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ENVIRONMENTAL PROTECTION AGENCY
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| Protection of Stratospheric Ozone | 40 CFR Part 82 [AMS-FRL-3226-2] |

# COMMENTS OF THE STAFF OF THE BUREAU OF ECONOMICS OF THE FEDERAL TRADE COMMISSION

Washington, D.C. 20580
November 1, 1988

* These comments represent the views of the staff of the Bureau of Economics of the Federal Trade Commission. They do not necessarily reflect the views of the Commission or any individual Commissioner.

## I. INTRODUCTION

The staff of the Bureau of Economics of the Federal Trade Commission ("the staff") submits the following comments[1] in response to the request of the Environmental Protection Agency (EPA) for comments on possible modifications to its program for the trading of allocated quotas for producers of certain chlorofluorocarbons (CFCs) and brominated compounds (halons).[2] The EPA is the agency designated to implement the terms of the Montreal Protocol,[3] under which several nations have agreed to reduce their output of CFCs and halons in order to protect the stratospheric ozone layer. CFCs and halons are produced by five domestic and several foreign firms and are used in computers, automobile air conditioners, refrigerators, aerosol cans, and various other goods. The EPA has decided to comply with the Montreal Protocol by creating a system of marketable permits, to be allocated to each of the five domestic producers of these chemicals as well as to each of the several importers in proportion to their 1986 production.[4]

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[1] These comments represent the views of the staff of the Bureau of Economics of the Federal Trade Commission. They are not necessarily the views of the Commission or of any individual Commissioner. Inquiries regarding these comments should be directed to staff economist Andrew N. Kleit, Bureau of Economics, Federal Trade Commission, Washington, DC 20580, (202) 326-3481.

[2] Advance Notice of Proposed Rulemaking (ANPRM) 53 Federal Register 30604, August 12, 1988.

[3] Protection of Stratospheric Ozone, Final Rule, 53 Federal Register 30566. The rule amends 40 CFR Part 82 by adding several subsections.

[4] EPA has chosen to implement its emission abatement program through producers instead of users of CFCs and halons. The EPA plan calls for "production" permits to be issued granting the firms the right to produce the restricted chemicals in the U.S., and "consumption" permits which gives firms the right to sell those chemicals for consumption in the U.S. Domestic producers will be issued all of the production permits and almost all of the

In its recent ANPRM, EPA has suggested amending its CFC and halon program in several ways. In particular, EPA has proposed supplementing its marketable permit system with regulatory fees or using auctions to allocate those permits in order to capture the value of those permits for the government. EPA has also suggested implementing engineering-based control mechanisms or outright bans for particular industries that are slow to reduce their usage of the controlled substances.

We encourage the EPA to implement the Montreal Protocol in a manner that enhances competition and economic efficiency. Toward that end, we support the EPA's adoption of an economic incentive-based approach to implementing CFC and halon reductions. This comment offers advice only as to the mechanism of implementing whatever level of domestic production EPA sets on the basis of the non-economic factors it must consider, specifically the need to implement the Montreal Protocol, including its provision requiring consideration of emerging scientific evidence. The staff offers no opinion as to what the level of CFC and halon production should be.

Marketable permits represent a low cost, pro-competitive method of reaching the output levels mandated by the Montreal Protocol. Allocation of marketable permits without compensation to the government, however, could grant a windfall[5] to those firms that receive the permits and thereby reduce important incentives to innovate. These concerns can be addressed either by

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consumption permits. Because the two types of permits are allocated in very similar manners, our analysis will assume there is only one type of permit. This assumption does not affect the validity of our analysis.

[5] "Windfall" in this context refers to a valuable right which the government grants to a firm without receiving compensation in return.

auctioning off permits or by attaching a regulatory fee to the allocation of these permits. Setting the proper fee, however, could be a difficult task. Indeed, we believe that auctions have all of the advantages, and fewer of the disadvantages, that regulatory fees have. We therefore suggest that the EPA adopt auctions as the mechanism for capturing the windfall for the government.

The benefits from an incentive-based approach may be reduced if producers exert market power through control of a large number of permits, which would allow producers to limit production and raise prices above the competitive level. To alleviate this problem we suggest that EPA consider retaining the right to reassign the permits of those producers who exercise market power by hoarding permits.

In any case, all of the market-based approaches that permit the resale of production or usage rights to CFCs and halons appear more likely to achieve the goals of the Montreal accord at lower cost than engineering-based regulations or bans, either in general or in particular industries. We therefore recommend against any efforts to impose direct controls on an industry by industry basis.

## II. FEDERAL TRADE COMMISSION EXPERIENCE

The FTC is an independent regulatory agency charged with the responsibility to foster competition and safeguard the interests of consumers. In discharging that responsibility, the staff of the FTC submits comments to federal, state, and local regulatory agencies to suggest the most competitive and efficient methods of achieving regulatory policy goals consistent with

consumer welfare interests. These comments will therefore address (and be limited to) the competitive and consumer issues raised by the EPA's proposal.

The staff has studied and commented upon similar innovative proposals for regulatory flexibility. For example, we forwarded comments last year to the EPA concerning the proposed program for trading or banking of credits of particulate matter emitted by heavy duty engines.[6] Comments have also been made by the staff to the Federal Aviation Administration concerning the allocation of airport landing slots,[7] to the National Highway Traffic Safety Administration on Corporate Average Fuel Economy Standards,[8] and to the Federal Communications Commission concerning the auctioning of the radio spectrum.[9]

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[6] Comments of the Bureaus of Competition, Consumer Protection and Economics of the Federal Trade Commission on Certification Program for Trading and/or Banking of Oxides of Nitrogen and Diesel Particulate Emission Credits for Heavy Duty Engines before the Environmental Protection Agency, Docket No. A-85-22, February 23, 1987.

[7] Comments of the Bureaus of Competition, Consumer Protection, and Economics of the Federal Trade Commission on Charges for Use of Metropolitan Washington Airports, Before the Federal Aviation Administration, Docket No. 25204, April 13, 1987, and Comments of the Bureaus of Competition, Consumer Protection and Economics of the Federal Trade Commission on Slots Transfer Methods, Before the Federal Aviation Administration, Department of Transportation, Washington, D.C., Docket No. 24105, Notice No. 84-6, July 25, 1984.

[8] Comments of the Bureaus of Competition, Consumer Protection, and Economics of the Federal Trade Commission in Re: Passenger Automobile Average Fuel Economy Standards Model Year 1987-88, Before the National Highway Traffic Safety Administration, Docket No. FE-85-01, March 26, 1986 and Comments of the Staff of the Bureau of Economics of the Federal Trade Commission on Passenger Automobile Average Fuel Economy Standards for Model Years 1989 and 1990, Before the National Highway Traffic Safety Administration, Docket No. FE-88-01, September 15, 1988.

[9] Comments of the Bureaus of Competition, Consumer Protection, and Economics of the Federal Trade Commission to Mark Fowler, Chairman, Federal Communications Commission, October 29, 1986.

## III. THE BENEFITS AND COSTS OF VARIOUS PROPOSALS TO RESTRICT CFC AND HALON PRODUCTION

The EPA has the responsibility for ensuring that production and use of CFCs[10] does not exceed the levels set by the Montreal Protocols. These treaty-determined levels can be achieved in several ways, and each method will result in different costs and benefits to society. The methods that EPA originally considered fell into two general categories: engineering controls and economic incentive-based approaches. In its recently released rules, EPA rejected engineering controls and decided to meet the protocol's limits through the use of an allocated marketable permit scheme. Because EPA now proposes to supplement its allocated market permit scheme with direct engineering controls in particular industries,[11] both general methods remain under consideration. We will discuss each category in general terms first, and then specifically address the proposals outlined in the ANPRM.

### A. Engineering Controls

An obvious way of attempting to achieve the agreed-upon reductions in CFCs is to implement a program of engineering controls. The EPA has discussed in the past[12] a plan under which it would examine the technological capacity of each firm or individual factory, allocate to each a fixed quota of CFCs to produce or use, and then approve a technological plan for implementing the program. Such engineering controls, however, are

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[10] For convenience, "CFCs" will be used to refer to both CFCs and halons.

[11] ANPRM at 30615-6.

[12] Notice of Proposed Rulemaking (NPRM) 52 Fed. Reg. 47489 (December 14, 1987), EPA Docket No. A-87-20 at 47500.

likely to be a very inefficient means of meeting the required standard. Numerous studies have illustrated the high cost to society of these types of controls relative to incentive-based approaches.[13]

One of the reasons for the high costs of engineering controls is that the cost of reducing the production or use of these chemicals is lower for some firms than for others. Thus, a given reduction in CFC output could be achieved at less cost to society if the bulk of the reductions came from firms whose costs of reducing production or use are relatively low.

Another drawback of engineering controls is that they act to limit or prohibit entry into the affected industry. While production or use rights could be allocated to firms currently in the affected industry, it would be difficult to devise a mechanism for reallocating those rights to firms that may wish to enter the industry or expand their output, subject to the limits of the Montreal Protocol or any other limits EPA may set. Under such a system there would be no low-cost and easily available mechanism whereby rivals could increase sales and new firms could enter in response to an increase in price. Therefore, such limitations on entry or expansion have the potential to encourage firms in an industry to raise price and lower output, to the detriment of consumers.

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[13] See, for example, M. L. Weidenbaum, *Government-Mandated Price Increases*, American Enterprise Institute, 1975; L. E. Ruff, "Federal Environmental Regulations," in *Case Studies in Regulation* (L. W. Weiss and Michael W. K. ed.), Little, Brown, and Company (1981) at 235-261; S. Breyer, *Regulation and Its Reform*, Harvard, 1982, at 261-276; L. J. Perl and F. C. Dunbar, "Cost Effectiveness and Cost-Benefit Analysis of Air Quality Regulations," *American Economic Review*, *72:2*, May 1982, at 208-213; R. Crandall, *Controlling Industrial Pollution*, Brookings, 1983, and A. McGartland and W. Oates, "Marketable Permits for the Prevention of Environmental Damage," *Journal of Environmental Economics and Management*, 12:3, September 1985, 207-228.

Engineering controls would also impose significant administrative costs on the affected industries as well as on the EPA. Each facility would be required to prepare a compliance plan demonstrating its ability to meet the new abatement levels. All of these submissions would have to be reviewed by EPA personnel. Facilities would also be required to submit performance test analyses, as well as sample output of the controlled substances. Because of the large number of producer and user facilities involved, the EPA estimates that a general program of engineering controls would cost firms in the industry a total of $227 million in the initial phase of the program and $122 million for each year thereafter.[14]

In the long term, engineering controls are also likely to discourage innovation. The inability of firms to sell off their CFC quotas will lower their incentive to economize on the production or use of these chemicals. Firms may also believe that if they generate new methods of reducing their production or use of CFCs below the levels set for them by the EPA, the EPA is likely to reduce their allowable quotas. Therefore, they may have little or no incentive to lower the costs to themselves and society of CFC output reduction.[15]

The use of engineering controls could also grant a windfall to the affected firms.[16] If engineering controls are employed, the government

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[14] Stratospheric Protection Program, Office of Program Development, Office of Air and Radiation, U.S. Environmental Protection Agency, "Protection of Stratospheric Ozone, Volume 1: Regulatory Impact Analysis Document," August 1, 1987 at 11-18. (Hereafter cited as "RIA".)

[15] See D. Greer, *Business, Government, and Society*, MacMillan, 1983, at 482.

[16] A reduction in the output of CFCs can be expected to lead to an increase in the market price of these chemicals. Firms granted the right to

grants to firms the right to use or produce a certain amount of chemicals. Merely because these rights cannot be explicitly sold does not imply that they are valueless to the firms holding them. Indeed, such rights could significantly increase the profitability of these firms because the existence and allocation of these rights precludes other firms from entering that industry in response to a price increase.

In the short term, the granting of windfalls merely shifts a valuable resource from the government to various parties. This windfall does not have any immediate effects on efficiency or competition. In the longer term, however, the granting of windfalls could encourage firms to attempt to increase their share of output allotments through increased expenditures in EPA proceedings. These "lobbying" efforts use resources and therefore generate costs to society. However, because their effect would be merely to transfer a right from one party to another, they do not create any benefits for society. Therefore, they represent a net efficiency loss to the economy. Under certain circumstances, the amount spent trying to obtain such

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produce or use CFCs are likely to gain a windfall from the resulting higher prices. This windfall may be reduced or eliminated for at least some of these producers or users if: 1) average cost is higher at lower sales volumes (economies of scale), so that some firms may be forced to leave the affected industries if output is constrained; 2) there are substantial sunk costs in the industry, so firms that are forced to end production of CFCs suffer financial losses as manufacturers are unable to productively redeploy their assets; and 3) the demand for these chemicals is very sensitive to price (highly elastic) so that producers cannot raise their prices significantly despite the mandated reduction in output. We have no information to indicate whether the conditions described above exist in the affected industries.

resources is equal to the value of the resource being allocated by the government.[17]

**B. Economic Incentives**

Another method by which the desired reductions in the production and use of CFCs could be attained involves giving economic incentives to firms to economize on the production or use of various chemicals. Economic incentives could be created by auctioning off the right to produce or use various chemicals, allocating such rights and then allowing the rights to be traded, or charging firms fees for such rights. The potential benefits of economic incentives and trading are well illustrated in the analysis of these proposals done for the EPA's Regulatory Impact Analysis.[18]

All of these incentive-based methods would create a market in which the right to produce or use CFCs would cost each firm some price or consideration. Firms that can inexpensively find substitutes for CFCs are likely to do so. Firms for which it is expensive to reduce production or use of these chemicals will likely opt to buy permits or invest in new equipment that would lower their production or use of CFCs. The result is that the required reductions would be achieved at the lowest cost to society.[19]

Another advantage of incentive-based approaches is that the administrative costs appear to be quite small. Firms would be required only

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[17] See R. A. Posner, "The Social Costs of Monopoly and Regulation," *Journal of Political Economy*, August 1975, *83:4*, 807-827. In general, see J. M. Buchanan, R. E. Tollison, and G. Tullock, eds., *Towards a Theory of a Rent-Seeking Society*, Texas A&M University, 1980.

[18] See RIA, Chapter 11.

[19] See, for example, J. J. Seneca and M. K. Taussig, *Environmental Economics*, Prentice Hall, 1979, at 60-90.

to report their output of CFCs and not be forced to provide extensive engineering detail. This is in addition to the enforcement costs of the program, which would occur under any output reduction system. EPA staff has estimated that implementation costs for firms under incentive-based approaches would be around $1.0 to $1.9 million for the start of the output reduction program and from $1.0 million to $23.6 million on an annual basis, depending on which incentive-based program is used.[20] This is well below the comparable costs for the EPA's engineering control alternative.

Economic incentive-based approaches may also (in the absence of possible anticompetitive conduct, as discussed below in Section VI) have few of the entry-inhibiting effects of engineering controls. Should a firm wish to enter the market or expand its output by lowering prices to consumers, it will be able to buy the right to produce or use CFCs from other firms in the industry without increasing the aggregate output level of these chemicals. This is in contrast to engineering controls, which have no such mechanism.

In the long run, incentive-based approaches give firms important reasons to innovate to reduce their use or production of CFCs. Unlike a regime of engineering controls, the incentive approach allows firms to capture the gains from innovation by selling off their unused production or use permits, or by reducing the fees they pay for such rights. If innovation does occur, it would lower the cost to society of CFC output reductions. Should any further reduction in CFC and halon output be necessary or desireable, innovation would also reduce the cost to society of such an action. Put differently, use of an incentive-based approach would make it

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[20] RIA at 11-18.

less costly -- and therefore more likely -- to lower further the production of CFCs in the future.[21]

## IV. ENGINEERING CONTROLS IN SPECIFIC INDUSTRIES

If EPA follows an economic-incentive system as we suggest, there will be no need for direct controls on specific industries in order to achieve the overall target domestic production figure. Therefore, we oppose engineering controls in specific industries for the same reasons we oppose general engineering controls. Such controls could reduce or eliminate incentives to develop substitutes, reduce competition in the affected industries, increase administrative costs, and be inflexible with regards to changing economic conditions. Further, giving EPA authority to make industry-specific decisions could greatly increase the "lobbying" costs of a CFC abatement program. Firms could spend considerable resources on administrative procedures to try to avoid being singled out by EPA for reductions. Each firm and each industry could potentially be required to justify its behavior to the EPA.

In general, EPA appears to believe that engineering controls may be necessary in specific instances because some industries will react differently than others to a system of economic incentives.[22] However, this is the precise reason why market incentives represent the most efficient means of imposing an abatement program on the economy and why direct controls should be avoided. Each firm and industry has a different ability to substitute for its CFC consumption. Only by insuring that the costs of

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[21] Greer at 482-3.

[22] ANPRM at 30615-6.

abatement fall on firms and industries that can most easily reduce their use of CFCs can the costs to the economy be minimized. Governments have only a limited ability to discern, let alone properly allocate these costs. A market system, on the other hand, tends to allocate these costs across firms with the lowest abatement costs automatically.

## V. SPECIFIC INCENTIVE-BASED APPROACHES

EPA now has three different incentive-based approaches available to reduce the production and use of CFCs: auctions, marketable permits, or marketable permits with fees. Each method has been shown to be administratively feasible in a variety of settings, although auctions and allocation of marketable permits appear more workable in this case. As the EPA has noted, auctions are regularly used by the federal government in the areas of government procurement, leasing of mineral rights, and the sale of Treasury bills.[23] The EPA has used marketable permits previously in its "banking" and "offset" programs.[24] The federal government has granted marketable rights for other resources as well, such as airport landing slots and radio and television frequencies. Fees for the right to pollute have been imposed by the EPA and several states on various hazardous waste streams.[25] This section will review particular aspects of each incentive-based approach as it applies to CFCs.

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[23] NPRM at 47507.

[24] Michael H. Levin, "Building a Better Bubble at EPA," *Regulation*, March/April 1985, 33-42.

[25] See, for example, Congressional Budget Office, *Hazardous Waste Management: Recent Changes and Policy Alternatives*, U.S. Government Printing Office, Washington, D.C., May 1985.

### A. Auctions

The EPA could implement its program of output reductions by auctioning off CFC production or use permits and then allowing the permits to be subsequently bought and sold.[26] Auctions have at least three advantages over other approaches. Auctions are likely to be an administratively simple and low-cost way to allocate production rights relative to fees, since the EPA would not have to estimate the correct fee to charge producers or users.[27] Also, firms would not be as inclined to spend resources lobbying the EPA to increase their share of output allotments, as firms might under engineering controls or under a system that made initial allocations to incumbent firms. In addition, by making firms buy the rights to produce or use CFCs, the EPA will capture for the Treasury the full value of these rights. For these reasons, auctions are probably the best of the incentive-based methods for allocating output rights.[28]

EPA has stated that any auction and subsequent market transactions

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[26] There are numerous types of auctions the EPA could employ in administering its output reduction program (NPRM at 47507 and ANPRM at 30611). We do not comment on the merits of these various auction designs, as EPA has indicated that if its adopts auctions, any specific details will be addressed in a further rulemaking (ANPRM at 30610-11).

[27] EPA has indicated that it believes auctions to be feasible. See ANPRM at 30611.

[28] EPA has expressed concern that it may not have the legal authority to conduct such auctions. ANPRM at 30611-14. We note, however, that the Department of Justice has stated its belief that EPA has this legal authority. Comments of the Department of Justice on Proposed Rule on Protection of Stratospheric Ozone, Before the Environmental Protection Agency, Docket A-87-20, February 8, 1988, at 16-30.

should be open to all interested parties.[29] We support this position. In general, markets work best when there are no unnecessary regulatory restrictions on who can buy and sell. Participation in a CFC permit market by entities besides producers can have important efficiency-enhancing properties. Brokerage services may arise which can reduce the search costs for would-be buyers and sellers of permits to find each other. Banks can finance the purchase of permits and perhaps accept permits as collateral.

EPA has expressed concerns, however, that the use of auctions will lead to uncertainty and speculation.[30] However, to the extent middlemen arise to handle these transactions, they can be expected to reduce, and not increase, uncertainty and risk. Middlemen can be expected to invest in permits when their price is below equilibrium value and sell permits when the price is above equilibrium value. This type of trading also acts to transfer risk to those parties who are better able to absorb it. These actions would stabilize the market and send the proper signals to firms.[31]

EPA has noted that there are concerns that an auction will lead to permits not reaching those parties who are best able to use them. However, it is to be expected that no matter how the permits are allocated, they will

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[29] ANPRM at 30611.

[30] NPRM at 47500 and ANPRM at 30611.

[31] For a discussion of the economics of speculation, see A. Alchian and W. R. Allen, *Exchange and Production: Competition, Coordination, and Control*, Wadsworth Publishing Company, 1977, at 132-137. Recent research in economics indicates that there are certain unusual circumstances, such as the October 1987 stock market crash, where speculation and other similar activities may generate market distortions due to information externalities and institutional constraints during large, rapid, price swings. See B. Greenwald and J. Stein, "The Task Force Report: The Reasoning Behind the Recommendations," *The Journal of Economic Perspectives*, Summer 1988, *2:3*, pp. 3-23. However, it does not seem likely that these circumstances would arise in a market for CFC permits.

eventually wind up with the firms that value them the most. All firms who use permits will pay their scarcity value, either directly in payment, or in "opportunity costs" by forgoing revenue that could be obtained by selling them to another firm. This decision of the firm is not affected by the manner in which permits are allocated.

EPA has also noted that there are concerns that large firms might outbid small firms in an auction for permits.[32] This may indeed occur. Firms of all sizes outbid each other in the marketplace all the time. If the larger firms outbid the smaller firms in the absence of monopoly power, this implies that larger firms are able to put the CFCs into a higher valued use.

Another objection to auctions has been the concern that unless producers can keep the windfall from CFC permits, they will not have the financial resources to develop substitute products for CFCs.[33] However, the decision to create a new product depends on its expected costs and returns, not solely on the cash flow of one part of a company. If a product will be profitable, it can be expected that the capital markets (either internally through a firm using cash on hand, or through increased borrowing from banks or bondholders) will react by funding the project.

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[32] ANPRM at 30611.

[33] See M. Weiskopf, "Bidding Chlorofluorocarbons Farewell," *Washington Post*, August 2, 1988 at A-19. This concern is also noted (though not supported) in Letter from James B. MacRae Jr., Deputy Administrator, Office of Information and Regulatory Affairs, Office of Management and Budget to Lee Thomas, Administrator, Environmental Protection Agency, February 12, 1988.

**B. Administrative Allocation of Marketable Permits to Producers**

By allocating to producers a specific level of tradeable permits, the EPA would ensure, in a competitive world, both the realization of the output limits imposed by the Montreal Protocol and the economic benefits of incentive-based systems. A system of tradeable permits would have most of the desired efficiency and administrative properties of an incentive mechanism. It would also, however, have some drawbacks. One drawback to the allocation of marketable permits by themselves is that it may cause firms to expend resources on otherwise nonproductive activities such as lobbying to gain a windfall by receiving permits for which they do not pay.[34] Marketable permits in a highly concentrated market may also lead to hoarding of permits by producers and reduce incentives for innovation (See discussion in Section VI below)

The EPA has suggested using regulatory fees in conjunction with marketable permits.[35] Under such a plan, the EPA might recover any resulting windfall for the Treasury and reach the required output levels. This proposal also presents some difficulties, however. If the EPA set the regulatory fee too high, there would be more output reduction than EPA set out to achieve.[36] If the EPA set the regulatory fee too low, the fee would not capture all the windfall that could result from the allocation of

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[34] Of course, the initial allotment of tradeable permits need not be to incumbent firms. In that case, other parties would gain any resulting windfall.

[35] ANPRM at 30608.

[36] See discussion Section I, page 2 above.

marketable permits.[37] EPA's discussion of this proposal points out the relevant problems the agency would face.[38]

EPA has proposed to alleviate this problem by setting the regulatory fee per CFC unit equal to the market price of a CFC consumption right. EPA's preferred method for determining this fee would be to subtract the production cost of the affected chemicals from the market price. However, we believe that this approach contains great difficulties. EPA would need to know not only what all of the chemicals sold for, but also what the production costs were in each of the producing firms.[39] EPA would also have to account for whatever uncertainties and changes that would be occurring in the marketplace. Further, producers could be expected to act strategically in this situation in order to lower the fees they are required to pay. Additionally, EPA would also be required to calculate a "fair" rate of return for the producers. Obtaining such information could be quite costly and difficult.[40] This is in contrast to the use of an auction to garner the windfall, which would have none of these problems while achieving the desired goal of capturing the windfall for the Treasury.

EPA has suggested designing a fee that does not attempt to capture the

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[37] We have no comments on a proposal to use regulatory fees in order to recover the administrative costs of an output reduction program.

[38] ANPRM at 30609.

[39] To properly calculate the windfall, EPA would be required to know the marginal, not the average cost of production in the industry.

[40] For a discussion of the difficulties of determining what a "fair" price is in similar circumstances, see Franklin M. Fisher and John J. McGowan, "On the Misuse of Accounting Rates of Return to Infer Monopoly Profits," *American Economic Review*, March 1983, *73:1*, 82-97.

entire windfall gain to producers.[41] By trying to set a fee less than the amount of the windfall, EPA would be able to reduce or eliminate "underproduction" of CFCs. However, the administrative problems noted above would still exist, as well as the granting of some windfalls to firms and possible resulting losses in innovation.

## VI. POTENTIAL MARKET POWER PROBLEMS

In implementing its program for the allocation of marketable permits, the EPA has chosen to direct its incentive plan at producers of CFCs. This choice may lead to anti-competitive consequences. The markets for the production of CFCs is highly concentrated. As Table 1 indicates, the Herfindahl-Hirschman Index for CFCs is 2958 (3.38 equivalent sized firms) and the Herfindahl for halons is 3648 (2.74 equivalent sized firms).[42] By any measure, these markets are highly concentrated.

Given highly concentrated markets, producers might have an incentive to hoard permits instead of using them for their own production or selling them to rivals or potential entrants. This would occur if the gain to firms from withholding is greater than the price they could receive for their permits. Such behavior would increase prices above the level associated with competition.[43] The existence of this type of entry or expansion barrier

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[41] ANPRM at 30609.

[42] The Herfindahl Index is the measure generally used for determining market concentration for antitrust purposes. It is calculated by summing the squares of the market shares of all the firms in the relevant markets. See Department of Justice, "Merger Guidelines," *Antitrust and Trade Regulation Report*, Special Supplement, June 17, 1982, at S-6.

[43] A similar outcome could occur with an auction of permits to producers.

could act to reduce (though not eliminate[44]) the advantages of incentive-based output reduction programs over the engineering controls discussed above.[45] To alleviate this problem, EPA may wish to consider retaining the right to reassign the permits of producers who hoard them. As with other options, the administrative costs of monitoring such potential conduct should be considered when deciding whether to enact such a reassignment provision.

Market power problems could also act to slow down the pace of innovation in the adoption of CFC alternatives. Since market shares are so high, producers will be aware that if they innovate to reduce their need for CFCs, they will also act to lower the price of permits on the open market and hence the windfall to themselves.[46] This will not completely reduce incentives for innovation, however. Firms will desire to innovate to gain income from selling off permits made surplus to them by the innovation.

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[44] One commentator has argued that in certain circumstances (where firms face highly disparate cost conditions and where the market is extremely concentrated) the use of marketable permits may reduce welfare slightly as compared to the use of engineering controls. See D. A. Malueg, "Welfare Consequences of Emission Credit Trading Programs," Economic Analysis Group Discussion Paper 87-11, Department of Justice, November 17, 1987. The cost conditions described by Malueg, however, do not seem to be applicable to any industry, and, while the market structure in CFCs and halons is highly concentrated, it does not appear to approach the extreme level of concentration required to obtain Malueg's conclusions. Further, Malueg's results should be adjusted to account for the important incentives for innovation that would still exist in a highly concentrated industry under a program of marketable permits, as well as the lower administrative costs of a permit program.

[45] R. W. Hahn, "Market Power and Transferrable Rights," *Quarterly Journal of Economics*, 1984, *99*, 753-765.

[46] This situation would only be a problem if the firms that have the ability to develop substitutes for CFCs are also the firms that receive the windfalls on permits. Firms that do not receive windfalls do not have any reason to desire high prices on permits. However, there is reason to believe that the firms that currently produce CFCs are also the firms that have the ability to create CFC substitutes. See M. Gladwell, "DuPont Plans to Make CFC Alternative," *Washington Post*, September 30, 1988 at F-5.

Firms will also desire to innovate in order to protect themselves against technological innovation by other firms (which would put them at a comparable competitive disadvantage). Thus, firms would still have greater reasons to innovate than they would under a program of engineering controls.

Problems with innovation incentives can be alleviated by eliminating the windfalls associated with permits. Thus, auctioning off permits or setting the proper regulatory fee would serve to reduce the costs to society in the long term of a CFC abatement program.

## VI. CONCLUSION

Market-based incentive plans, like the one EPA has adopted, appear to represent the lowest cost, most efficient, and most pro-competitive method of implementing CFC and halon output reduction under the terms of the Montreal Protocol. Further, by reducing the costs of abatement through encouraging innovation, market-based incentive plans can make further reductions in CFC and halon output more likely, because such reductions will impose less economic burden on society.

In addition to supporting adoption of an economic incentive-based plan, we support EPA's goal of capturing the windfall resulting from allocating permits. However, we believe that the best way to gain this windfall is through auctions, not through regulatory fees. Regulatory fees appear to present substantial administrative problems that would not be encountered in an auction system.

The gains from an incentive-based program, however, can be reduced

somewhat if firms act to obtain market power through the hoarding of permits. We urge the EPA to take actions to alleviate this problem.

Finally, we oppose any effort to adopt engineering controls or bans on an industry by industry basis. Such actions would be contrary to the market-based incentive plan that the EPA has adopted and would be likely to increase the cost to society of CFC and halon abatement.

**Table 1**
**Annual Consumption Allocations**
(in millions of kilograms)

**Group I ("CFCs")**

| | Firm | Allotment | Market Share |
|---|---|---|---|
| Domestic | DuPont | 139.373 | 45.88% |
| | Allied-Signal | 74.044 | 24.38 |
| | Pennwalt | 38.221 | 12.58 |
| | Kaiser Chemical | 27.616 | 9.09 |
| | Raicon | 13.466 | 4.43 |
| Foreign | ICI Americas | 6.311 | 2.08 |
| | Nat'l Refrig. | 3.069 | 1.01 |
| | Kali-Chemie | 0.438 | 0.14 |
| | Refricentro | 0.421 | 0.14 |
| | Hoechet Celanese | 0.330 | 0.11 |
| | Sumitomo | 0.230 | 0.08 |
| | Holchem | 0.212 | 0.07 |
| | Pharmachem | 0.029 | 0.01 |

**Group II ("Halons")**

| Firm | Allotment | Market Share |
|---|---|---|
| DuPont | 27.731 | 48.15% |
| Great Lakes | 19.855 | 34.47 |
| ICI Americas | 6.348 | 11.02 |
| Atochem Inc. | 2.126 | 3.69 |
| Kali-Chemie | 1.534 | 2.66 |

Herfindahl Index for Group I: 2958
Herfindahl Index for Group II: 3648

The Herfindahl Index is calculated by summing the squares of the market shares of all the firms in the relevant markets.

Source: Final Rule at 30599