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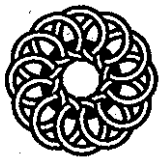

Analysis of Options for Distributing Allowances by Auction

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Analysis of Options for Distributing Allowances by Auction

INTRODUCTION

This is one of a series of National Round Table on the Environment and the Economy (NRTEE) papers dealing with issues common to several possible designs for a domestic greenhouse gas emissions trading system.

This paper deals with the distribution of allowances to participants in a "cap and trade" system by auction. In such a system, designated sources are required to hold allowances equal to their actual emissions. The number of allowances available is limited. The regulatory authority distributes the allowances by selling them at auction.

The main arguments for distributing allowances by auction are that:

- The allowances represent a right to use a limited public resource, namely the waste absorption capacity of the atmosphere. Proper management requires the government obtain the highest price for the use of this public resource. A well-designed auction achieves this objective.

- An auction raises revenue that the government can use to improve the performance of the economy and to offset adverse impacts suffered by particular groups as a result of the introduction of the limit on emissions.

The main issues that arise with an auction of allowances, then, are the design of the auction and the use of the revenue generated. Although auctions are routinely used to distribute other public resources, such a Treasury bills, oil and gas exploration rights and communications frequencies, they have not yet been used to distribute allowances for an emissions trading program. While an auction is part of the American SO_2 allowance program, it is not the basis for distributing allowances and now represents only a small share of total sales.

Topics addressed by this paper are:

- The design of the auction
- Experience with the use of auctions
- The secondary market
- Use of the auction revenue
  - Efficiency considerations
  - Equity considerations
- Rationale for transition to an auction

Many of these topics are discussed well in a paper on "Tradable Carbon Allowance Auctions: How and Why to Auction" by Peter Cramton and Suzi Kerr prepared for the Center for Clean Air Policy's Greenhouse Gas Emissions Trading Braintrust in March 1998.[1] It is attached to this document and should be read in conjunction with this paper because it discusses several of the topics covered here in more detail.

Cramton and Kerr assume that the allowance trading system is implemented for the carbon content of fossil fuels sold by oil refineries, natural gas pipelines, natural gas liquid sellers, and coal processing plants. While this is similar to one of the options for a domestic emissions trading system being analysed for the NRTEE, their conclusions relating to the use of an auction to distribute allowances apply to any cap and trade system.

Cramton and Kerr also compare an auction to a *gratis* distribution of allowances, which they assume would reflect historic emissions. Hence, they refer to *gratis* distribution of allowances as grandfathering. The NRTEE paper on *gratis* distribution of allowances, Issue 6, clearly indicates that *gratis* distribution need not, and probably should not, reflect historic emissions. Some of Cramton and Kerr's comments on grandfathering, therefore, do not apply to all *gratis* allocation rules.

THE DESIGN OF THE AUCTION

There are many ways to conduct an auction and there is ample evidence that the design affects the outcome. The best design for an auction varies with the nature of the item sold and the number of bidders. An auction for a unique item, such as a work of art, should be designed to elicit from each potential buyer the highest price he/she is willing to pay for the item being sold. Then selling the item to the highest bidder maximizes the revenue to the seller and maximizes satisfaction for the buyers.[2]

An auction of emissions allowances, like Treasury bills, involves the sale of a large quantity of the same item, generally to multiple buyers. Either a price discriminating auction or a uniform price auction is possible in this case. In a price discriminating auction potential buyers submit sealed bids for a specified quantity at a specified price. The bids are ranked in descending order by price and sales occur until the available quantity has been sold. This design maximizes efficiency by getting the best price for each item sold.[3]

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[1] The Center for Clean Air Policy is located in Washington, D.C.

[2] Since the item is unique, only one of the potential buyers can purchase it. If the auction design successfully elicits the highest price each buyer is willing to pay for the item, it will be sold to the buyer for whom it is most valuable.

[3] Efficiency focuses on minimizing waste, thereby resulting in the best use of resources. Efficiency in the reduction of greenhouse gas emissions requires that the limited number of allowances be allocated to the sources for which they have the most value. These are the sources facing the highest costs to reduce their own emissions. Such an allocation means the emissions reductions needed are achieved at the lowest cost.

In a price discriminating auction buyers pay different prices for the same good purchased from the same seller on the same day. This can be interpreted as being unfair. In contrast, a uniform price auction sells all of the available allowances at the same price. Potential buyers submit the quantity they wish to purchase at a given price. If the desired quantity is more than is available, the auctioneer raises the price. Potential buyers submit new bids for the quantities they wish to purchase at the higher price. This continues until the demand equals the available supply. That is the price at which allowances are sold to all bidders.

A small number of bidders, or a few bidders who purchase a large share of the available items, can reduce the price obtained in a uniform price auction and so reduce the revenue received by the government. Since there are multiple rounds of bidding, a potential buyer can "signal" other bidders (if individual bids are known) to get a lower price. In the case of an auction for greenhouse gas allowances, the number of participants would probably be relatively large (more than 25) and it is unlikely that any of them would buy a large share of the available allowances.[4]

Under these conditions Cramton and Kerr recommend an ascending "clock" auction. It would work as follows:[5]

- The "clock" indicates the current price.
- Bidders submit the quantity of allowances they are willing to buy at the current price.
- If the total quantity exceeds the quantity of allowances available, the price is increased by a known increment
- Bidders indicate the quantity they are willing to buy at the higher price.[6]
- Bidding continues until the quantity bid is less than the quantity available.
- The allowances are then allocated at the previous price.
- Since not all bids can be satisfied at that price, allowances are prorated for the bidders that reduced their quantities in the last round.

The total quantity bid, but not the quantities submitted by individual bidders, is reported for each round to give bidders an indication of how quickly they are approaching the clearing price and to prevent signaling.

Relative to less efficient approaches to achieving the same emissions reduction, this means lower prices for some products, higher wages for some employees, higher profits for some shareholders, and higher tax revenues.

[4] In principle, one buyer could attempt to purchase most of the allowances and then resell them to other participants at a higher price. Quarterly (or more frequent) auctions, and a secondary market linked to the global market, as discussed below, would make such a strategy unattractive.

[5] The auction would be conducted by the regulatory agency responsible for the allowance trading program or an agency acting on its behalf.

[6] Under the rules of the auction bidders are not allowed to increase the quantity they offer to buy as the price rises.

This format is perceived to be fair since all buyers pay the same price for their allowances, although this is not the most efficient outcome. However, if the number of participants is large enough to minimize market power, the inefficiencies are likely to be insignificant. Cramton and Kerr recommend that auctions be held quarterly to ensure a regular supply of allowances. Firms that are unsuccessful in obtaining the allowances they want at one auction can try again at later auctions or turn to the secondary market.

If allowances are to be auctioned for an emissions trading program that involves relatively few sources, a different design might be needed. For example, if the trading program included only firms that produce or import HFCs, a different auction design might be needed to get an efficient outcome. Combining several small trading programs, or combining small programs with a large program, is one possible way to deal with the concerns raised by a having limited number of participants.[7]

EXPERIENCE WITH THE USE OF AUCTIONS

Although auctions are routinely used to distribute public resources, such a Treasury bills, oil and gas exploration rights and communications frequencies, they have not yet been used to distribute allowances for an emissions trading program.[8] An auction is part of the American SO_2 allowance program, but it is not the basis for distributing allowances and now represents only a small share of total sales.

SO_2 Allowance Auction

The only experience with an auction for allowances is the SO_2 trading program for electric utilities in the United States. This auction is **not** used to distribute the allowances. The allowances are distributed *gratis* and small number are withheld for sale at auction to ensure that allowances will be available for new, small sources. The revenue is distributed to the sources whose allowances were sold.

The SO_2 trading program was created by Title IV of 1990 Clean Air Act Amendments and came into effect in 1995. When fully implemented in 2000, the program will apply to

[7] For example, HFC producers and importers, oil refineries, natural gas pipelines, natural gas liquid sellers, and coal processing plants could all be part of a single program with allowances denominated in CO_2 equivalent tonnes.

[8] Communications frequencies in different urban areas are not a homogeneous commodity and the number of frequencies available in any given area is small. The issues involved in designing an efficient auction for communications frequencies are very different from those involved in the design of an auction of a uniform commodity with a large number of bidders, such as an auction of greenhouse gas emissions allowances so the experience with auctions of communications frequencies is not reported here. The Treasury bill auction, like an auction of greenhouse gas emissions allowances also sells a uniform commodity. The number of participants in the Treasury bill auction is smaller than is likely to be the case for greenhouse gas allowances. In the U.S. the top five primary Treasury bill dealers routinely purchase over half of the issue, yet market power is not a serious concern.

all electric utility generating units with an output capacity of 25 MW or greater that use fossil fuels with a sulfur content greater than 0.05%.

Allowances are distributed *gratis* to generating units that existed in 1990; new units receive no allowances. During Phase I (1995-99) the units required to participate are allocated SO_2 allowances on the basis of a standard emission rate (2.5 lbs of SO_2 per million BTU) multiplied by the average energy input for the years 1985 through 1987.[9] In Phase II (from 2000 on) the emission rate drops to 1.2 pounds per million BTU for all units but it is still multiplied by the average energy input for the years 1985 through 1987. The basic allocation rule is supplemented by a number of special provisions. If necessary, all allocations are prorated to equal the number of allowances available for that year.

Since new units receive no allowances, independent power producers wanted assurance that allowances would be available for purchase. An auction was established for this purpose. A fraction (2.8%) of the allowances allocated to each unit is withheld and sold at auction. The revenue derived from the auction is divided among the units in proportion to the number of allowances withheld.

The auction is a sealed bid auction with bidders paying the price they bid; a price discriminating auction. The design of the auction has been criticized for providing an incentive to underbid.[10] In 1993 and 1994 the auction accounted for a substantial share of the total number of allowances traded. When Phase I began in 1995, the secondary market began to develop.[11] The quantities of allowances sold in the secondary market have grown rapidly and auction sales have amounted to less than 5% of total trades since then. As a result, concern about the structure of the auction has diminished because it has little effect on the market.

Bank of Canada Auction of Bonds and Treasury Bills

The Bank of Canada, in its role as the government's fiscal agent, conducts auctions of bonds and Treasury bills.[12] The auction is designed to produce the highest prices for the government while being fair and transparent for buyers. Treasury bills with terms of three, six, and twelve months are auctioned on a biweekly basis. Auctions are usually

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[9] The 263 units listed in Table A of Title IV are required to participate. Other units can choose to participate. Units that opt-in receive allowances approximately equal to their historic emissions.

[10] See the references to Cason 1995, Cason and Plott 1996, and Joskow, Schmalensee and Bailey 1997 in the Cramton and Kerr paper.

[11] No action was required to develop the secondary market. Electric utilities can trade directly with one another and many early transactions took this form. But by 1997 virtually all trades were arranged through brokers that specialize in emissions trading.

[12] For more information, see Finance Canada, *Debt Management Report, 1997*, Finance Canada Distribution Centre, Ottawa, 1998.

held on Tuesday for delivery Thursday. To be eligible to bid, a firm must meet reporting, performance, and distribution criteria. To become an eligible bidder, a firm must be an investment dealer incorporated in Canada, a bank, or a non-bank member of the Canadian Payments Association.

Approximately 30 firms are eligible to participate in the auctions. Each firm is assigned bid limits by the Bank of Canada. Any firm may bid for up to one-third of each tranche of a Treasury bill auction. Bidding limits for different bonds depend on the firm's activity in the primary and secondary markets for those securities. No firm is allowed to bid for more than 25% of the total amount of bonds tendered at an auction.

The most active bidders in both bond and Treasury bill markets may apply to become Bank of Canada jobbers. Jobbers are expected to bid at every Treasury bill and bond auction, to consistently market Treasury bills and bonds to a broad customer base, and to provide the Bank of Canada with assessments of market conditions, weekly statistical reports, and audited financial statements.

Oil and Gas Exploration Leases in Alberta

In Alberta, oil and gas development proceeds through a business arrangement between the Province as resource owner, and private companies that explore for and develop the resource. The price for the right to exploit Alberta's petroleum resources is composed of an up-front competitive bid, plus a stream of royalty payments over the life of a well. The competitive bid is based on a company's expectations of commodity price, exploitation costs, and the royalty payments associated with extraction of the resource.

Twenty-four Public Offerings for the disposition of crown petroleum and natural gas rights are made each year. In 1996, 9,020 petroleum and natural gas parcels were sold involving 4.6 million hectares of land for a value of $726 million.

THE SECONDARY MARKET

If allowances are auctioned, a secondary market would also exist in Canada. Firms whose bids were unsuccessful could buy allowances in the secondary market. The allowances and credits available on the secondary market would include: credits from specified domestic sources, assigned amount from international emissions trading, joint implementation reductions, clean development mechanism credits, and allowances purchased at auction and offered for resale. The secondary market would reflect global supply and demand for greenhouse gas allowances and credits.

Given that Canada's emissions are small relative to global emissions, the global market will largely determine prices in the secondary market unless international or Canadian rules restrict the ability to use, or raise the cost of using, allowances or credits from other

countries.[13] If the secondary market is closely linked to the global market, the auction will be small relative to the secondary market and auction prices can be expected to reflect the global price. This is the desired outcome from an economic efficiency perspective.

The existence of a secondary market that is large relative to the auction should alleviate any concerns about strategic behaviour in the auction leading to restrictions on the supply of allowances for unsuccessful bidders. However, the auction must still be designed so that bidders are not able to buy allowances substantially below the market price.

It could be argued that the existence of a secondary market, especially one large enough to effectively determine the auction price, eliminates the need for an auction. The government could simply sell the allowances on the market. But the government will still be a relatively large seller and the timing or quantities of its sales could affect activity in the secondary market. Relatively frequent auctions of allowances minimize the impact of government sales on the secondary market.

An auction also provides a fair and transparent way for the government to sell the allowances. The procedure for determining the price and the successful buyers is fair and transparent. If instead, the government were to sell allowances periodically on the secondary market, the process for determining the price and the successful buyers is not clear. Some buyers will on occasion purchase allowances from the government at a price lower than the market price over the next few days. Then the government will be charged with incompetence or rewarding supporters or incompetence. An auction eliminates the potential for such charges.

USE OF THE AUCTION REVENUE

An auction of allowances raises revenue, possibly a significant amount of revenue.[14] The economic impacts of using an auction to distribute allowances depend on how the revenue is used.

Several options for the use of auction revenue, each with its advantages and disadvantages, have been suggested, including:

- Reduce existing distortionary taxes. Any tax creates a disincentive to engage in the taxed activity. Existing taxes discourage investment, employment creation, and work. Using the auction revenue to reduce such taxes can stimulate economic activity and so reduce the economic impact of the limit on greenhouse gas emissions.

[13] For example, supplementarity provisions for international emissions trading, joint implementation, and the clean development mechanism could limit the extent to which allowances or credits from other countries could be used in Canada.

[14] Cramton and Kerr (p. 3) provide an order of magnitude estimate of 10% of federal revenue and 2% of GNP for the United States.

- Purchase assigned amount, joint implementation credits or clean development credits from other countries. Purchasing such allowances or credits from other countries with the auction revenue means that smaller emissions reductions are needed domestically.

- Lower taxes to offset the economic burdens on individuals. The costs of limiting greenhouse gas emissions are ultimately borne by individuals. Most studies suggest the costs are proportionally larger for the lowest income groups. Auction revenue could be used to offset the economic burdens on individuals through changes to the personal income tax or goods and services tax.

- Provide adjustment assistance to the groups most adversely affected. Limiting greenhouse gas emissions will have disproportional effects on some groups and auction revenue could be used to help them adjust. Assistance could be provided, for example, to firms, individuals and communities affected by the closure of coal mines.

- Give rebates to participating sources to reduce competitiveness impacts. Distributing the auction revenue to participants in the trading program minimizes adverse competitiveness impacts due to the limits on greenhouse gas emissions. However, the formula for distributing the revenue must give sources an incentive to reduce emissions.[15]

Clearly a decision has to be made as to how to use the revenue. That decision inevitably involves a choice among competing efficiency and equity objectives and judgements as to what is fair for different groups. The decision on how to use the revenue must therefore be a political choice.

Reduce Existing Distortionary Taxes

Efficiency considerations favour an auction over *gratis* distribution because it raises revenue, which can be used to reduce existing distortionary taxes.[16] How the auction revenue is recycled has a significant effect on the economic impacts. Depending on conditions in the economy, the way in which the revenue is recycled can yield economic benefits that offset some or all of the cost of the emissions limitation policy.[17] Then the policy has both climate change and economic benefits; a "double dividend."

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[15] Revenues from some emissions taxes in Scandinavian countries are redistributed to the taxed sources.

[16] Lawrence Goulder, Ian Parry and Dallas Burtraw ("Revenue-raising vs. Other Approaches to Environmental Protection: The Critical Significance of Pre-existing Tax Distortions," *RAND Journal of Economics*, forthcoming) show that for a given environmental goal using non-revenue raising policies is more costly than using revenue raising policies with revenue recycling. Thus, revenue raising policies with revenue recycling improve efficiency.

[17] If the economy is at full employment and if all existing taxes are for social or health reasons (i.e., imposed to correct for non-environmental externalities), the possibility of an economic benefit, such as employment or income growth, does not exist. No economy meets these conditions.

Every economy has existing distortionary taxes (in the sense that they are not intended to correct for an externality or other distortion) and unemployed resources.[18] The auction revenue can be used to reduce these taxes and so increase the efficiency of the economy and hence increase employment or income. The economic effects depend on the existing tax structure and will differ depending on whether the revenues are used to reduce payroll, personal income, corporate income, investment income, or expenditure taxes.[19]

The notion of a "double dividend" for policies that limit greenhouse gas emissions by using a carbon tax or auctioned allowances has created a controversy in the literature. It is important to understand that the debate is about the *attribution* of the economic benefits; there is no debate about the *existence* of these benefits.

Are the economic benefits from reducing existing distortionary taxes due to climate change policy or tax reform? Some analysts argue that since the auction generates the revenue, using the revenue to reduce existing distortionary taxes and stimulate economic growth is a valid way to reduce the cost of an emissions limitation policy. Other analysts argue that a lump sum distribution of the auction revenue should be used because it has a neutral impact on economic activity.[20] The economic benefits of reducing existing taxes are then attributed to tax reform, not the emissions limitation policy.[21] But tax reform is possible only if the government has a new source of tax revenue, such as an allowance auction, to replace the revenue lost by reducing existing taxes.

In practice, a decision to implement an allowance auction would require consideration of options for use of the revenue. Clearly, one of the options is to use the revenue to reduce existing distortionary taxes. That would stimulate economic growth and help offset (perhaps more than offset) the economic cost of the emissions limitation policy. Whether

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[18] If an economy had a non-distortionary tax structure and unemployed resources and government action to reduce unemployment is constrained by lack of revenue, the auction could be used to stimulate employment and so create an economic benefit.

[19] Studies for the U.S. suggest much larger economic benefits from reductions in taxes on capital and on employers than from reductions in corporate income, personal income, or sales taxes.

[20] Many studies of the economic impacts of a carbon tax (allowance auction) compare the carbon tax (allowance auction) to a baseline with no environmental policy. A fair comparison requires that the carbon tax (allowance auction) be compared to a baseline that uses other policies to achieve the same environmental goal. Or that the economic cost of the carbon tax (allowance auction) be compared with the benefits of reduced climate change damage.

[21] As noted by Jean-Charles Hourcade, Erik Haites, and Terry Barker, "Macroeconomic Cost Assessment," Chapter 6 of J.A. Sathaye and J. Christensen, eds., *Mitigation and Adaptation Cost Assessment: Concepts, Methods and Appropriate Use*, United Nations Environment Programme, UNEP Centre, Risø, Denmark, 1998, the correct analytical approach is more complex still and is never used because of the technical and political difficulties of determining the optimal fiscal system leading to full employment.

that is called climate change policy or tax reform may be important from a political perspective, but it doesn't change the outcome.[22]

Purchase Allowances or Credits from Other Countries

Auction revenue could be used to purchase assigned amount, joint implementation reductions or clean development credits from other countries. Purchasing such allowances or credits from other countries with the auction revenue means that smaller emissions reductions are needed domestically. Smaller domestic reductions mean lower costs and improved competitiveness, at least in the short run.

Purchases of allowances or credits from other countries would use only part of the revenue raised.[23] The revenue is transferred to other countries and can not be used to address equity issues. The revenue transferred to other countries is ultimately used to purchase Canadian goods and services.[24] The economic impacts of those purchases should be compared with use of the revenue to stimulate growth in Canada by reducing existing distortionary taxes. However, since only part of the revenue is used to purchase allowances and credits from other countries, the balance can be used to address equity and efficiency issues.

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[22] The following analogy may help. Assume that the advertised price of a product is $100, but that a manufacturer's rebate of $25 is available to every purchaser. The price (assuming lump sum distribution) is $100, but the net cost of purchasing the product (reducing existing distortionary taxes) is $75. It is not possible to collect the rebate (reform existing distortionary taxes) unless the product is purchased (another source of revenue is found). One can argue that the price is $100 or $75, but the cost is $75 in either case.

[23] If the secondary market is linked to the global market and the auction is well designed, auction prices should still be close to the global price for allowances and credits. The auction revenue will equal the world market price times the allowable emissions. Under the Kyoto Protocol allowable emissions will be 94% of 1990 emissions. The emissions trading program should cover at least half of those emissions, or more than 50% of 1990 emissions. In the absence of a national commitment, greenhouse gas emissions are likely to be 125% to 130% of 1990 emissions. Thus the reductions required are 30% to 35% of 1990 emissions. In the absence of supplementarity provisions, allowances and credits equal to this reduction could be purchased from other countries at the world price. The cost of the allowances and credits purchased (less than 35% of 1990 emissions at world prices) is less than the revenue raised (more than 50% of 1990 emissions at world prices).

[24] A Canadian who buys allowances or credits from a seller in another country transfers Canadian dollars to an entity outside the country. Those Canadian dollars can only be used to buy goods and services from, or to make investments in, Canada. For the sake of simplicity assume that the seller accepts Canadian dollars as payment for the credits or allowances. The seller can buy Canadian goods and services using the money. Or the seller can exchange the Canadian dollars for other currency. But the seller of the other currency, whether a foreigner or Canadian, then has more Canadian dollars. Those Canadian dollars can only be used to buy Canadian goods or services or to invest in Canada. Ultimately, then, purchases of allowances or credits from other countries lead to higher purchases of Canadian goods and services or more foreign investment in Canada.

Lower Taxes to Offset the Economic Burdens on Individuals

Cramton and Kerr note that any policy to limit greenhouse gas emissions will have price effects and wealth effects. The price effects are similar regardless of the policy adopted, but the wealth effects differ.[25] Under a cap and trade system an auction gives ownership of the right to emit greenhouse gases to the government while *gratis* distribution gives ownership to the recipients of the allowances, creating different wealth effects.

Although firms incur the cost of purchasing allowances, the costs are ultimately borne by consumers, employees and owners of capital. The firms that purchase allowances shift the cost to their customers, employees, suppliers, shareholders and lenders. Suppliers and customers of intermediate goods shift the cost to their customers, employees, suppliers, shareholders and lenders. Ultimately the costs are borne by individuals in their capacities as consumers of different products, employees of particular firms, and owners of capital.[26]

The wealth effects, and hence the impacts on owners of capital, vary for different policies. An auction of allowances assigns ownership of the right to emit greenhouse gases to the government and hence imposes a higher burden on owners of capital than a *gratis* distribution of allowances. The arguments in favour of an auction are that it is consistent with the polluter pays principle, owners of capital tend to be wealthier and so can afford the cost, and an auction captures all the value of the allowances for Canadian residents while *gratis* distribution benefits non-resident owners of capital. Of course, an auction might also impose a higher burden on employees of those firms, but some of the auction revenue could be used to ease the adjustment for employees.

The distribution of costs across income groups due to an auction of allowances is the same as the distribution of costs due to a carbon tax. Cramton and Kerr review (pp. 14-15) empirical studies of this issue for the U.S. They note that the available studies do not reflect the effects of changes in capital value and that they assume perfectly competitive pricing, which may not be appropriate for some key industries.

Cramton and Kerr note that the studies suggest the effects will be slightly regressive -- higher costs as a percentage of income for low-income groups. Auction revenue could be used to offset the economic costs on individuals, with particular attention to the adverse impact on low-income groups, through changes to the personal income tax or goods and services tax.

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[25] The magnitude of the price effects varies somewhat due to differences in the efficiency of different policies.

[26] Some suppliers and owners of capital may reside in other countries, so Canada's policies to limit greenhouse gas emissions can affect individuals in other countries. Conversely, the policies adopted by other countries can affect Canadians.

Provide Adjustment Assistance to the Groups Most Adversely Affected

Limiting greenhouse gas emissions will have adverse impacts on activities that generate such emissions. Due to its relatively high emissions per unit of energy and the availability of substitute energy sources for many applications, coal producers and users appear to be particularly vulnerable. This is true regardless of the policies adopted to limit greenhouse gas emissions.

An auction of allowances generates revenue that could be used to facilitate adjustment by firms, individuals, and communities affected by the closure of coal mines. Spending could be targeted to serve specific purposes. In contrast, *gratis* distribution of allowances to firms would allow the mining companies to determine how those resources are used.

Give Rebates to Participating Sources to Reduce Competitiveness Impacts

Participants in the trading program required to buy allowances at auction (or on the secondary market) may be less competitive as a result. The competitiveness of other entities may also be affected through price increases and/or lower demand for energy and other products. The impact on competitiveness is very complex. It depends on the ability of participants to shift costs to their suppliers, employees, customers and sources of capital. The impact on the competitiveness of Canadian sources also depends on the policies adopted by other countries.

The competitiveness impacts of different domestic greenhouse gas emissions trading program designs is the subject of another NRTEE paper. It is sufficient to note here that auction revenue could be used to reduce competitiveness impacts if that is a desirable policy. However, the revenue would need to be redistributed in a manner consistent with international trade rules.[27] And revenue redistributed to participants is not available to help groups adversely affected to adjust or to stimulate economic growth.

RATIONALE FOR TRANSITION TO AN AUCTION

To this point an auction has been discussed as an alternative to *gratis* distribution of allowances. Another possibility is a gradual transition from *gratis* distribution to an auction. Participants at the time the trading program is launched would receive allowances *gratis* in accordance with an agreed rule. But the share of the calculated allocation received *gratis* would decline to zero over a period of five or ten years. Any allowances not distributed *gratis* would be sold at auction. Thus, at the end of the transition period all allowances would be sold at auction.

[27] Foreign competitors, for example, might be able to argue successfully that some forms of revenue redistribution constituted an unfair subsidy.

The argument for this option is that imposition of a limit on greenhouse gas emissions reduces the value of existing capital that generates emissions. *Gratis* distribution of allowances to existing sources for some period of time provides some compensation for the loss of value of this capital stock and provides transitional support to adjust to the new competitive environment. Providing such compensation conflicts with the polluter pays principle. And the auction revenue foregone is not available to offset the economic costs to individuals, to help groups adversely affected adjust, or to stimulate economic growth.

SUMMARY

An auction is a means of distributing allowances to participants in a cap and trade system. It recognizes government ownership of the waste absorption capacity of the atmosphere and obtains the highest price of the use of this public resource. An auction also raises revenue that the government can use to improve the performance of the economy and to offset adverse impacts suffered by particular groups as a result of the introduction of the limit on greenhouse gas emissions. The main issues that arise with an auction of allowances, then, are the design of the auction and the use of the revenue generated.

The auction design is important to an efficient outcome. Cramton and Kerr recommend an ascending clock auction with quarterly auctions for an "upstream" trading program for the carbon content of fossil fuels. Such a design should be suitable for most greenhouse gas allowance trading programs provided there are a reasonable number of participants.

The auctions would be complemented by a secondary market where participants could buy and sell allowances. In this market they could buy and sell credits from specified domestic sources and credits or allowances from international emissions trading, joint implementation and the clean development mechanism. Unless international or Canadian rules restrict the use the ability to use, or raise the cost of using, allowances or credits from other countries the secondary market will closely reflect global prices. Since the auction would be small relative to the global market, auction prices would reflect the global market price. This is the desired outcome from an economic efficiency perspective.

An auction of allowances raises revenue, possibly a significant amount of revenue. This is an argument in favour of an auction rather than *gratis* distribution. The economic impacts of using an auction to distribute allowances depend on how the revenue is used. Revenue could be used in a variety of ways to improve efficiency and/or to address equity issues. Efficiency can be improved by using the revenue to reduce existing distortionary taxes.

The costs of limiting greenhouse gas emissions, regardless of the policy used, are ultimately borne by individuals in their capacities as consumers, employees, and owners of capital. In aggregate the distribution of costs is likely to be slightly regressive, but some groups will be significantly affected. Auction revenue can be used to offset some of

these impacts; adjustment assistance to coal mining firms, employees and communities and changes to the personal income or goods and services tax to offset the burden on lower income groups for example.

Clearly a decision has to be made as to how to use the revenue. That decision inevitably involves a choice among competing efficiency and equity objectives. A transition from *gratis* distribution of allowances to existing participants to an auction over five or ten years likewise involves a choice among competing efficiency and equity objectives. The decision must therefore be a political decision.