

AIR EMISSIONS MARKETS¹

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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 limitation of aggregate emissions—and trading—the flexibility and least-cost properties associated with it. Until recently, relatively little interest has been directed to the creation and distribution of the property rights that are the essential mechanism by which cap-and-trade systems work. This paper focuses specifically on this aspect, more commonly known as allocation in the spirit of Libecap's *Contracting for Property Rights* (1989). The arguments made in this paper are 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 value that is created by these systems. The following section, which constitutes the bulk of the paper, analyzes the assignment of the property rights and of the value associated with them in

¹ This is a first draft with minimal referencing and to be used only for discussion purposes. Comments are welcome either in person at the Florence workshop or by email to ellerman@mit.edu.

the early US programs, the EU ETS, and more recently 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 realization 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 resource, in this case, the use of the atmosphere as a repository for emissions streams. An important characteristic of this problem is that the parties whose activities lead to the over-use of the resource, and whose use is to be restricted, draw little if any profit from the exploitation of the common pool resource. 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 the free 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 are not those whose access is to be rationed. Second, these latter will see little interest in constructing a market since they draw no profit from the use of the resource and will be concerned mainly about the consequences of pricing access on their existing profits. Third, those demanding action will as often as not fail to perceive that it is they, as the ultimate consumers of the goods being produced, who are the ultimate source of the problem. As a consequence, their expectation is, as often as not, that the harm will be removed without any further consequence on the prices of the goods that they consume. Or to paraphrase a common slogan, they believe that the polluter should pay without realizing that it is they who are the ultimate polluter and that

the polluter is only an agent of their desires. The agency problems created by 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 entities 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 constraint that they seek.

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, but the first impulse for dealing with the problem has been prohibition or some other form of legal prescription that limits 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, 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. This approach also creates value in the form of scarcity rents, but they are well hidden—unlike the case for cap-and-trade—and this can be an advantage in the political realm.

A FRAMEWORK FOR THINKING ABOUT 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, generally meaning an assignment to public use, or grandfathered, generally understood as being assigned to corporate entities that own the covered facilities. This is an oversimplified picture but it captures the main line of debate. The over-simplification occurs because it obscures who are the ultimate recipients of the allowance value since both government and corporations are legal shells. When allowances are assigned to an incumbent that is a corporate entity, profits are increased approximately by 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, upon which taxes are also paid. If the corporate entity is price-regulated on a cost-of-service basis, the allowance value is presumed to be passed through to rate-payers since no cash cost is incurred. Rate payers are also the presumed ultimate recipient when allowances are assigned to non-profit entities, such as rural coops, municipalities, and government owned corporations. When allowance value is passed through to consumers in either the cost-of-service or non-profit cases, there is also nothing to tax and therefore no return of allowance value to the government.

The passing of the allowance value through to rate-payers in regulated and non-profit cases does create an inefficiency in forsaking the demand adjustments that these rate-payers would make if they faced the full price of the newly limited emissions, as would occur where competitive, for-profit entities recognize the opportunity cost and capture the scarcity rent for their shareholders (and the government). However, questions can be raised in the regulated and non-profit cases concerning whether regulatory practice results in the allowance value being passed through to rate-payers. For instance, rate-regulated electric utilities act as if they capture these rents and it can be argued that regulatory lag, asymmetrical rate treatment for over- and under-recover of costs, and performance-based rate-making create circumstances whereby regulated utilities in fact capture the allowance value. This is however a very complicated subject which must be set aside here.

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 grandfathering. 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 inefficiency that is attributed to grandfathering.

A second possible use of auction revenue is a per capita distribution of the auction revenues to citizens, now called “cap-and-dividend.” 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 are attractive since recipients of income from capital are predominantly in the upper income quintiles and because most of the taxes are also paid by the upper income quintiles (Dinan and Lim, 2003?). Serious proposals have been made to reduce taxes only for the lower income quintiles (Metcalf, 200?); 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 is increased government expenditure typically for some use related to climate change, such as 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. Payments could also be made to the corporate entities who are the recipients of free allowance allocations, but this use never figures in arguments concerning the use of auction revenues. No doubt, these recipients would prefer to receive the value in kind, in the form of allowances, because that form of distribution would be less subject to later amendment.

The final potential recipient of auction revenues is the Treasury, as for any other tax, 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, the Acid Rain SO₂ Trading Program, the NO_x Budget Program, and the RECLAIM Program in the Los Angeles Basin. The distinguishing characteristic of allocation in this phase 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 CO₂ Emissions Trading Scheme in which allowances were initially assigned almost entirely to emission sources, albeit with increasing controversy that has led to the adoption of a phasing-out of free allocation without much attention to the ultimate recipients of the allowance value. The third phase is represented by the current proposals in the US for a GHG cap-and-trade program in which allocation has become the most controversial aspect of legislative debate and the distribution of allowance value is almost completely separated from emission sources.

The Age of Innocence: The Early US Programs

All of the early US programs—the Acid Rain SO₂ Trading Program, beginning in 1995, the Los Angeles RECLAIM Programs for NO_x and SO₂ beginning in 1994, and the NO_x Trading Program in the Northeastern states beginning in 1999 that became the larger national NO_x 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 typically carefully asserted. Finally, this assignment was non-controversial, at least compared to what would appear in later programs and proposals.

Several reasons can be adduced for the non-controversial aspect of the early allowance allocations. The first is that this aspect of cap-and-trade was poorly understood in these early years, at least by the general policy community. The arguments for adopting the early cap-and-trade programs emphasized their least-cost aspects and their

potential effectiveness in addressing the pollution problem. Also, adoption of these programs was in many ways a response to the exhaustion of the conventional, prescriptive approach to air emission regulation in dealing with more complex pollution problems. Participants, including the legislators or regulators who enacted the programs, were aware of the distributive aspects, but allocation was never a major issue in the public discussion.

A second reason for the lack of controversy over allocation was the regulatory precedent. The value created by a constraint 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 than on the distributive aspects. An important exception was Buchanan and Tullock (197?) who hypothesized that the capture of this value was the reason that emission sources preferred 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 cap-and-trade.

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 SO₂ program, scrubbers were financed in part by the sale of the allowance streams that would not longer be needed once the scrubber was installed and operating.

A third 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.

A final reason for the lack of controversy is that the conventional regulatory approaches were largely viewed as infeasible. The clearest example of this is the RECLAIM programs. The regulatory authority, South Coast Air Quality District (SCAQD), had developed a detailed source-specific, command-and-control program to reduce NO_x and SO₂ emissions sufficiently to bring Los Angeles into compliance with the National Ambient Air Quality Standards established as a consequence of the 1970 Clean Air Act Amendments, 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 the SCAQD Plan and the flexibility that would avoid the egregious examples that could be used politically to weaken the program's effectiveness. 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 perceived better protection against potential adverse effects of the constraint on their existing profits.

A similar situation obtained with the nearly contemporaneous Acid Rain SO₂ Trading Program. The 1970 Clean Air Act was not well designed for dealing with inter-state pollution and a decade of failed legislative proposals 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 proposed in 1989 by the newly elected Bush Administration. As was the case with RECLAIM, legislators and the owners of affected facilities appreciated the ability to deal with the distributional concerns through allowance allocations.

The preference for cap-and-trade is also evident in the NOx 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 Model Rule and participating in the regional NOx emissions trading program. In both cases, states were assigned a “budget” or limit on NOx 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 NOx Budget Program, the choices made clearly indicate a preference for the cap-and-trade approach by state regulators and presumably those regulated by them.

The striking feature of all of these early US programs is that the assignment of the allowances was identical regardless of the process by which the program was created. The allowances and the value embodied by them were granted for free 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. Granting allowances in some amount to those who would be expected to undertake abatement actions in any case was a lot easier than issuing a rule and then having to amend it to fit the heterogeneous circumstances of the real world in which the rule had to be applied.

The Loss of Innocence: The EU ETS

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 GHG and more particularly CO2 emissions. The European Union’s CO2 Emissions Trading Scheme, which started in 2005, marks the transition. The EU ETS started out with virtually 100% grandfathering to incumbents, but auctioning was an issue in the

adoption of the EU ETS and it will become the basic rule as a result of the amendments adopted in December 2008.

When the European Commission initially proposed the EU ETS, no auctioning was included in response to stakeholder comments; however, the European Parliament insisted upon the addition of mandatory auctioning with amendments that went so far as to make auctioning the only means of distributing allowances in the second 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 trial period. At the urging of strong industry lobbies, both the UK and Germany held out for member-state opt-outs for the first, trial 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. As a consequence, auctioning was only an option in the final directive, which allowed member states to 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 excluded.

The member state uptake of the auctioning option was not overwhelming. As shown in the table below only four member states 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 decided to auction (including Germany and the UK) and the percentage rose to 3.0%.

Member state	Annual quantity (million tonnes)		Percentage of MS total	
	2005-07	2008-12	2005-07	2008-12
Denmark	1.675	0.08	5.00%	0.3%
Hungary	0.78	0.54a	2.5%	2.00%
Lithuania	0.18	0.26a	1.5%	2.9%
Ireland	0.17	0.11	0.75%	0.5%
Germany	0	40	0	8.8%
UK	0	17.23	0	7.00%
Netherlands	0	3.2	0	3.7%
Austria	0	0.4	0	1.3%
EU ETS Total	2.81	61.82	0.13%	3.00%

a. The quantities for Hungary and Lithuania reflect announced intentions pending final notifications of the second period amounts in the CITL.

The motivations for auctioning vary. For instance, Ireland's auction was set up explicitly to fund the agency created to administer the EU ETS and the size of the auction reflects expected budget needs. Denmark's choice of the maximum allowed auction in the first period was intended to set an example, which the country abandoned when no other member state followed. Revenue from Denmark's auction was treated as general revenue during the first period, as were the revenues from the auctions in Hungary and Lithuania, although the revenue from these latter two barely covered the cost of conducting the auctions since they were conducted late in the first period after the price had sunk to very low levels. [Complete for second period motivation after checking].

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 proposal to amend the Directive based on the first period's experience included provisions 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 any industrial facility found to be trade-impacted. The subsequent legislative process allowed qualifying East European countries to phase-out free allocation to electric utilities between 2013 and 2020 and extended the industrial phase out from 2020 to 2027.

All in all, 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 2008 amendments concerning the distribution of allowances is that what was not possible politically in 2003, when the initial Directive was debated, became so five years later. The proximate cause was the political controversy about wind-fall profits that arose in the course of 2005 and into 2006 as prices rose to unexpectedly high levels before falling dramatically with equal lack of anticipation. Although this uproar no doubt fuelled the demand for a change and provided political cover, a more nuanced view would stress the issues at stake in 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 the measure, compromising on allocation was the price of enacting a system that would apply for all EU member states. 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 second feature of note is the deference given to industries subject (in theory) to extra-EU competition. The strikingly different treatment of the electricity and industrial sectors first became evident in the first period allocations in the assignment of the expected shortage to the electricity sector on the rationale that its output and the jobs associated therewith would not be jeopardized by 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 shortage was assigned to the electricity sector. This is readily evident in any ex post examination of the differences between allocations and emissions at affected facilities and the flows of allowances for compliance, generally from East to West and from industry to the electricity sector. Moreover these patterns will likely be continued in the post-2012 period based on the criteria for determining trade impact, which 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. Whether free allocation would actually protect EU production and jobs in these industries is not at issue, at least not yet; the claim is believed. This outcome was made the easier by division within the electric utility industry. Coal-fired utilities in the EU15 tended to oppose full auctioning, but others that were more endowed with hydro and nuclear generation were more supportive since they received relatively fewer allowances and the infra-marginal rents accruing to their hydro and nuclear generation would not be affected.

The distinction based on potential trade-impact, which was drawn first in the EU ETS, emphasizes the concern for avoiding distributive effects that would jeopardize existing profits. It was equally unacceptable that the profits of affected firms would be increased by the assignment of allowance value and that they would be diminished by the imposition of a carbon price. Whatever the theoretical or empirical justification, where pre-existing profits are viewed as being threatened, a claim for allowance value is clearly recognized.

Finally, distributing auction rights among member state governments turned out to be more efficacious in gaining consensus than determining member state totals for emission rights. Among other things, the 2008 amendments did away with the entire structure of allocation that had been used in the first and second periods. Instead of the EU-wide cap being the sum of the emission rights to be distributed by each government to sources within its jurisdiction, an EU-wide cap effective in 2013 has been established in the amended Directive. Since the Commission cannot raise its own revenue through taxes or other means, the adoption of the principle of full auctioning meant that the member state governments would be the recipients of the auction revenues and that auction rights (instead of emissions caps) would be allocated to the constituent member states. The Commission's initial proposal for an amended Directive would have required that member states dedicate 20% of auction revenues to climate-related programs; however, this proposal violated the long-held principle that the Commission cannot tell member states how to spend their revenue. As a result, the final legislation simply expresses a wish that member states will use up to 50% of the auction revenues for

climate-related purposes. Accordingly, member states retain the right to distribute auction revenues however they wish, including to incumbents. In this sense, the EU allocation remains incomplete in that the final recipients are not identified. All that is known now is that those recipients will be decided by the political processes in each member state and that there is an expressed wish that the auction revenue be used for climate-related programs. 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.

The True Claimants Finally Emerge: The US GHG Proposals

The transition from the assignment of allowance value to incumbent emitters in perpetuity to public uses appears to be completed with the only existing CO₂ cap-and-trade system in the US, the Regional Greenhouse Gas Initiative (RGGI), in the north-eastern states, and the more significant federal proposals that continue to be under active consideration in the US Congress. The key distinction in these proposals is that few of the allowances are initially assigned to the entities that are subject to surrender requirements and those that are so assigned will be phased out in time. Although auctioning will be the prevailing form of distributed allowances to emissions sources, little if any of the allowance value will be dedicated to reducing distortionary taxes or to reducing the budget deficit. Climate-related programs some funding, but the major recipient in the latest iteration, the bill now moving through the US House of Representatives, will be consumers.

RGGI entered into effect at the beginning of 2009 and it is the only state or regional cap-and-trade program to be implemented in the US. Although the initial proposal called for participating states to reserve 25% of allowances for public auction to be used for public and consumer benefit, the final choices of all the participating states have 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. Since the RGGI cap is widely regarded as non-binding, the price of the allowances auctioned to date has been low (about \$3.50/metric ton) and the allowance value not great. The reasons for 100% auctioning from the beginning reflect three factors: 1) the

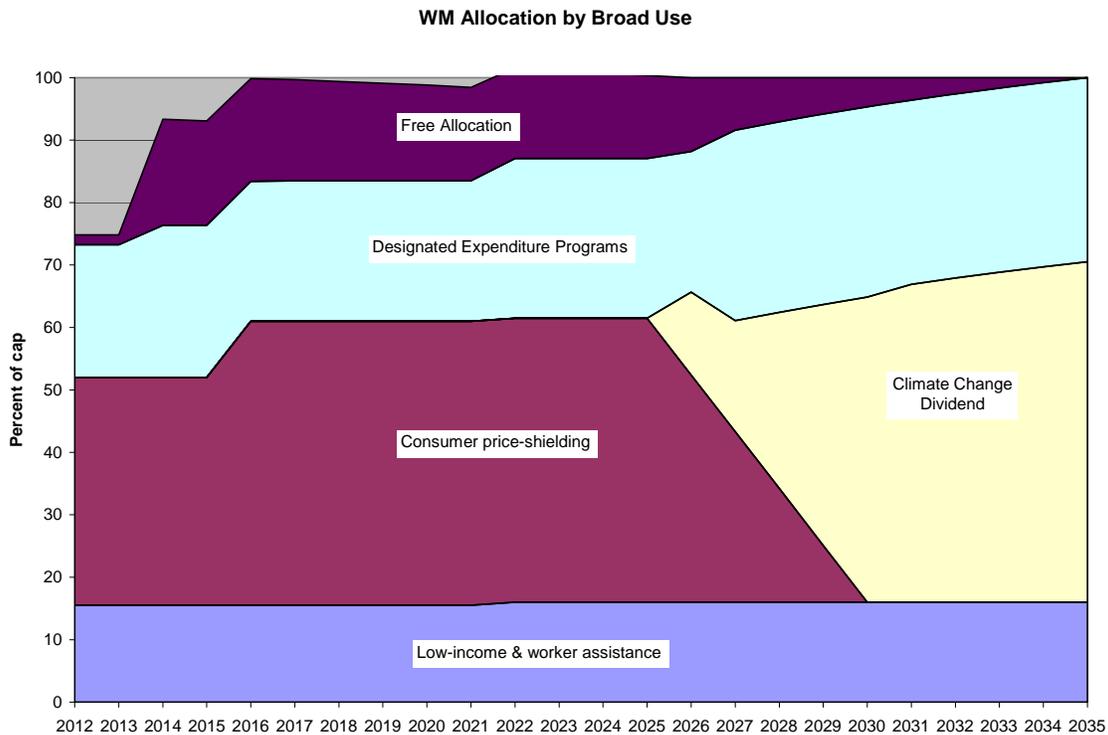
greater awareness of the allowance value in part because of the experience in the EU ETS, 2) the complete liberalization of the markets for electricity generation in the Northeast which implied a repeat of the experience in the EU ETS, and 3) the difficulty of continuing the funding of demand-side management (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 had been considered in past years by the US Senate followed the RGGI format for distributing allowance value although with a significant level of free allocation to incumbent emitters that would be phased out eventually. These proposals failed to gain a majority, mostly because little effort was made to achieve regional compromise, but also due to the appearance of the auctions as a means of funding barely disguised “pork” outside of the usual budgetary and appropriations process. This year’s Waxman-Market proposal, which has just gained approval in the House Energy and Commerce Committee, differs in important ways and it is the proposal that will be described below as an example of the latest evolution of political practice and thinking.

The distinctive features of the Waxman-Markey bill as it has emerged from committee are:

- The majority of allowance value is dedicated to compensating consumers for the effects of a carbon price
- Free allocation to entities required to surrender allowances is limited to trade-impacted industry
- Funding of special programs is scaled back considerably from the RGGI example or what has been proposed in earlier proposals in the US Senate

The exact percentages of these allocations will undoubtedly undergo some change as this legislative proposal wends its way through the remaining legislative process. Final passage and enactment into law is not certain, although that outcome is widely expected. Still, it has cleared one of the most important and representative committees in the US Congress and the broad outlines seem likely to be preserved. The general recipients of allowance value are illustrated in the following figure.



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 bands in this figure, with climate related programs and free allocation occupying the top two bands. Consumer compensation starts out at 52% of the cap and rises to 71% by the end of transition period, while special programs start out at 21% of the cap 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. The unallocated shares of the cap in the early years reflect the delayed entrance of the industrial sector and the natural gas distribution companies prior to 2016. Explicit provision is made for any unallocated shares from 2016 through 2025 to be sold at auction and the proceeds to go to the Treasury.

The three programs by which consumer compensation is effected imply a shift in the recipients over time from being exclusively within-household uses to also including household transportation use from 2026 on. The largest component of consumer

compensation occurs initially through a mechanism that concerns only electricity and home heating fuel uses, but this mechanism is succeeded by a per capita Climate Change Dividend that will start in 2026. The initial allocations will be made to the regulated local distribution companies (LDCs) through which all electricity and natural gas is provided to retail and commercial customers and to the states in proportion to home heating oil and propane use for home heating. The proportions of the cap for electricity, natural gas, and home heating oil and propane are 35%, 9%, and 1.5% through 2026 after which they are phased out ratably over a five-year period. Since the recipients are not required to surrender allowances (with the exception of the natural gas LDCs), these allowances will be sold presumably by auction to those requiring allowances and the revenues used as an offset to the cost of electricity purchased or supplied for distribution to retail customers. In effect, the allowance value is to be passed through to rate-payers. Costs incurred for undertaking abatement (or purchasing still more allowances in lieu of abatement) would have to be recovered in the rates charged, but customers would be shielded from the major cost of the cap-and-trade program, the scarcity rent, until the phase-out begins in 2026. Thereafter, unallocated auction revenues would be distributed on a per capita basis. The main effect of this change will be to shift the basis of compensation away from only the household uses of energy excluding transportation to a more comprehensive basis that will also compensate consumers for the costs imposed on emissions from transportation uses. The third component of the consumer compensation segment is directly targeted to low income households (15%) and worker assistance (0.5% rising to 1% in 2022) in order to compensate for the regressive effects of carbon pricing and worker displacement.

Aside from their reduced scope compared with RGGI and earlier Senate proposals, the notable feature of the specially designated uses is the shift from programs promoting near-term abatement to those fostering adaptation, technology transfer, and carbon capture and sequestration. The former category includes promotion of renewable energy and energy efficiency programs (from an initial 8% to a final 5%), avoidance of tropical deforestation (from 5% to 2%), and investment in advanced automobile technology (3% to 0%). The latter category includes domestic adaptation (2% to 8%), international adaptation (1% to 4%), international technology transfer (1% to 4%), and

carbon capture and sequestration (0% to 5%). Finally, funding for clean energy R&D centers remains at 1.5% throughout.

Free allocation to entities required to surrender allowances against emissions is made only to industrial installations based on potential international trade impact. In fact even among this group, a free allocation cannot be taken for granted. The only sector entitled to an unambiguous free allocation is the refinery sector with 2% of the total from 2014 through 2026. This is significantly less than the total number of allowances refiners will need to surrender beginning in 2012 to cover the carbon content of all the products they distribute downstream. The 2% free allocation is intended to cover process emissions from refineries, which come under the cap in 2014 along with other industrial emissions, in order to preserve their position against product imports from off-shore refiners, whose exports to the US market would be subject to the same allowance surrender requirements as the refinery products. The remaining free allocation to industrial installations of approximately 15% of the cap is mediated through an allowance rebate program for eligible industrial sectors, which are to be defined by rule based on the trade and carbon intensity of each sector's output. 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.

DISCUSSION/CONCLUSION

If the final GHG cap-and-trade program in the US resembles the committee-approved Waxman-Markey bill, the assignment of property rights in cap-and-trade programs will have undergone a complete transformation in form, if not entirely in the recipients of the allowance value. From being assigned entirely to the emitting sources included within the program through free allocation, allowances are now to be overwhelmingly auctioned. This evolution in form 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 assignment of property rights in the early US programs displayed some degree of innocence, but the distributions were practical and their distributive effects were not that different due to the form of price regulation then prevailing for the electricity generating facilities that were largely the only sources subject to these 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 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. The exercise of these rights would now be limited in the aggregate, but their exercise by individual sources would be recognized to some extent. These entities 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. Given the prevailing mode of price regulation, this arrangement was the more acceptable by lightening the cost burden that would be passed on to rate payers. This distributive outcome is not that different from that envisaged for the first fifteen years of the currently proposed US GHG cap-and-trade program.

The EU ETS marks the formal loss of innocence regarding the assignment of the property rights created by cap-and-trade systems. Although more controversial from the beginning, the assignment of rights initially 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 largely deregulated and industrial customers purchased their power in the wholesale market without the buffering effect of retail regulation. Perhaps predictably, it was they who were the loudest to protest the effect of carbon prices on electricity prices as a result of windfall profits. The review of the program mandated in the initial Directive 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, or produce results different from, the allocation of free allowances under the existing structure is yet to be seen.

The EU ETS also marks the appearance of what has proved a durable feature in the allocation of allowances in GHG programs, the preferential treatment of installations that are deemed to be exposed to competitors not facing a price on GHG emissions. This distinction first emerged in the decision in a number of member states concerning which sectors would receive fewer than their expected emissions where the cap was regarded as binding. Trade-exposure became the basis for allocating industrial sectors as many allowances as were felt to be needed and allocating all of the shortage to the electricity sector on the reasoning that it would experience fewer effects given its captive market. This rationale has now been extended as the basis for a slower phase out of free allocation and what is potentially a permanent exception from auctioning for at least some sectors whose pre-existing positions are believed to be jeopardized by the adoption of a constraint on carbon emissions.

The current US GHG programs and proposals mark a further evolution in the assignment of property rights in which little is left to doubt concerning the recipient of the allowance value. With the exception of installations in sectors judged to be trade-exposed, no emitter will receive a free allocation of allowances. However, the allowance value is not being used to reduce distortionary taxes or to reduce the federal deficit, as has been so often advocated. Climate-related programs will be funded, although in smaller scale than suggested by the RGGI allocation or earlier federal proposals; but the major recipient of the allowance value will be consumers in distributions that will be skewed in favor of lower income households. Households are after all the origin of the demand for goods and services that leads to pollution and those who will bear the final cost of measures taken to reduce environmental effects. This consumer interest in

compensation for these costs has been slow to assert itself, but it appears finally to have done so.

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. Those benefiting from the removal of the harm have been long in perceiving their rightful claim and those most insistent upon a claim have been the entities who are the source of the harm. Their claims are not motivated by concern for drawing any benefit from the exploitation of the common pool resource, but 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 many if not most cases double compensation since competitive markets can be assumed to reflect the new cost of emissions. The slow but inevitable recognition of this circumstance is forming the basis for assigning most of value associated with emission rights to those who ultimately pay, consumers, who are also the ultimate polluters. To quote the immortal words of Pogo: “We have met the enemy and he is us.”