme: Rights, Rents and Fairness*. Cambridge and New York: Cambridge University Press.
- Ellerman, A. Denny and Barbara K. Buchner (2008). "Over-allocation or Abatement? A Preliminary Analysis of the EU ETS Based on the 2005-06 Emissions Data", *Environmental & Resource Economics*, 41:2 (Oct), pp. 267-287.
- Ellerman, A. Denny and Paul L. Joskow (2008). *The European Union's Emissions Trading System in Perspective*. Washington, D.C.: Pew Center on Global Climate Change.
- Ellerman, A. Denny and Raphael Trotignon (2009). "Cross-border Trading and Borrowing in the EU ETS" *The Energy Journal* 30(2) (special issue, October), pp. 53-78.
- Ellerman, A. Denny, Frank J. Convery and Christian de Perthuis (2010). *Pricing Carbon: The European Union Emissions Trading Scheme*. Cambridge and New York: Cambridge University Press.
- European Commission (2008). "Proposal for a Directive of the European Parliament and of the Council Amending Directive 2003/87/EC so as to Improve and Extend the Greenhouse Gas Emission Allowance Trading System of the Community." COM(2008) 16 final, 23 January.
- European Union (2003). "Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC." *Official Journal of the European Union* L275, pp. 32-46, 25 October 2003.
- European Union (2009). "Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community" *Official Journal of the European Union* L140, pp. 63-87, 5 June 2009.
- Goulder, Lawrence H., Ian W. H. Parry, and Dallas Burtraw (1997). "Revenue-raising vs. other approaches to environmental protection: the critical significance of pre-existing tax distortions" *RAND Journal of Economics* 28:4 (Winter), 708-31.
- Harrison, David, Jr. (2004) "Ex post evaluation of the RECLAIM Emissions Trading Programmes for the Los Angeles Basin" *Tradeable Permits: Policy Evaluation, Design and Reform*. Paris: OECD. pp. 45-69.

- Kettner, Claudia, A. Koepl, S.P. Schleicher, and G. Thenius, G (2007). *EU Emissions Trading Scheme: The 2005 evidence*. Working Paper 22.2007, Fondazione Eni Enrico Mattei, Milan.
- Kruger, Joseph, Wallace E. Oates, and William A. Pizer (2007). "Decentralization in the EU Emissions Trading Scheme and Lessons for Global Policy" *Review of Environmental Economics and Policy* I(1)(winter): 112-133.
- Libecap, Gary D. (1989) *Contracting for Property Rights*. Cambridge, New York, and Melbourne: Cambridge University Press.
- Metcalf, Gilbert E. (2007) *A Proposal for a U.S. Carbon Tax Swap: An Equitable Tax Reform to Address Global Climate Change*. Discussion Paper 2007-12. Washington: The Brookings Institution, 2007.
- Orszag, Peter R. (2007) *Approaches to Reducing Carbon Dioxide Emissions*. Written testimony before the Committee on the Budget, U.S. House of Representatives, November 1, 2007.
- Parry, Ian H. W., Roberton C. Williams III, and Lawrence H. Goulder (1999). "When can carbon abatement policies increase welfare? The fundamental role of distorted factor markets" *Environmental Economics and Management* 37:1 (1999), 52-84.
- Regional Greenhouse Gas Initiative (RGGI) (2006). *Model Rule* (8/15/2006), available at: <http://www.rggi.org/docs/Model%20Rule%20Corrected%208.15.06.pdf>.
- Schmalensee, Richard, Paul L. Joskow, A. Denny Ellerman, Juan-Pablo Montero and Elizabeth M. Bailey (1998). "An Interim Evaluation of Sulfur Dioxide Emissions Trading" *Journal of Economic Perspectives*, 12(3):53-68 (summer).
- Skjærseth, Jon Birger and Jørgen Wettestad (2008). *EU Emissions Trading: Initiation, Decision-making and Implementation*. UK: Ashgate Publishing.
- Stavins, Robert N. (1998). "What Can We Learn from the Grand Policy Experiment? Lessons from SO<sub>2</sub> Allowance Trading" *Journal of Economic Perspectives*, 12(3):69-88 (summer).
- Tietenberg, Thomas H. (2006). *Emissions Trading: Principles and Practice* (2<sup>nd</sup> edition). Washington: Resources for the Future.
- US Environmental Protection Agency (US EPA) (various). *Progress Report*, various years by program, available at <http://www.epa.gov/airmarkets/progress/progress-reports.html>.