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Mass-Based Trading under the Clean Power Plan: Options for Allowance Allocation

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SUMMARY

Many states are considering mass-based allowance trading programs to meet the federal requirements under the Clean Power Plan (CPP). Under a mass-based trading approach, states work with a certain number of allowances, or an allowance “budget,” that matches the total emissions limit for each year of the program. States have many options for allocating the allowances that power plants will need to cover their carbon dioxide emissions. They can directly give the allowances to specific parties, set them aside for a specific purpose, auction them, or use some combination of these options.

Allowance allocation may be the single-most important decision states will make when implementing mass-based trading programs. In making that decision, each state will want to carefully consider its goals, especially given that the total value of all allowances in its allowance budget is likely to dwarf the actual resource expenditures needed to bring its power plants into compliance. Allowance allocation determines how that value and CPP costs are distributed among electricity producers, consumers, and other stakeholders.

States and the EPA have considerable experience with various allocation mechanisms. Consequently, the implications of different choices, which depend on a state’s economic regulatory context, are known. This paper describes the choices and their effects as well as explores potential goals and the allowance allocation methods best suited to achieve them.

Introduction

The U.S. Environmental Protection Agency (EPA) finalized its Clean Power Plan (CPP) in October 2015, establishing state emissions goals and providing guidelines for the development and approval of state plans to achieve those goals.[1] Many states are considering mass-based allowance trading programs to meet the federal requirements. Under a mass-based trading approach, states begin with a certain number of allowances, or an allowance "budget," that matches the total emissions limit for each year of the program. States have many options for distributing or "allocating" the allowances that power plants will need to cover their carbon dioxide emissions.[2] This paper explores those allowance allocation options.

Allowance allocation may be the single-most important policy decision states will make as they implement a mass-based trading program.[3] Allowances have value because power plants need allowances to cover their emissions. The total value of a state's allowance budget may be quite large. For example, Pennsylvania's allowance budget in 2022 is approximately 95 million short tons.[4] At an assumed value of $10–15 a ton, Pennsylvania will be distributing allowances valued at roughly $1–1.5 billion for 2022.[5] The way a state distributes this allowance value can reward actions that power plant owners or other parties took in the past or it can encourage decisions in the future. It can also be used to assist parties who may be disproportionately affected by any resulting increase in power prices, such as poor households or energy-intensive businesses. Allowance allocation determines the distributional impacts of the program, and different allowance allocation methods have different distributional consequences.

This paper examines allowance allocation options and the economics of allowance allocation. After providing some important background information on the CPP and mass-based trading, it explores the many goals that states may wish to achieve through allowance allocation and options for achieving those goals. It discusses the EPA's proposal to implement a federal plan in states that do not file an approved state plan, in particular, the way the EPA proposes to allocate, or distribute, allowances. It concludes with some reflections on allowance allocation in light of the economics and past experience.

Background

The Clean Power Plan, the Mass-based Trading-Ready Approach, and Allowance Allocation

The Clean Power Plan aims to reduce carbon dioxide emissions from existing power plants under Section 111(d) of the Clean Air Act.[6] The CPP establishes emissions goals for states as well as requirements that apply when states develop plans to achieve those goals. If a state does not file an approvable state plan by the applicable deadline, the EPA will proceed to implement a federal plan in the state.[7]

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[1] 80 *Fed. Reg.* 64661 (October 23, 2015).

[2] The term *allocation* is used here to mean the same thing as *distribution* and to encompass all possible ways to distribute allowances in a mass-based trading program. This paper uses both terms interchangeably.

[3] Some states are also considering making their mass-based goals tighter than those the EPA requires. In those states, the stringency question is perhaps equally important.

[4] This is Pennsylvania's annual budget without the new source complement. 80 *Fed. Reg.* 64965 (October 23, 2015)(Proposed Federal Plan and Model Rules), at 64825.

[5] The precise value of a Pennsylvania allowance is not yet known, but modeling analyses suggest that a value of $10 per ton is a reasonably conservative estimate. See Ross, Murray, and Hoppock (2015).

[6] 42 U.S.C. 7411(d); 80 *Fed. Reg.* 64663. The CPP covers steam electric-generating units that burn coal, oil, and natural gas as well as combined cycle combustion turbines. Simple cycle combustion turbines are not covered.

[7] On February 9, 2016, the Supreme Court issued orders granting a stay of the Clean Power Plan (CPP) rule pending review of its merits by the federal Circuit Court of Appeals for the D.C. Circuit and the Supreme Court, if it decides to review the D.C. Circuit's decision. The stay suspends the deadlines in the final rule. The new deadlines will not be known unless and until the stay is lifted at the time of a final decision.

The CPP provides states with broad flexibility to decide the policy pathway they will use to achieve the EPA-prescribed state emissions goals. The EPA expresses state emissions goals as both emissions rates and mass emissions budgets so that states may choose either a rate-based or mass-based policy. States may also choose to implement rate-based or mass-based emissions trading policies and to allow trading with entities in other states that choose a similar path.

To enable states to implement emissions trading programs, the EPA has proposed two model rules: one rate-based and one mass-based.[8] Both model rules are "interstate trading ready," which means that a state that implements the model rule will be able to allow trading with entities in any other state that also implements the same type of trading-ready approach. Because interstate trading can be accomplished without any formal agreements between the states, states may find the trading-ready approach more attractive than if they had to negotiate formal terms with other predefined states. This approach also allows markets to evolve.

A significant number of states appear poised to take a mass-based trading approach. Those that do so may well rely on the model trading rule as a starting point for their rulemaking.[9] States have some key decisions to make even if they rely on the EPA's model rule. They must decide whether to cover only existing plants under the emissions limit or to extend a (slightly larger) emissions limit to fossil units, primarily natural gas units, built after January 8, 2014.[10] States that do not cover new plants are required to address emissions "leakage" from existing to new sources.[11] States must also decide how to distribute allowances, which is the focus of this paper.

The EPA has proposed to implement either mass-based trading or rate-based trading in states that do not submit approvable state plans. In the event that the EPA implements mass-based trading in a federal plan, it has proposed a method for allocating allowances, discussed below. Even states with an EPA-imposed, mass-based federal plan have the option to substitute their own allowance allocation plan for the EPA's proposed approach.

How a Mass-Based Trading-Ready Approach Works

If a state decides to implement a mass-based policy that allows for allowance trading under the CPP and the EPA's model rule, it starts with an emissions budget for each year of the program.[12] The emissions budget consists of the total number of allowed tons of carbon dioxide that may be emitted from covered power plants. Each allowed ton is issued by the state in the form of an "allowance." Allowances are then initially distributed at the discretion of the state, but they are ultimately used by covered power plants that need them for compliance.

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[8] Proposed Federal Plan and Model Rules, supra note 4. A model rule provides rulemaking text that states may use when implementing the program. The EPA has said that state plans that incorporate a model rule are "presumptively approvable" by the EPA, though states are free to adjust and adapt the model rules to fit their circumstances. For example, states may implement state-specific approaches to allocation. The EPA has said that if it has to implement a federal plan in a state, it will implement one of the model rules for that purpose.

[9] States in the Northeast and Mid-Atlantic that are already participating in the Regional Greenhouse Gas Initiative (RGGI) are expected to adapt their existing program to meet CPP requirements. Similarly, California is expected to build on its existing mass-based trading program to meet CPP requirements.

[10] Proposed Federal Plan and Model Rules, supra note 4 at 64716; 40 CFR §60.5710.

[11] For a robust discussion of covering new sources and addressing leakage, see Adair and Hoppock (2015).

[12] For most states, the emissions budget will be the same as the emissions goal prescribed by the EPA in the final CPP. Some states may choose to implement a budget that is more stringent than that required by the EPA.

In a mass-based program, each covered power plant is required to measure, monitor, and report its emissions.[13] At the end of each compliance period, the plant must turn in sufficient allowances to cover its emissions. If a plant's emissions exceed the number of allowances in its account, the state will impose penalties and potentially take other steps to enforce program requirements. The EPA does allow for multiple-year compliance periods to account for annual variations in weather and market conditions that can affect allowance demand. However, compliance requires that the sum of emissions during the compliance period must not exceed the number of allowances procured by the power plant during that period. Any allowances procured in excess of the plant's emissions can be banked for future compliance.

The limited total number of allowances in the EPA's prescribed emissions budget defines the environmental stringency of the program. Because the state's allowance allocation method does not change the number of allowances in the system, it also does not determine the overall environmental impact of the program. The allowance allocation method can, however, encourage specific types of generation, specific reduction activities, or both.

At a minimum, the allowance allocation decision affects the distribution of program costs and benefits. Understanding how trading works and the economics of allowance allocation is essential for policy makers developing a mass-based trading program.

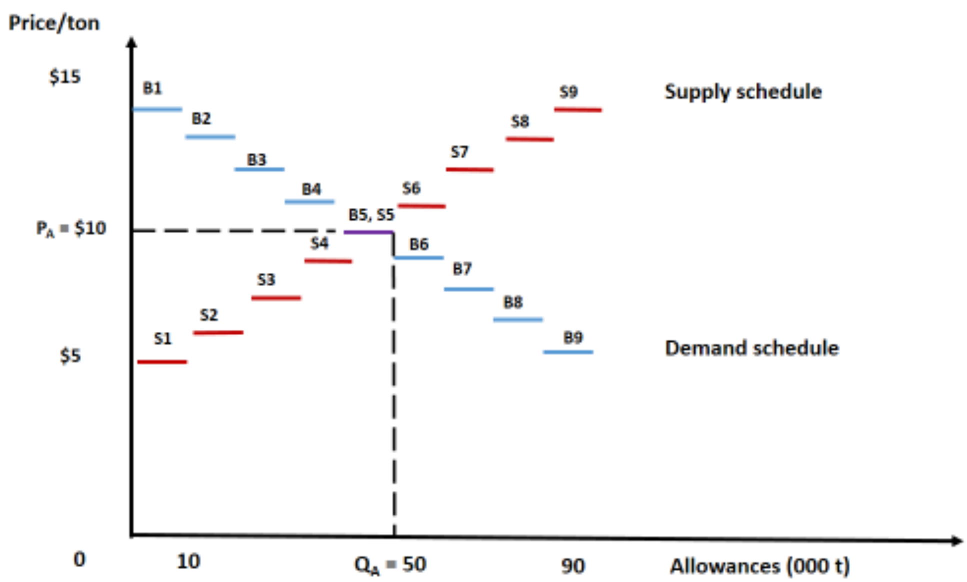
How Allowance Trading Works

At the very basic level, trading occurs to meet compliance obligations. Although allowances are typically distributed at the beginning and periodically throughout the compliance period, they can be traded at any time through a secondary market—whenever a buyer believes it will need more allowances to meet its compliance obligation and a seller believes it will need fewer. This exchange is conditioned on the price of the allowance. For the exchange to occur, the buyer must believe that buying the allowance at the stated per-ton price is cheaper than reducing emissions by a ton. Conversely, the seller must believe that forgoing a ton of emissions is cheaper than the allowance price. This exchange yields gains to both the buyer and seller and provides the basic incentive to trade.

Figure 1 illustrates buyers and sellers coming together in an allowance market. In this simplified example, nine potential buyers (B1, B2, and so on) have a price at which they are willing to buy a fixed lot (10,000 tons) of allowances. The buyer bids are arranged highest to lowest to create a demand schedule. Those willing to pay the most are those for whom the cost of reducing emissions (the alternative to buying more allowances) is highest. The successively lower bids represent declining marginal benefits of allowance purchases (lower cost savings for each additional lot). On the flip side, nine potential sellers (S1, S2, and so on) of allowance lots (also 10,000 tons each) are arranged from lowest to highest offers to sell to create a supply schedule. Sellers with the lowest offer prices are those for whom the cost of reducing emissions is the lowest. Higher offers represent higher marginal costs of emissions reductions. The market clears where demand and supply schedules meet—at an allowance price (PA) of $10, there are buyers who collectively want to buy 50,000 tons worth of allowances and holders of 50,000 tons worth of allowances that want to sell. And both buyers and sellers gain from the transactions. For instance, Buyer B1 is willing to pay $14 per ton for an allotment of 10,000 allowances and only pays $10 per ton (surplus of $40,000). And Seller 1 is willing to sell the allotment for $5 per ton but gets $10 for the allotment (surplus of $50,000). Buyers B2, B3, and B4 and sellers S2, S3, and S4 all gain from trade as well (though not as much as B1 and S1, respectively). B5 and S5 essentially break even at $10 and thereby set the market price.

[13] The plants covered by the CPP already measure, monitor, and report emissions under 40 CFR Part 75.

Figure 1. Allowance market clearing and price determination



The simplified market just described is a "spot" market involving the exchange of current compliance period allowances for immediate delivery. A somewhat more complicated, but common, deal is a futures contract whereby one party agrees to deliver allowances at an agreed-on price at a future date. Parties may operate in the futures market to shield themselves from risk of a volatile allowance price, arranging instead to lock into a price under which they can procure allowances for future compliance.

Spot and futures markets are typically made up of numerous buyers and sellers. Sometimes there are enough buyers and sellers that transactions operate through a central exchange at a listed price. For instance, outfits such as the Intercontinental Exchange (ICE) and the European Energy Exchange (EEX) provide a centralized hub for allowance spot and futures exchanges for greenhouse gases and other pollutants (e.g., nitrogen oxide) across multiple compliance regimes, such as those of the U.S. EPA, the California cap-and-trade program, and the European Union Emissions Trading System. In other cases, transactions may be more individualized at terms directly established by specific buyers and sellers—so-called over-the-counter transactions. In either case, allowances are exchanged for a price and thus constitute a market.

Distributional Effects of a Carbon Price in Electricity Markets: Downstream Impacts and Receipt of Allowance Value

The foregoing discussion shows how allowance markets bring together buyers and sellers to determine a price and allowance trading volumes within and across time periods. The primary consequence of this trading is that it establishes a price signal that moves through markets and affects investment and consumption decisions. The paper now explores how CPP allowance prices affect electricity market prices and the distribution of impacts across producers and consumers, and how allocating allowance values to different parties can modify those impacts.

Consider the operation of wholesale markets for electricity (sometimes called *dispatch* markets). The wholesale markets described here closely resemble those operated by regional transmission organizations

(RTOs) or independent system operators (ISOs) wherein generators (utilities, merchant generators, cooperatives, municipal power producers, and so on) bid to supply electricity to load-serving entities in the region. Some regions, such as the southeastern United States, are characterized by large, vertically integrated, and regulated producers that operate as their region's balancing authority, matching demand with generation primarily from their own resources. In these markets, power not self-supplied is often traded through bilateral arrangements with other producers more than through an open wholesale market with many potential sellers and buyers. However, even where wholesale markets are not very active, utilities can be expected to optimize their systems to achieve lowest-cost production. Thus, the basic principles of allowance price effects on power prices described here apply in both settings.

In these markets, generators bid in advance (e.g., a day ahead) to supply electricity to meet demand during a specific time period for a given price. The system operator organizes the bids from lowest to highest and continues to accept bids until the amount of electricity supplied at the successively higher bids meets the expected load segment demand, as illustrated in Figure 2. In this simplified case, the two lowest bids are offered by coal units ($30 and $40 per MWH, respectively), the next lowest ($50) by a gas unit, and the next lowest ($60) by another coal unit. Together, these bids do not meet load demand needs, but the next bid of $70 from a gas plant will add enough electricity to meet demand.[14] As such, the market-clearing price would be $70, which all producers supplying this segment will receive. The profit earned by each generator during that segment equals the difference between the market price and the bid price. The third gas unit bid is $80, so it remains offline for this load segment.

Figure 2. Carbon price pass-through in the wholesale electricity market

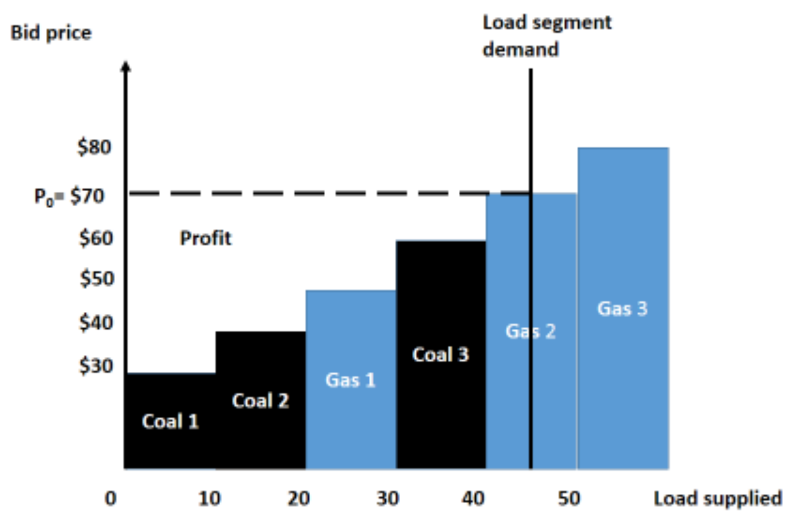
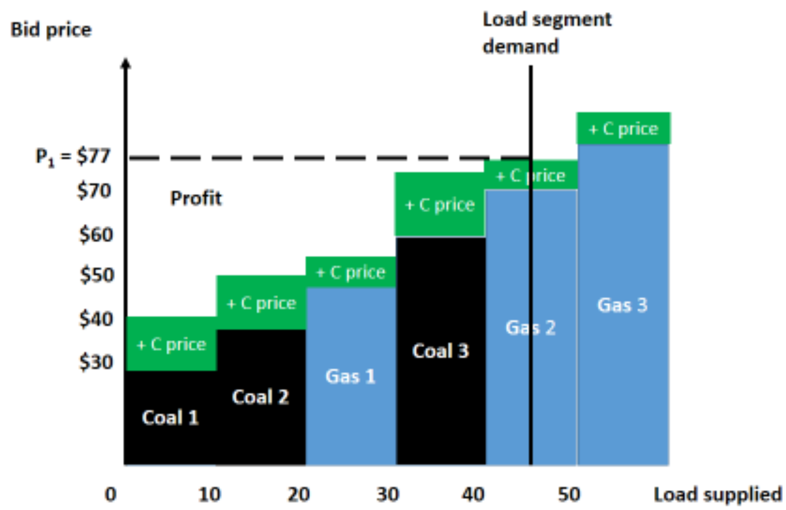


Figure 3 shows how the situation changes when carbon allowance pricing is introduced. The green bars represent the additional cost of generation due to the need to submit allowances for the emissions associated with generation. The green bar is larger for coal units than gas units due to the former's higher emissions rate per MWH.

[14] Actually, this offer will provide more than enough to meet demand, but the system operator may choose to purchase just what is needed to meet the load.

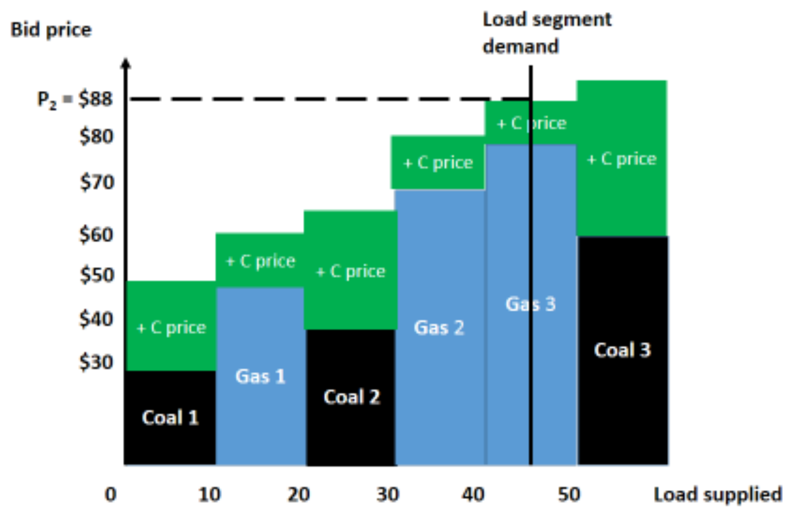
Figure 3. Wholesale electricity market clearing under a low carbon price



In the example in Figure 3, all units' costs rise because of the allowance requirement, but the carbon price is relatively low, so the ordering of lowest to highest cost units does not change; Gas Unit 2 still sets the wholesale market price for this segment. Its dispatch bid rises from $70 to $77 to cover allowance costs; thus, the market-clearing price rises accordingly.

The situation can differ when carbon prices are relatively high, as illustrated in Figure 4. Here, the incremental cost of coal generation is so large relative to the cost of generation by gas units that the dispatch ordering changes. Most importantly, Gas Unit 3 replaces Coal Unit 3 as the market-setting supplier. Once its costs are factored in, the market-clearing price rises to $88, and Coal Unit 3 is out of the market at that price.

Figure 4. Wholesale electricity market clearing under a low carbon price



"Free" Allowances, Opportunity Costs, and Price Pass-through

The allowance cost factor illustrated in figures 3 and 4 will generally apply even when generators receive allowances free of charge. The reason is that allowances have economic value given that they can be sold if not used and thus have an opportunity cost associated with their use. Generators will normally add this cost to their other generation costs in their dispatch bid offers, just as they would reflect a fuel price change. Thus, the market price will rise through the opportunity cost pass-through of the marginal supplier, even though the allowances do not represent out-of-pocket costs for generators. This rising market price offers the possibility of windfall profits for recipients of free allowances (higher price received without a corresponding increase in input costs), as was found in the EU ETS before it auctioned allowances (Sijm, Neuhoff, and Chen 2006).[15] Now that the EU ETS auctions allowances, all costs that are passed along through higher prices are real resource costs for generators and not a source of windfall profits.[16] This issue is addressed below in the context of retail price setting in regulated markets and the potential use of allowance values.

Leakage Potential

The redispatch from Coal Unit 3 and Gas Unit 3 in Figure 4 points to a potential problem with leakage if not all fossil units are covered by the rule, as would be the case if states choose not to include the new source complement under the mass cap. If Gas Unit 3 is a new unit operating in a state that does not cap new units, there would be no green bar representing a carbon cost in Gas Unit 3's dispatch cost, which would make it even more likely that it would be dispatched in lieu of a coal (or gas) unit that did carry

[15] Although this dynamic exists in both regulated and restructured electricity markets, it plays out differently in each with respect to consumer impacts. If allowances are allocated at no cost to power generators that are subject to economic regulation, the state's utility commission can generally ensure that the value of the free allowances is captured for the benefit of consumers. If a state allocates free allowances to merchant generators that are not subject to economic regulation, the utility commission cannot capture the allowance value to protect consumers.

[16] Generator costs do rise from any actions they take to reduce emissions (fuel switching, increased efficiency), and these costs are appropriately reflected in any price increase. It is the pass through of values of free allowances that constitute a potential source of windfall profits.

carbon costs. Because the coal unit does not dispatch, it does not count against the state's cap, and allowances it otherwise would have used can be used for other capped emissions sources. Thus, emissions are shifted across covered sources, but they are not reduced. In fact, emissions from the new source gas unit (Gas Unit 3) do not count against a cap and thus can be emitted without consequence, leading to an overall rise in emissions due to redispatching from covered existing units to uncovered capped units, the phenomenon referred to as emissions leakage.

The EPA realizes this leakage is a potential problem with a state's option to not include new units under the cap and has thus proposed that future allowances be awarded to existing units (for every MWh of power generated) but not to uncapped new units. In theory, this strategy would rebalance the dispatch curve so as to eliminate the dispatch preference for new units over existing units purely on the basis of carbon pricing responsibilities. Whether the proposed method actually rebalances the dispatch stacks perfectly to counter leakage incentives is the subject of current modeling efforts. The allocation of allowances to address leakage is discussed in greater detail below.

Retail Price Effects

In states with restructured power markets not subject to price regulation, wholesale price effects will typically be directly reflected in the retail price, with transmission, distribution, and administration costs added on to the price that the final consumer pays. Thus, if allowance requirements have an effect on wholesale prices, even if that effect is due solely to opportunity costs from the use of free but marketable allowances, the consumer will generally absorb price changes through increased retail rates. However, in price-regulated markets, the regulating entity such as the public utility commission will generally have power over which costs can be passed along to the final consumer. By and large, all real resource costs (e.g., fuel, operating and maintenance costs, and capital costs) can be passed along through consumer rates as long as they are reasonable and essential. Allowance costs, in principle, can fulfill the real cost requirement, because allowances are essential to operations, and there is little question that such costs would be reasonable if the generator needs to purchase allowances at auction or in a secondary market. However, if the allowances are given for free, there may be a limit to cost recovery through rates; that is, it may not be "reasonable" to charge customers higher rates for allowances given free to the producers.[17]

If a power company receives more allowances than it needs for compliance, it can sell the surplus in the allowance market. Revenues from the sale of allowances may be treated like fuel cost adders for the purposes of rate determination in a traditionally regulated state. In Wisconsin, for instance, the "fuel cost" that utilities are allowed to recover through their rates is defined as the net of costs and credits for the purchase and sale of (in addition to fuel) items such as market energy, renewable energy credits, and emission allowances (see Wis. Admin Code § PSC 116.02(1)). However, the revenues received from allowance sales are treated analogously to a fuel cost reduction, in which case they are subtracted from the rate base to the benefit of consumers.

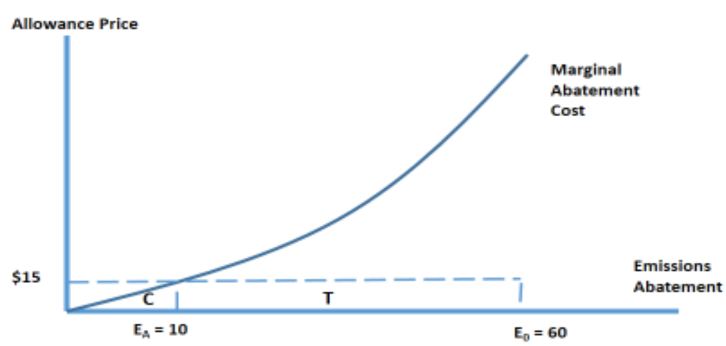
[17] Some markets have characteristics of both restructured and traditionally regulated markets. For instance, the Mid-Continent Independent System Operator (MISO) operates across 15 states in the Midwest and South and one Canadian province. Most of these jurisdictions have vertically integrated utilities that are traditionally price regulated. MISO requires utilities to both sell their generation into the wholesale markets and to buy from the market all the energy needed to serve its load. In this way, the utilities may both receive a higher wholesale price from the pass-through of allowance costs and pay a higher price as buyer of the wholesale power, with little overall net effect on their bottom line. Such circumstances would limit any cost pass-through to retail customers.

The question is whether regulators should keep prices low. As noted above, utility commissions could intervene to disallow retail rates to reflect the value of free carbon allowances. But doing so may be suboptimal because it limits the role that ratepayers can play in conserving electricity by paying higher prices that accurately reflect the cost of carbon emissions. Alternatively, the commission could allow the rate to rise but rebate the allowance value to customers in some other way (e.g., a lump sum) that will compensate them for the increased cost without taking away the price incentive to conserve.

Distinguishing among Real Resource Costs, Allowance Value, and Transfers

The total value of the allowances to be allocated in a mass-based trading program is substantially greater than total compliance costs, meaning generators need not receive all of the allowances to cover their costs. This point is highlighted by the connection among real resource costs, allowance values, and transfers, all of which convey different notions about program costs. The real resource costs of the program reflect the cost of changing production practices, fuel mix, and the like to achieve emissions reduction called for in the program. The allowance value, on the other hand, reflects the market value of all allowances allocated to the program. Figure 5 shows how resource costs and allowance values differ.

Figure 5. Resource costs versus allowance values



E_0 in Figure 5 represents that emissions within a certain state would be 60 million tons absent a carbon policy. The program, however, caps emissions at 50 million tons, requiring emissions abatement of 10 million tons. To get emissions down to 50 million tons, producers will need to operate more efficiently and dispatch to lower-emitting, but typically more expensive, generation to achieve a fixed amount of power.[18] The real resource costs of the emissions reductions are captured by the marginal abatement cost (MAC) curve in Figure 5. These reductions tend to get more expensive as the amount of abatement increases, a phenomenon illustrated by the rising curve. In this example, the last 10 million tons to abate cost $15 per ton in real resource costs. In a trading system, the marginal cost would be expected to establish a market price of $15 per ton. The total resource costs to abate 10 million tons is represented by area C under the MAC curve.

[18] The real costs of customers forgoing power use as prices rise—referred to as a loss in consumer surplus—could be considered part of the real resource cost, but for simplicity, this example focuses on the cost of supplying a fixed demand load as illustrated in figures 2–4.

The 50 million tons of emissions that remain are subject to the allowance price of $15. Thus, the total allowance value simply equals 50 million tons x $15 per ton or $750 million dollars—the area T in Figure 5. Whereas area C represents the real cost of emissions reductions, area T represents a transfer value from sellers to buyers of allowances. The real costs represent the actual value of resources that generators within the state must expend to reduce emissions. But transfers represent just the movement of payments from one source to another within the state and have no net effect on total costs. So when a state decides who gets the allowances, it is essentially deciding who gets access to the $750 million of allowance value. This example illustrates that (where most emissions remain) the value transfers are much larger than the real resource costs.[19] That reality underscores the distributional importance of the allowance allocation decision.

Allowance Allocation: Goals and Options

As noted above, allowances have economic value because the holder can use them for compliance and avoid further emissions reduction costs and because they can be purchased from and sold to other parties. Given the economic value of allowances, states and stakeholders will want to carefully consider their goals for allowance allocation. With those goals in mind, states and stakeholders can then evaluate the options. Existing state and federal programs provide numerous examples of allowance distribution methods.

Goals

Before evaluating the options, states and their stakeholders will want to consider their goals for allowance allocation. Below are the objectives most often mentioned in discussions about allowance allocation. Illustrative allocation methods are noted in connection with individual goals and are more fully explained in subsequent sections of this paper.

Promote Fairness

Although "fairness" will mean different things to different stakeholders, states may wish to weigh fairness concerns that arise in discussion of allowance allocation. For example, should power plant owners that have already invested in improving the carbon profile of their generation get more allowances than those that have not made similar investments? Alternatively, does fairness mean allowances are distributed to those who need them most for compliance? What does fairness mean from the perspective of electricity customers? If the atmosphere is deemed a public good, does fairness dictate that allowances should benefit the public? Allowance allocation decisions hinge on answers to these questions.

Compensate Electricity Consumers

Because under the CPP electricity consumers are expected to see an increase in electricity prices, states may wish to approach allowance allocation in a manner that mitigates or offsets that increase. The available methods for accomplishing this goal will vary by state and will depend on a state's regulatory and market environment.

States with restructured power markets generally have affected units owned by merchant generators that are not subject to economic regulation. As explained above, this situation will generally lead to a rise in wholesale electricity prices regardless of allowance allocation method and possible windfall profits to merchant generators if they receive allowances for free. To capture the economic value of the allowances

[19] In this case, the allowance values (transfers) are roughly 10 times the resource cost (C can be approximated at $75 million using simple geometry). The allowance value and the resource cost become more similar in magnitude as required emissions reductions increase and as the amount of emissions that remain to be paid for with allowances decreases. At some point, required reductions become large enough to exceed transfers.

to thereby compensate consumers for higher prices and avert windfall gains by generators, restructured states may allocate allowances to load-serving entities on behalf of their ratepayers or auction allowances and direct the auction proceeds to ratepayers.[20] Both approaches can ensure that market prices fully reflect generators' operating costs (purchased allowances), while further ensuring that consumers receive an allowance value to compensate for higher prices.

In regulated states, the situation and remedies differ from those of restructured states, because most generators are vertically integrated utilities subject to economic regulation of prices and profits. In those states, economic regulators can more easily ensure that consumers benefit from the allowance value created in a mass-based trading program by limiting the ability of generators to pass on certain costs (e.g., the opportunity cost of free allowances) through rate increases and by requiring sharing of any profits generated by the sale of allowances to other entities. But even regulated states must consider the effects of price increases on customers of other entities within their borders that may not be subject to economic regulation, such as municipals and cooperatives. In those cases, price protection options may be similar to those for consumers in restructured states.

Encourage Specific Outcomes

Allowance value can be dedicated to achieving specific outcomes, such as increased end-use energy efficiency or renewable generation. For example, a state that has a policy of encouraging industrial energy efficiency through the deployment of high-efficiency combined heat and power (CHP) units could reward those industrial CHP units with allowances, either through direct allocation or an allowance set-aside established specifically for this purpose, or by targeting auction revenues toward this purpose. Allowance allocation can also encourage operation of specific types of generation by rewarding that operation. For example, output-based allocation, periodically updated on the basis of current generation of a certain type, incentivizes that type of generation by giving it a cost advantage at the point of dispatch. A generator knows it will be rewarded with allowances for its generation and thus can price its generation more competitively than sources that receive no allowances in proportion to their output.

Minimize Transaction Costs

Transaction costs will increase when the initial allowance allocation requires a large number of trades to accomplish the optimal allowance use. This situation occurs when allowances are initially distributed to parties that do not need them for compliance. In contrast, when the method succeeds in initially distributing allowances to parties that will use them to cover emissions and that will have relatively little need for subsequent trades, overall transaction costs will be lowered. Proponents of auctions point out that an auction allows market participants to purchase the allowances on the basis of initial and ongoing determinations of their compliance needs. Similarly, allocations closely based on affected units' expected emissions could also result in relatively fewer transfers and lower overall transaction costs. In either case (auctions or "need-based" allocations), secondary trading will occur because compliance needs can change in unexpected ways. However, the volume of this trading should be lower when auctions or need-based allocations are frequent.

Accommodate New Power Plants

States that choose to cover new plants in their mass-based trading program may wish to consider how new entrants will acquire allowances. Many trading programs have had allowance set-asides for those new plants or have allowed new entrants to participate in allowance auctions.

[20] The implication here is that load-serving entities are subject to economic regulation that in turn allows the utility commission to oversee the disposition of economic value, essentially ensuring that the value is applied to consumer benefit.

Address Emissions "Leakage"

Allowance allocation can be used to counteract the incentive that might otherwise exist to generate electricity using power plants that are not subject to the mass-based trading program, an incentive that is said to cause emissions "leakage" from covered plants to non-regulated plants. An allowance allocation method that provides covered plants an incentive to operate by granting the plants more allowances when they generate more electricity on an ongoing or "updating" basis will contribute to achievement of that goal.[21]

Address Specific Circumstances

States can use allowance allocation to accommodate any number of specific circumstances. For example, if a utility decides to retire a coal plant as a means of helping the state achieve its emissions goal, the state could reward that action with allowances even though the retired plant no longer needs allowances for compliance. If a state with an energy-intensive, trade-exposed industry is concerned about the electricity costs that the program would add, it could grant the industry allowances designed to offset the program cost—for example, the above-discussed output-based allocations, which reduce the advantage of competitors that do not pay a carbon price.

Options

After a state has determined its goals for allowance allocation, it can apply those goals in evaluating various allocation options. Table 1 presents an overview of these options.

[21] For a discussion on how an updating output-based allocation can reduce leakage, see Burtraw, Linn, Palmer and Paul (2016).

Table 1. Options for allowance allocation

Distribute to whom?	On what basis?	Rationale?	Possible downsides or issues?	Examples
Covered power Plants—"affected units"	Historical heat input: A plant gets a share of allowances prorated according to its heat input (MMBTU) in the baseline period.	Heat input provides a fuel-neutral and end-of-pipe technology-neutral method that is most relevant to pollutants for which end-of-stack abatement is available.	Does not reward plants that have installed end-of-stack emissions abatement, such as carbon capture and storage.	EPA proposed the Acid Rain Program (SO_2 trading) as a model for all subsequent trading programs under the Clean Air Act, though states could choose alternatives and some did.
	Historical output: A plant gets a share of allowances prorated according to its output (MWhs) in the baseline period.	Historical output allocation allows units with lower emissions per unit of output to be better off than units with higher emissions per unit of output.	In general, historical approaches do not adapt but instead base important allocation decisions on performance in a past year.	EPA proposes to allocate the bulk of allowances using this method under the CPP federal plan proposal.
	Historical emissions: A plant gets a share of allowances equal to its share of total emissions (CO_2) in the baseline period.	The emissions metric aims to provide units with an allocation that approximates what the unit will need for compliance.		At least one state used emissions for allocations under the initial NOx Budget Program. Under the Cross State Air Pollution Rule (CSAPR), EPA allocated allowances on the basis of heat input and capped those allocations on the basis of highest historic emissions.
	Output updating: At an annual or other interval, a plant receives allowances corresponding to its total output (MWhrs) in the previous interval.	Updating promotes specific forms of generation by linking allocations to output, giving units an incentive to increase production. It also reduces the cost advantage of competing producers that are not subject to a carbon price and that would otherwise attract more market share and produce more emissions (leakage).	Because plants receive more allowances by generating more electricity, the allocation method could lead to inefficient outcomes whereby more generation occurs than is "needed." Updating may also reduce the incentive to retire existing plants as compared to free allocation on a historical basis.	Some states, including Massachusetts, Connecticut, and New Jersey, used this approach under NOx trading programs. EPA is proposing to use the approach for a limited number of allowances in the CPP federal plan proposal's updating output-based set-asides if states do not cover new sources under their state plan.

Distribute to whom?	On what basis?	Rationale?	Possible downsides or issues?	Examples
All generators, including non-covered sources	Distribute to all generators (covered and non-covered) on the basis of their share of output.	This approach could encourage output from new zero- or low-emitting generation, such as renewables or nuclear, by rewarding producers with allowance value.	Allocation to existing renewable generators and nuclear plants will not increase generation, because these plants already operate at maximum capacity factors (they have low relative operating costs).	There are no examples of direct allocation to other types of generation, though renewables have benefitted from allocations out of set-asides (e.g., under the CPP federal plan) and from use of auction revenues for renewables programs.
Load-serving entities (LSEs)	LSEs would receive a share of allowances prorated on the basis of their share of load served in the baseline period. Allocations could be made on an updating basis to make sure LSEs receive allocations that closely match their share of consumption.	This approach compensates potential losses to ratepayers. LSEs deliver power to customers and are generally regulated by state utility commissions, even in restructured states. They are therefore in a position to credit consumers with the value of allowances.	Because the electricity system is multistate, the location of generation and emissions often does not match the location of the consumption. Thus some states will have more allowances than are needed to compensate consumers, and other states will have too few to compensate consumers.	California allocates electricity allowances to LSEs. These allowances are then auctioned for the benefit of ratepayers. Under the federal Waxman-Markey bill, load-serving entities were to receive allocations on the basis of their pro rata share of electricity sales in the early years of the program. Eventually, all allowances would have been auctioned.
Entities other than power producers	States directly allocate allowances to non-power-producing entities to achieve specific purposes. For example, a state could direct allowances to one or more entities that implement end-use energy efficiency projects in the state.	This approach achieves complementary policy objectives, lowering program costs for all or for certain populations or inducing innovation. The rationale would depend on the entity receiving the allowances and would likely be unique to each state.	Depending on the intended recipients and the mechanism for allowance distribution, allocating to other entities can add substantial complexity to a program. For example, a set-aside mechanism for energy efficiency requires rules, a process, and staffing.	New York allocates its RGGI allowances to the New York State Energy Research and Development Authority, which auctions them and invests the proceeds in clean energy technologies.

Distribute to whom?	On what basis?	Rationale?	Possible downsides or issues?	Examples
Buyers through auction	The state would auction allowances and use the proceeds for state-determined purposes.	Auctions are efficient ways to distribute allowances, and they ensure that the full value of the allowances are captured and monetized. Auctions also allow states to direct money to specific purposes more fungibly than allocating allowances for those purposes and in line with current budgetary practice.	Auctions may present legal authority issues for some states where auctions have not been implemented in the past. Auctions also require the design and construction of an auction platform.	Kentucky sold allowances remaining in a 5% NOx set-aside account. Virginia conducted a one-time auction of allowances in its 5% NOx set-aside account. RGGI states auction nearly all allowances and invest in energy efficiency and other consumer benefit programs. California allocates electricity sector allowances to load-serving entities and requires them to auction the allowances for the benefit of electricity consumers. California also auctions a share of its non-electricity allowances and places the proceeds in the state's Greenhouse Gas Reduction Fund, which is used for investments in low-carbon technology and conservation.

The allowance allocation options in Table 1 can be implemented in three ways: (1) allowances can be directly given to designated parties; (2) they can be set aside in a pool for designated purposes, designated parties, or both; and (3) they can be sold at auction. States can also choose a combination of these approaches. Direct allocation to specific parties has historically been the point of departure for many emissions trading programs at their inception. Set-asides are conceptually similar to direct allocation, but because the recipient of the allowances or the size of the allocation is not yet known, the set-aside is created pending submission of project-based applications, the arrival of new parties, such as new power plants, or both. Auctions have been increasingly used, especially in the deregulated electricity markets of the northeastern United States and in the European Union.

Allocating to Covered Power Plants or "Affected Units"

Most EPA- and state-administered mass-based trading programs under the Clean Air Act have allocated allowances to the power plants that have an obligation to cover their emissions with allowances. Most of these programs distributed allowances on a historical basis, meaning that allocations were made prior to the start of the program on the basis of actions in the past and were not updated. Some states, however, chose to implement updating approaches, and a couple states used partial auctions or allowance sales.

Historical Heat Input

Under a historical heat-input-based approach, each affected unit receives a share of the allowances on the basis of its pro rata share of total heat input in the historical baseline period. In general, the EPA and states have used historical heat input to determine allocations because high-quality and transparent heat input data were available for covered units, ensuring accuracy. Heat input is also fuel neutral and as a metric does not tend to favor one fuel over another in terms of received allowances. Heat input is control technology neutral, meaning plants that installed controls to reduce emissions would get the same allocation as plants that did not, all other factors equal.[22] The result was that plants with control technology were rewarded and received allowances that they did not need for compliance purposes, possibly giving them a trading opportunity or emissions "head room."

Congress first utilized the heat-input metric for allowance allocation when it passed the 1990 Amendments to the Clean Air Act, thereby creating the national sulfur dioxide (SO_2) trading program to combat acid rain.[23] Under the ozone season mass-based trading program—part of the Ozone Transport Commission's nitrogen oxides (NOx) budget program—states used historical heat input to allocate allowances under to reduce NOx emissions. Subsequent programs to address ozone and particulate transport under the Clean Air Act also primarily relied on a historical heat-input methodology for compliance with the EPA's model rules. States were given the option to replace the allocation method with a method of their choosing.

Historical Emissions

Under a historical emissions-based approach to allocation, each affected unit receives a share of allowances on the basis of its pro rata share of total emissions in the baseline period. The primary rationale for using an emissions-based allocation method is that it approximates the number of allowances that the unit will need to operate in each year, less the required emissions reduction and subject to demand fluctuations.

At least one state, Delaware, used the historical emissions metric for allocation in the NOx budget trading program under the Clean Air Act. In addition, although the EPA used the heat-input metric to establish

[22] See the EPA's discussion of the advantages of heat-input-based allocations when it issued the Cross-State Air Pollution Rule (CSAPR), 76 *Fed. Reg.* 48208 (August 8, 2011), at 48286.
[23] 42 USC Section 7651c.

allocations under the Cross State Air Pollution Rule (CSAPR), it also capped each unit's allocations at the highest total emissions for the unit in the historical baseline years to counter the prospect of overallocation.[24]

Historical Output

Under a historical output-based allocation, each affected unit receives a share of allowances equal to its share of total output from affected units in the baseline period. An historic output-based allocation metric tends to reward those units that produce more electricity with fewer emissions, because those units will get more allowances than they will likely need to cover their emissions. The EPA is proposing to use a historical output-based method as part of its allocation approach under the CPP's mass-based federal implementation plan.[25]

Output Updating

Under an output-based allocation to affected units with updating, allocations are determined at regular intervals on the basis of a unit's share of total output from affected units in the previous year or years. Specific allocations are not known in advance, but units know that they will receive more allowances when they operate more. This approach provides a production incentive for the recipient. One attribute of this approach is that it reduces the cost advantage of competitors not facing a carbon price; absent this approach, producers could gain market share from the regulated entities, increasing emissions from unregulated sources (leakage). It has therefore been proposed that competitiveness and leakage concerns associated with carbon pricing be addressed more generally (Fisher and Fox 2007). The output updating approach also incentivizes lower-emitting units to operate more, because those units will earn more allowances per unit of generated electricity than higher-emitting units.

Some states have used updating output-based allocations in the NOx trading programs under the Clean Air Act ozone transport programs; Connecticut, Massachusetts, and New Jersey have used them under the OTC NOx Budget Program and the EPA NOx Budget Program or NOx SIP Call. The output updating approach is being advanced in the CPP's mass-based federal plan for states that choose to cap emissions from existing sources, but not new sources. In the case of the federal plan, the approach is implemented through an allowance set-aside.

Box 1. Historical versus Updating Approaches to Allowance Allocation

Historical approaches, also sometimes referred to as grandfathering approaches, use data from a historical baseline period to determine allowance allocation. For example, a historical allocation based on emissions would give each covered unit a share of allowances that corresponds to the unit's emissions in the baseline period. The allocation share is static; it does not change on the basis of developments that occur after the baseline period.

Updating approaches, in contrast, take changes into account during the program and therefore can affect ongoing behavior. For example, if allocations are carried out annually and are based on a unit's electricity output in the prior year, the unit has an incentive to increase its output to obtain more allowances. Updating approaches based on a performance metric can be used to encourage better system performance by rewarding efficiency or certain fuels.

[24] CSAPR, supra note 21 at 48285.
[25] Proposed Federal Plan and Model Rules, supra note 4 at 65015.

Box 2. Tools for Achieving Allocation Goals: Direct Allocation versus Set-Asides versus Auctions

Direct allocation can be used to distribute allowances to a defined set of parties (or power plants) that exist at the time of allowance distribution. Direct allocation can, however, change over the course of the program to accommodate new parties (or power plants) at specific intervals. When direct allocation changes over time—usually applying a metric known in advance—it is called an *updating* allocation.

Allowance set-asides allow the program administrator to reserve some allowances for allocation to parties or projects not yet in existence. For example, allowances from an energy efficiency set-aside can be awarded to successful energy efficiency projects that are carried out after the initial allowance distribution. Similarly, a new-entrants set-aside reserves allowances for allocation to new power plants that come online after the initial allowance distribution.

Allowance auctions or sales distribute purchased allowances to the purchasing parties. Auction revenue can be used to achieve the program administrator's goals, such as compensating electricity consumers or investing in energy efficiency to reduce program costs.

States can choose a combination of these tools to achieve allowance allocation goals.

Allocating More Broadly to All Generators (Including Non-Covered Sources)

A state could allocate allowances to all generators that produce electricity, including both affected units and non-emitting (e.g., renewable and nuclear) units and to highly efficient smaller generators such as CHP units. This approach would favor generation that is lower emitting, including zero-emission generation like renewable generation, over generation that is higher emitting. To date, this broad allocation approach has not been used in a mass-based trading program, though some approaches have targeted allocation to specific subsets of non-covered sources, such as renewables. It bears noting that allocating allowances to existing renewables and nuclear plants will not increase generation from those plants, which already operate at maximum capacity factors due to their low operating costs relative to other forms of generation.

Allocating to Load-Serving Entities

A state could allocate allowances directly to the load-serving entities (LSEs) within its borders to ensure that allowance value is distributed in a manner that closely matches electricity consumption. Load-serving entities may be distribution utilities in a state with a restructured electricity market that has no economic regulation of affected generating units. They can also be distribution cooperatives or municipal power companies. In a sense, the allocation to load-serving entities can be viewed as a consumer rebate to offset the increased cost of electricity under the program. California allocates allowances to load-serving entities, which then assign the allowances to auction for the benefit of their consumers. One consideration of this approach is whether the allocation is used to lower rates or to provide a rebate that is not directly proportional to use. The former approach can undermine incentives for consumers to conserve electricity when faced with higher rates per unit of use.

Allocating to Other Entities

In individual cases, it may be desirable for a state to allocate allowances to another entity if it wishes to direct the value of the allowances to that entity, as is New York's approach under the Regional Greenhouse Gas Initiative. Allowances are allocated to the New York State Energy Research and Development Authority, which then auctions the allowances and invests the proceeds in clean energy technologies, such as the entity that implements energy efficiency programs in the state.

Allowance Set-Asides

Allowance set-asides provide a tool for reserving allowances during program implementation for specific parties or projects. In general, the potential recipients of allocations under a set-aside are not known at the time the set-aside is established. Alternatively, the precise quantity of allowances to be distributed may depend on a later showing by the recipients. For example, a number of states implemented a new-source set-aside to reserve allowances for use by new plants that would have a compliance obligation under the program.[26] Still others implemented energy efficiency, renewables, or other clean energy technology set-aside accounts.

Set-asides aimed at complementary purposes such as energy efficiency reflect the states' view that energy efficiency can play an important role in achieving emissions goals. Allowances awarded to energy efficiency projects are sold by the project proponents to parties that can use the allowances for compliance. The revenue gained from the sale is then retained for the benefit of the energy efficiency project sponsor. In effect, by awarding allowances to energy efficiency projects, states invest allowance value in these projects.

Because set-asides delay distribution of allowances for future purposes or projects, states must consider what happens to the set-aside allowances if those future purposes or projects do not materialize. If a state sets aside 5% of its allowances for allocation to demand-side energy efficiency projects, and no project sponsors apply for the allowances or the number of applicants is insufficient to draw down the full set-aside, what happens? For the most part, the EPA and states have instituted set-aside "flow back" provisions that distribute leftover set-aside allowances to affected units according to some method, usually by the same method used to initially distribute the bulk of the allowances.[27] At least one state decided to retain unsubscribed set-aside allowances and retire them.[28] Still another sold the unused allowances in its set-aside account.[29]

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[26] Mass-based trading programs for the electricity sector have generally covered both existing and new power plants and so it was necessary to consider how new plants would obtain the allowances they needed to operate. Under the Clean Power Plan, covering new plants is a decision for the states. States that choose to cover new plants may choose to offer a new-source set-aside.

[27] The proposed federal mass-based trading plan would distribute allowances from the renewable energy set-aside back to affected units on the basis of historical generation if there were no subscribers to the set-aside. Proposed Federal Plan and Model Rules, *supra* note 4 at 65069, proposed to be codified at 40 CFR §62.16245(a)(6). See also New York's CAIR rule at 6 NYCRR § 244-5.3(c)(8)(flow back provision under CAIR).

[28] For example, Illinois. 35 Ill. Adm. Code 274.210 (no flow back provision).

[29] Kentucky provided for the sale of all allowances in its new-source set-aside, whether or not new sources were built. 401 KAR §51:160.4. A similar approach was taken by the EPA pursuant to the federal Acid Rain Program under Title IV of the Clean Air Act. 40 CFR §73.70 et seq. See Box 3.

Box 3. Early Experiences with Government Auctions or Sales of Allowances

The U.S. Congress was the first to direct that allowances be auctioned as part of the EPA's implementation of the acid rain allowance trading program under the 1990 Amendments of the Clean Air Act. Small auctions under that program began in 1993 and continue today.

Under the NOx Budget Trading Program (also called the NOx SIP Call program), **Kentucky** set aside 5% of its allowances for sale as part of a new-source set-aside. Sales were conducted through a commodities broker and proceeds went to the state's general fund. Similarly, in **Virginia** the legislature ordered that the state's 5% new-source set-aside be auctioned for the years 2004 and 2005.

In 2008, the Northeast and Mid-Atlantic states that participate in the **Regional Greenhouse Gas Initiative** began periodic auctions of nearly 100% of their allowances; proceeds from the sales were directed to consumer rebates, energy efficiency, and other clean technology purposes. Utilities in **California** also use an auction to sell allowances they receive under California's mass-based trading program.

Auctioning Allowances

States may auction allowances and direct the revenues to fiscal purposes or to other purposes such as consumer rebates, energy efficiency investments, or other complementary efforts. At the direction of its legislature, Virginia auctioned its 5% set-asides for the years 2004 and 2005.[30] Using a broker on the secondary market, Kentucky sold 5% of the NOx allowances in its NOx Budget Trading Program during each year of the program's implementation.[31] RGGI states implemented auctions to distribute nearly all of the allowances in the RGGI program. They invest the auction proceeds in energy efficiency and other clean energy purposes. California allocates allowances for the electricity sector to load-serving entities and requires that those allowances be consigned to auction and that the revenues be used for programs to benefit customers. California also auctions a significant share of non-electricity allowances and uses the proceeds for its Greenhouse Gas Reduction Program, which targets investments in renewable energy, energy efficiency, advanced vehicles, water and natural resource conservation, and waste reduction.

State Allocation Examples from Other Trading Programs

Many states have experience implementing allocation approaches under other emissions trading programs involving the power sector, notably the NOx budget/NOx SIP Call, Clean Air Interstate Rule (CAIR), and the Regional Greenhouse Gas Initiative (RGGI). Table 2 summarizes how five states addressed allocation—experiences that they and other states can draw from to make allocation decisions if they choose a mass-based, trading-ready approach under the CPP.

[30] Authorization for the auction was provided in the 2002 Virginia state budget. A later legislative enactment in 2004 prohibited future sales of allowances without legislative authorization.
[31] 401 KAR §51:160.4. Kentucky's sale of allowances was authorized by the state legislature, as environmental rules are reviewed and approved by the legislature in the normal course in the state.

Table 2. Selected allocation experiences under other mass-based trading programs

	Illinois	Kentucky	Missouri	New York		Virginia
Program	NOx CAIR	NOx Budget and CAIR	NOx Budget/NOx SIP Call	NOx CAIR	RGGI	NOx CAIR
Allocation Approach	70% of allowances allocated on basis of previous year's output, updated annually	95% of allowances allocated to affected units on basis of heat input in baseline period	99% of allowances allocated to affected units on basis of heat input	85% of allowances allocated to affected units on basis of heat input; 10% of allowances auctioned	100% of allowances auctioned	95% of allowances allocated on basis of heat input
Set-Asides	25% of allowances to Clean Air Set-Aside for energy efficiency, renewable energy, and other clean tech projects; 5% of allowances to new unit set-aside	5% new-entrant set-asides sold.	1% of allowances in energy efficiency/renewable energy set-aside	5% new-source set-aside	None	4% new-unit set-aside; 1% efficiency/ renewable energy set-aside
Noteworthy	No "flow back" of set-aside allowances if not subscribed	5% set-aside sold on secondary market by state budget division		Direct allocation to units despite auction in RGGI	Auction	

Legal Considerations for Implementing State Allowance Allocation Options

States must have adequate legal authority to implement state plans to meet federal CPP requirements. This requirement extends to a state's chosen allocation approach. Experience to date suggests that most allocation options should present no legal authority issue for states, but allowance auctions may require careful design to fit existing legal authority and in some cases may require new state legislation.[32]

In implementing the now numerous mass-based trading programs to reduce nitrogen oxides (NOx) under the Clean Air Act, states demonstrated that they have existing legal authority to allocate allowances to affected units or to other entities in the state. Indeed, states have successfully relied on their existing legal authority to allocate allowances to regulated entities and non-regulated entities carrying out desirable energy efficiency, renewable energy, and other projects. This track record could extend to the Clean

[32] For a discussion of allocations and state legal authority, see Peskoe (2016).

Power Plan to allow states to allocate allowances to covered power plants, load-serving entities, or other entities, such as developers of renewable energy projects, without seeking new authority from state legislatures.

Auctioning allowances may present a unique challenge for some states. With the exception of New York, states that have auctioned allowances have done so with specific legal authority to implement the program.[33] In New York, the environmental agency allocates Regional Greenhouse Gas Initiative allowances to the quasi-independent New York Energy Research and Development Authority (NYSERDA). NYSERDA has the capacity to receive the allowances, auction them, and invest the proceeds for complementary clean energy technology programs. In a sense, the environmental agency uses its general legal authority to allocate allowances to NYSERDA in the same way that it could allocate those allowances to an energy efficiency project implementer.

For states that have no analog to NYSERDA, auction by consignment may be an approach allowed by existing state law. These states would allocate allowances to one or more entities—perhaps in-state distribution utilities or load-serving entities—on the condition that the entities sell the allowances by auction or some other method that ensures open access to the allowances. Distribution utilities are subject to rate regulation in all 50 states, meaning that the disposition or investment of the revenue from the auction would be subject to direction from the state utility commission to protect ratepayers.[34]
The precise limits of an individual state's legal authority are beyond the scope of this paper. The observations offered here represent a starting point for a thorough legal analysis in each state.

Federal Plan Proposal

The EPA intends to implement a federal plan in states that choose not to submit a state plan to implement CPP requirements. If the EPA implements a mass-based trading program as a federal plan in a state, it will determine the way allowances are allocated. In its draft federal plan, the agency proposes to allocate the bulk of the allowances to affected units on the basis of historic output and to allocate the rest with three allowance set-asides, as described below.[35]

Historical Output-Based Allocation

The EPA proposes to allocate the bulk of the allowances to affected units on the basis of each unit's average output during the three baseline years of 2010, 2011, and 2012. The precise percentage of the total allowance budget to be allocated through historical allocation depends on the size of the updating output-based set-aside (see below) and varies between 69% and 95% of the allowances and depends on the state.[36] Because the historical output-based allocation would be made without distinguishing among fuel or technology types, plants that produced more electricity with fewer emissions will get more allowances per unit of emissions than higher-emitting plants.[37]

[33] The fact that a state agency has specific authority to auction allowances does not mean that specific authority was necessary. Indeed, in some states obtaining specific legislative authority may be the custom rather than a legal necessity.
[34] Where the load-serving entity is a municipal power company or a cooperative, the entity is owned, controlled, or both by the customers, making it less likely consumers would not benefit from the sale of allowances.
[35] Even states with an EPA-imposed federal plan may propose and adopt replacement allocation provisions that the EPA would administer. Proposed Federal Plan and Model Rules, supra note 4 at 65015.
[36] See Adair and Hoppock (2015 at 9).
[37] The EPA requested comment on this approach and on an alternative that would divide the total allowance budget between steam units and combustion turbines before allocating on the basis of historical output, an approach that would increase the number of allowances going to coal plants. Proposed Federal Plan and Model Rules, supra note 3 at 65015.

Two Set-Asides to Address Leakage to New Sources

To counteract the emissions leakage that it expects may occur because new power plants are not covered by the federal plan, the EPA proposes to implement two allowance set-aside mechanisms: a renewable energy set-aside and an output-based allocation set-aside with updating (OBAU).[38]

Renewable Energy Set-Aside

Five percent of each annual allowance budget would go into the renewable energy set-aside. Project proponents that commence construction on certain types of new or incremental renewable generation after January 1, 2013, can apply to receive allowances from the set-aside. Allowances from the set-aside are to be pro-rated on the basis of the project proponent's share of total eligible renewable generation—that is, generation approved to receive an allocation. In the event that no applications are received, the allowances in the set-aside will "flow back" and be allocated to affected units on the basis of historical output.

Output-Based Allocation with Updating Set-Aside

The EPA has also proposed an OBAU set-aside for states with a federal plan. That set-aside size varies, depending on the state's baseline natural gas capacity. The number of allowances in the set-aside will be equal to 10% of the adjusted baseline natural gas capacity multiplied by the hours in a year and the emissions rate standard for new NGCC units. This formula translates to a set-aside ranging between 0% and 26% of the total allowance budget, depending on the state's baseline natural gas capacity.

The OBAU set-aside would be implemented beginning in the second three-year compliance period. Only existing NGCC units are eligible for an allocation from the OBAU set-aside, and that allocation would be based on a unit's net generation above a 50% capacity factor in the prior compliance period. The goal of the set-aside is to incentivize increases in generation from existing NGCC units to offset the incentive new plants might have to generate because they have no compliance obligation under the program.

Clean Energy Incentive Program Set-Aside

Because the EPA intends to implement the Clean Energy Incentive Program (CEIP) as part of a federal plan, a 1% set-aside for that purpose is proposed for the first compliance period. The set-aside would be directed to certain renewable energy projects and low-income energy efficiency projects that produce renewable electricity or energy savings in 2020, in 2022, or in both years. The precise implementation details for the CEIP are still being developed by the EPA and are expected to be the focus of a new rulemaking action in spring 2016.

Conclusion

Allowance allocation may be the single-most important decision states will make when implementing mass-based trading programs under the Clean Power Plan. States will want to carefully consider their goals in making allowance allocation decisions, especially considering that the total value of all of the allowances in a state's allowance budget is likely to dwarf the actual resource expenditures needed to bring the state's power plants into compliance. Allowance allocation does not determine the overall environmental stringency of the rule—the size of the cap does that—but it does determine how that value and CPP costs are distributed across important constituencies.

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[38] The EPA defines *leakage* as "the potential of an alternative form of implementation of the BSER (e.g., the rate-based and mass-based state goals) to create a larger incentive for affected EGUs to shift generation to new fossil fuel-fired EGUs relative to what would occur when the implementation of the BSER took the form of standards of performance incorporating the sub-category-specific emission performance rates representing the BSER." Proposed Federal Plan and Model Rules, supra note 3 at 65019.

Allowances can be directly given to specific parties, set aside for a specific purpose, auctioned, or some combination of the three. States and the EPA have considerable experience with various allocation mechanisms. The implications of different choices vary, depending on whether and how a state regulates electricity prices. These implications are especially important when allowances are given for free to compliance entities yet might influence prices that emerge from electricity wholesale markets. As a result, states should carefully consider the effects of different approaches on electricity producers, consumers, and other stakeholders.

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