OCCASIONAL PAPER SERIES, ISSUE 25:03 DECEMBER 1999

IS CREDIT FOR EARLY ACTION CREDIBLE EARLY ACTION?

Credit for Early Action allows firms that take early action to reduce emissions to be rewarded with credit against future regulatory standards or carbon taxes.

Is Credit for Early Action an inherently flawed concept, with questionable environmental effectiveness, high economic cost, and inequitable impacts on distribution of wealth?

We recommend announcement of policies to remove existing disincentives to early action, combined with the phase in of either emission limits and trading or a carbon tax.

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ACKNOWLEDGEMENTS

This report is based on based on *Closing the Gap: A Comparison of Approaches to Encourage Early Greenhouse Gas Emission Reductions*, a publication of West Coast Environmental Law Research Foundation and the Hamburg Institute for Economic Research. *Closing the Gap* was funded under a generous grant by the German Marshall Fund of the United States, and in-kind contributions of West Coast Environmental Law Research Foundation and the Hamburg Institute for Economic Research. West Coast Environmental Law receives core funding from the Law Foundation of British Columbia.

Between the completion of *Closing the Gap* and this report, Senator John Chafee, a Republican Senator from Rhode Island, passed away. Senator Chafee introduced one of the Credit for Early Action proposals discussed in this report. While this report is critical of the proposal and advises other approaches to reducing greenhouse gas emissions, Senator Chafee's contribution to the search for solutions is deeply appreciated. Senator Chafee was widely respected for his search for solutions. His passing will be mourned.

KEY FINDINGS AND RECOMMENDATIONS

INTRODUCTION

Throughout the developed world policy makers are looking at measures to encourage cost effective reductions in greenhouse gas emissions. To reduce greenhouse gas emissions at lowest cost, governments will need to adopt measures that encourage changes in technology and behaviour throughout the economy. In North America, governments have focused on two approaches to the creation of incentives: Credit for Early Action and Market Instruments. Market instruments include both emissions trading and emission charges. Under emissions trading governments limit emissions and allow emitters to trade either allowances to emit or credits for reducing emissions below allowed levels. Under emission charges, governments directly or indirectly place a charge on greenhouse gas emissions. Credit for Early Action programs neither limit emissions nor impose a price on emitters. Instead, companies that reduce emissions below a government set baseline are rewarded with credits against future emission charges or emission limits.

FINDINGS

While the exact design of either Credit for Early Action or Market Instruments will have a huge impact on environmental effectiveness, economic efficiency and equity, a number of conclusions can be drawn:

- **The environmental effectiveness of Credit for Early Action is extremely difficult to predict.** A lack of data on individual corporate emission patterns makes choice of effective baselines difficult. Too lax, too stringent or otherwise inappropriate baselines could reduce environmental effectiveness. Moreover, credits are a speculative commodity, and it is uncertain whether the market will value them sufficiently to invest in significant reductions.

- **Credit for Early Action programs do not yield lowest cost emission reductions.** Reductions that result from structural changes in the economy and changes in consumption patterns will often be impossible to credit. Also, some reductions will not be valued because they do not fall below a credit generation baseline.

- **Credit for Early Action programs will not achieve compliance with the Kyoto Protocol at lowest cost.** Minimizing Kyoto Protocol compliance costs requires

investment in research, development and innovation, and shifting investments in long-lived capital stock towards low carbon technology. There is often a long lead-time between when investment planning begins for these activities and when a reduction occurs. During the period prior to the coming into force of the Kyoto Protocol, Credit for Early Action programs will add little certainty to the value of these investments. Once the Kyoto Protocol comes into force, Credit for Early Action will tend to accelerate emission reduction projects that can be quickly implemented but may not have the lowest long-term costs, and are not necessarily the most important for reducing compliance costs.

- **Credit for Early Action will increase the compliance costs for those who are not able to participate effectively in the Credit for Early Action program.** Under a program that has no limit on the amount of credit created and weak credit generation baselines, the impact on compliance costs could be extreme. The increase in costs will primarily be borne with those already facing high compliance costs.

- **Credit for Early Action could have major distributive effects while having very limited environmental impacts.** Both credit for past action and credit for emission reductions or carbon sequestration that would have occurred anyway could overwhelm the generation of credit from incremental emission reduction projects.

- **Credit for Early Action is inherently more complex and requires more bureaucratic oversight and regulation than well-designed market instruments**. Credit for Early Action is often seen as easily implemented interim measure because it does not impose any immediate costs beyond administration. However, inherent difficulties in design could delay implementation well beyond the timeframe in which effective market instruments could be designed and implemented.

- **Credit for Early Action may not counteract the disincentive created by the possibility of grandfathering; alternatives can effectively counteract this disincentive.** Emission rights may, in the future, be allocated based on emitters' historic emissions. This creates a disincentive to emission reductions. Early crediting may not remove this disincentive. Baseline protection – guaranteeing that any grandfathering will be based on business as usual emissions – can effectively counteract this disincentive.

RECOMMENDATIONS

- **Government should immediately implement a baseline protection policy.**

- **Government should proceed immediately to implement market instruments that create incentives throughout the economy to reduce greenhouse gas emissions.** A tradable emissions cap on fossil fuel producers and importers would be the simplest, most efficient and most effective instrument. Until the ratification of the *Kyoto Protocol*, such a cap could simply stabilize emissions at current levels. Most of the revenue from the auctioning of carbon rights could be returned to households while a portion could be returned to states or provinces whose economies would otherwise bear an undue proportion of emission reduction costs.

- **In the absence of the political will to immediately implement market instruments, legislating market instruments for future implementation is preferable to Credit for Early Action.**

- **Credit for Early Action should only proceed if governments are unwilling to adopt more equitable, efficient and effective measures, and if it can implemented in the short term.** If a Credit for Early Action does proceed, limiting the amount of the Kyoto budget used for credits is essential to ensuring that the system does not increase the future compliance costs of non-participants to a point where ratification of the Kyoto Protocol would be difficult. However, the environmental effectiveness of a Credit for Early Action will be significantly reduced if there is only a limited credit budget. The best means of limiting the impact of early crediting on non-participants and ensuring additional emission reductions is by having very stringent credit generation baselines supplemented by a limited credit budget.

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GLOSSARY

"**1605(b) Program**" the US voluntary emission reduction reporting program created by s. 1605(b) of the Energy Policy Act of 1992 (42 USC 13385).

"**Allocation base period**" the historic period used in grandfathering, e.g. if emitters are granted emission allowances in proportion to their total emissions from 1990 to 1995, 1990 to 1995 would be the allocation base period.

"**Annex 1 Parties**" The nations listed in Annex 1 to the UNFCCC. This includes all the nations that were members of the OECD in 1992 plus the nations of Eastern Europe that are undergoing transition to a market economy.

"**Annex B Nations**" The nations listed in Annex B of the Kyoto Protocol. These nations are subject to emission limits under Protocol. Currently Annex B only lists those Annex 1 Nations that have ratified the UNFCCC (i.e. all besides Belarus and Turkey).

"**Assigned Amount Units**" Units of the allowable emissions assigned to Annex B Nations under the Kyoto Protocol. The unit of trade in international emissions trading.

"**Baseline protection**" is a policy intended to ensure that, in the event of grandfathering, parties reducing emissions prior to the allocation base period are not disadvantaged. Baseline protection is a contingent policy, only coming into effect in the event of grandfathering.

"**Business as usual emissions**" the level of emissions that would exist in the absence of a Credit for Early Action program or market instruments.

"**Carbon allowances**" permits to import or produce a unit of carbon in fossil fuels. The unit of trade in upstream cap and carbon allowance trading programs.

"**Carbon tax**" is a tax placed on fossil fuel proportionate to its carbon content. Although not strictly speaking simple carbon taxes, this report also refers to taxes placed on non-energy sources of carbon dioxide and other greenhouse gases, as carbon taxes.

"**Certified Emission Reductions**" are emission reduction credits generated under the Clean Development Mechanism and useable to supplement assigned amount units.

"**Clean Development Mechanism**" is the mechanism created by the *Kyoto Protocol* for generation of emission reduction credits in Non-Annex B nations (i.e. developing nations).

"**Credit budget**" is a limited portion of a nation's Kyoto Budget allocated to Credit for Early Action.

"**Credit generation baseline**" in a Credit for Early Action system is the level of emissions below which actual emissions must drop in order for an entity to generate early action credits.

"**Credit generation base period**" refers to any period which is used to establish the credit generation baseline. For instance, if reductions are generated by improvements in performance of greater than one percent per annum, and the credit generation baseline is initially based on performance in 1999, 1999 is the credit generation base period.

"**Downstream cap and emission allowance trading**" See *How Market Instruments Work*, on pages 8-10.

"**Emission allowances**" permits or allowances to emit a unit of greenhouse gases. The unit of trade in a domestic downstream cap and emission allowance trading program.

"**First Commitment Period**" is, under the Kyoto Protocol, the 2008 to 2012 period during which Annex B Nations' emissions must be reduced relative to 1990 levels.

"**Grandfathering**" an allocation of emission allowances based wholly or partly on an emitter's emissions in a historic period.

"**Kyoto Budget**" is the total assigned amount units assigned to an Annex B nation during the First Commitment Period.

"**Mandatory performance standards combined with credit trading**" See *How Market Instruments Work*, on pages 8-10.

"**Pre-compliance period**" the period before the First Commitment Period

"**Upstream cap and carbon allowance trading**" See *How Market Instruments Work*, on pages 8-10.

INTRODUCTION AND BACKGROUND

Once it comes into force, the *Kyoto Protocol to the United Nations Framework Convention on Climate Change* (the "Kyoto Protocol") will require industrialized nations to reduce emissions in the period 2008 to 2012 significantly below current and projected levels. This paper compares the concept of Credit for Early Action with various market instruments as means of narrowing the gap between projected emissions and Kyoto limits.

Market instruments create a market price for emissions and use the market to encourage reductions at the lowest price. This is done by placing limits on greenhouse gas emissions and allowing the market to decide where reductions occur, or by imposing a carbon tax or emissions charge. Although market instruments can be applied within a sector, in the context of greenhouse gas emissions, they are generally used to encourage reductions throughout the economy or across large sectors.

Credit for Early Action also creates an incentive for emission reductions throughout the economy or at least across many sectors. However, rather than imposing a carbon tax or emission charge or placing limits on emissions, Credit for Early Action programs promise that entities which take action to reduce greenhouse gases prior to the imposition of a carbon tax or emission limits will receive a credit against future taxes or limits.

After providing an overview of the Kyoto Protocol and the rationale for taking early action the paper reviews the theory and specific proposals for market instruments and Credit for Early Action. The next part provides a comparative analysis of these approaches, examining their relative efficiency, environmental effectiveness, and impacts on redistribution of wealth. Credit for Early Action is found problematic on a number of counts, and is next evaluated as interim strategy for imposition while political support for market instruments develops.

BACKGROUND

In June 1992, the nations of the world negotiated the *United Nations Framework Convention on Climate Change* (the "UNFCC"). The ultimate objective of the UNFCCC is to avoid dangerous anthropogenic interference with the climate system. The first step in achieving

that goal was a commitment by the most industrialized nations to develop policies and measures with the aim of returning their greenhouse gas emissions to 1990 levels by 2000.

The next step came in December 1997, when the Kyoto Conference of the Parties to the UNFCCC agreed to a protocol that, for the first time, set quantitative limits on the emissions of greenhouse gases from a number of industrialised countries (the "Annex B Nations"). Each Annex B Nation is assigned an amount of emissions (the nation's "Kyoto Budget") based on varying proportions of 1990 emissions. During the "First Commitment Period" from 2008 to 2012, Annex B Nations are required to reduce average annual emissions to a specified percentage of 1990 levels. Overall, Annex B Nations are required to reduce emissions to approximately 95% of 1990 levels. Actual national limits range from 92% for the EU to an allowable increase of ten percent for Iceland.

The emission reductions called for in the Kyoto Protocol are clearly insufficient to avert the continuing atmospheric build up of greenhouse gases, but given rapidly increasing emissions in many countries, the Kyoto reductions potentially necessitate major changes. United States emissions are projected to exceed 1990 levels by 23% or more in 2010, but under the Kyoto Protocol the US is required to achieve a 7% emission reduction.[1] In Canada, emissions are projected to increase by 18%, but the Protocol calls for a 6% reduction.[2] European Union emissions are projected to increase by 6% but the EU is subject to an emission reduction target of 8%.

The Kyoto Protocol allows nations to meet their emission limits both by trading assigned amount units among Annex B Nations and by the generating of certified emission reduction credits (CERs) through emission reduction projects in developing nations. The latter mechanism is referred to as the Clean Development Mechanism or CDM. Under the CDM nations can begin generating credit for reductions as early as 2000.

The Protocol has been signed by almost all the Parties to the UNFCCC, but its coming into force requires ratification by national governments representing 55% of Annex B emissions. Although a spirit of cooperation at recent international negotiations bodes well for the Protocol, coming into force is unlikely prior to 2002 and coming into force could remain uncertain for several years.

THE RATIONALE FOR EARLY GREENHOUSE GAS EMISSION REDUCTIONS

THE ENVIRONMENTAL RATIONALE

The human enhanced greenhouse effect is caused by the build up in the atmosphere of gases which remain in the atmosphere for periods that range from decades to millennia. Avoiding dangerous anthropogenic interference with the climate system entails limiting cumulative emissions over many decades. Earlier action reduces the need for deeper, more rapid reductions in the future, and reduces the risks of passing thresholds where impacts

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[1] Table C.6 of UNFCCC (1998), *Second Compilation and Synthesis of Second National Communications, Tables of Inventories of Antropogenic Emissions and Removals of Greenhouse Gases for 1990-1995 and Projections up to 2020,* (UNFCCC Secretariat, doc. FCCC/CP/1998/11/Add. 2).

[2] *Ibid.*

of climate change increase non-linearly.[3] It also reduces environmental impacts prior to stabilization of greenhouse gas concentrations, and increases future generations' ability to choose greater levels of environmental protection.

Aside from climate impacts, measures to reduce greenhouse gas emissions will reduce air pollution in urban areas. Tentative calculations show that the benefits of emission reduction through reduction of local pollutants, especially SO_2, are comparable to the value of carbon credits under a high carbon tax of 20-2000 $ per ton carbon.[4]

THE ECONOMIC RATIONALE

Economically, it makes sense neither to reduce emissions to Kyoto Protocol levels overnight nor to delay reductions until 2008. Ideally, the emissions path that makes the most sense is a compromise between these two extremes. It will depend on an assessment of the likelihood of the Kyoto Protocol coming into force and an assessment of how the costs of reductions will change over time.

It is clear that in many cases the long term costs of reductions will increase if action is not taken in the short term. As individuals, businesses and governments invest in infrastructure, equipment, buildings and production facilities, their decisions will have a long term impact on emissions. In the case of equipment such as cars this impact might last ten years. In other cases, e.g. roads and transportation infrastructure, the impact can last centuries.[5] If investments are made in carbon intensive capital stock, there will be a future cost of prematurely replacing such stock in order to meet future emission limitations. Ensuring appropriate investment in the course of capital stock turnover is particularly important in the context of greenhouse gases because there are few "end of pipe solutions" to greenhouse gas emissions. Solutions generally lie in increased efficiency throughout the economy.

Moreover, when governments or the private sector choose between alternative technologies — e.g. between investing in the rail system or the road system, or between expanding fossil fuel production and introduction of renewables — they reinforce a pattern of development which is increasingly difficult to turn away from. Once certain choices are made, the market tends to reinforce them. Investing in low carbon intensity technologies today may sometimes impose an immediate cost, but it will help ensure that businesses and individuals do not face higher costs in the longer term. These "bifurcation points" — points where choices are made between models of development — are most obvious in the context of developing countries and economies in transition, but also exist in developing countries.

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3 For example, the Gulfstream could stop flowing meaning that temperatures in Europe would drop by several degrees Celsius even if global temperatures rose strongly. See Rahmstorf, Stephan, (1999) "Shifting seas in the greenhouse?" in *Nature* 399, at 523-524.

4 Ekins, Paul (1996) "How large a carbon tax is justified by the secondary benefits of CO_2 abatement" in *Resource and Energy Economics* 18, at 161-187

5 Jaccard, Marc (1997) "Heterogenous Capital Stocks and Decarbonating the Atmosphere: Does Delay Make Cents?" (Simon Fraser University, School of Resource and Environmental Management, Burnaby, BC) [unpublished].

Government could choose to delay introduction of emission reduction policies until the First Commitment Period allowing firms to assess the likelihood of future emission limits, the likely shape of future regulations and the lowest cost emissions path given these uncertainties. However, this laissez faire approach is unlikely to yield emission reduction patterns which are ideal from a broad societal perspective:

- Even in the absence of future emission limits there is some evidence that consumers and firms already under-invest in energy efficiency due to various market failures. Energy efficiency gains of 10 to 30% above current trends appear to be possible at negative or zero net cost.[6] Measures that can cost-effectively overcome these barriers are justified regardless of future emission limits.

- Firms and individuals may be largely unaware of the Kyoto Protocol and its implications, and may be less able than governments to assess the likelihood of future emission restrictions and the likely cost of future emission reductions. This is especially true where climate change economics and science have become highly politicized. In particular, efforts to derail the Kyoto Protocol by prophesying its demise may lead to under-investment.

- Firms and individuals are likely to apply a higher discount rate to future emission reduction costs, focussing too much on short term costs at the expense of long term economic well being.

- Given uncertainty as to the shape of future regulations, businesses may fear that they will be penalized for early emission reductions.[7] Even where firms are not directly penalized for reductions, they may choose not to invest in lowest cost measures if doing so negatively impacts their ability to negotiate for beneficial climate policies.

- Firm's individual investment decisions will not take into account a number of economic and environmental benefits associated with taking early action. As noted above, measures to reduce greenhouse gas emissions will also reduce air pollution in urban areas. Studies for European countries and the US indicate that secondary benefits of air quality improvements related to lower greenhouse gas emissions could offset between 30 and 100% of the greenhouse gas emission reduction costs.[8]

- Early reduction policies are likely to lead to increased research and development on energy efficiency, renewable energy and other greenhouse gas mitigation techniques. If policies lead to innovations and development of new low cost, low carbon technologies they will reduce the costs of achieving future emission reductions for other firms. Policies that encourage innovation are particularly important in achieving long term low cost reductions.

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6 Intergovernmental Panel on Climate Change, Working Group III, "Economic and Social Dimensions of Climate Change: Summary for Policy Makers" in James Bruce et al. *Economic and Social Dimensions of Climate Change, Contribution of Working Group III to the Second Assessment Report of the IPCC* (Cambridge: Cambridge University Press, 1996).

7 See *Removing a Disincentive*, page 36.

8 D.W. Pearce et al. "The Social Costs of Climate Change: Greenhouse Damage and the Benefits of Control," in James Bruce et al., above at footnote 6, at 218.

All these factors suggest that early reduction measures are appropriate. Early reduction measures also help reduce the uncertainty that makes climate change policy difficult. Policies which yield a better understanding of the marginal costs of abatement throughout the economy will help shed light on the uncertain costs of emission reductions.

Encouraging early domestic greenhouse gas emission reductions also makes sense in the context of any single nation's domestic economic strategy. Lack of early domestic action is likely to result in greater reliance on international flexibility mechanisms. Having failed to realize low cost reductions during capital stock turnover, costs of compliance through domestic measures will be higher and the international flexibility mechanisms will appear more cost effective. This will result in lower overall investment in improving domestic efficiency and a redirection of capital away from the domestic economy.

A July 1999 study by the US Energy Information Administration examined the impacts of meeting the Kyoto Protocol under an emissions trading system starting in 2000 versus one that started in 2005.[9] The methodology of the report included an implicit assumption that, contrary to the previous paragraph, reliance on international flexibility mechanisms would not be affected by the start date. Moreover, the macroeconomic study did not include economic, environmental or social benefits from reduced emissions. Despite these limitations which tend to understate the benefits of an early start, modelling indicated that earlier implementation lead to a smoother transition to a low carbon economy with lower cumulative costs. Delaying action only became relatively economic when future costs were significantly discounted.

THE POLITICAL RATIONALE

Early greenhouse gas emission reductions are also consistent with existing international obligations. The UNFCCC commits most industrialized nations to develop policies and measures with the aim of returning their greenhouse gas emissions to 1990 levels by 2000.

Although stabilization at 1990 levels is a goal and not a binding commitment, in many cases Annex 1 nations cannot be said to have delivered on their commitment in a meaningful way. For instance, a 1998 report on domestic climate change policy by the Canadian Parliament's independent Auditor General concluded that many of the key elements necessary to manage the implementation of Canada's response to climate change are missing or incomplete.[10]

The failure of most Annex 1 Parties to meet the stabilization target and the failure of several nations to implement policies that could realistically hope to stabilize emissions carries a political cost in current international climate change negotiations. Developing countries, for instance, have been highly critical of Annex 1 failures. Calls for quantitative emission caps on developing countries emissions have been criticized as premature given Annex 1 Parties' failure to implement their initial commitments.

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[9] United States Department of Energy, Energy Information Administration, *Analysis of the Impacts of an Early Start for Compliance with the Kyoto Protocol*, (Washington: Dept. of Energy, 1999).

[10] Auditor General of Canada, *Report of the Commissioner of the Environment and Sustainable Development*, (Ottawa: Supply and Services Canada, 1998).

Failure to take early action is also increases the risk of non-compliance with the Kyoto Protocol. First, the Protocol calls for demonstrable progress in achieving commitments by 2005. Second, as noted above, the failure to take early action is likely to lead to increased reliance on the international flexibility mechanisms. At the same time, the EU is calling for stringent limits on use of the mechanisms. If such limits are adopted, there is an increased likelihood of a breach if early actions are not taken.

POLICY APPROACHES TO EARLY ACTION

Given the above, governments will likely need to adopt policies prior to 2008 in order to meet the Kyoto target. Early programs shift the emission path from business as usual-growth to a downward-sloping path. Ideally, they will reduce emissions during the First Commitment Period to below a nation's Kyoto Budget. While a portfolio of measures will likely be needed to achieve this end, the creation of incentives to reduce emissions throughout the economy are likely an essential part of this portfolio. Such incentives can be created by market instruments or through Credit for Early Action.

MARKET INSTRUMENTS

Outside of North America, policy makers responsible for developing economy-wide incentives to reduce greenhouse gas emissions have focussed on either emissions trading and/or carbon taxes.

THE RATIONALE FOR MARKET INSTRUMENTS

Both economic theory and experience suggest that these market instruments have a number of advantages. In particular:

- *Achieving emission reductions at lowest possible cost.* In a competitive market without any market failures, well-designed market instruments should reduce emissions at the lowest possible costs. In practice, market failures (e.g. information barriers or externalities) exist, but the market will still often be more effective than government regulators in locating low cost emission reductions.

- *One instrument yields a myriad of adjustments.* One instrument can encourage use of products and technologies that emit less or use less energy; earlier replacement of inefficient technology; changes in consumption patterns to products that create fewer emissions in their production; and switching from carbon intensive fossil fuels to less carbon intensive fuels and renewables.

- *Incentive to innovation.* Market instruments create an economy wide incentive to innovate in ways that reduce greenhouse gas emissions. In a traditional regulatory "command and control" environment, emitters have no incentive to reduce

emissions beyond required levels and may even be fearful that innovation will lead to government imposing stricter regulation.

- *Shifting the onus for finding low cost emission reductions.* Market instruments also have an advantage in terms of the political achievability of reductions. Regulations that prescribe a particular technology or emission rate encourage businesses to exaggerate the cost of emission reductions so that they can avoid stringent regulations. Government does not have the same understanding of an emitter's needs and opportunities as does the actual emitter, and it cannot easily separate gross exaggerations from valid concerns. Market mechanisms shift the onus of finding most cost-effective emission reduction measures from government to the private sector.

- *Separation of where emission reductions occur and who bears the cost.* Market instruments generally allow government to achieve equitable sharing of costs while also ensuring cost effective solutions. Market instruments separate the issue of who pays for emission reductions and where they occur. In the case of a carbon tax or emissions trading with auctioned allowances, government can determine the distribution of benefits and costs through the recycling of revenue. Where allowances are allocated gratis, the allocation formula will determine winners and losers.

HOW MARKET INSTRUMENTS WORK

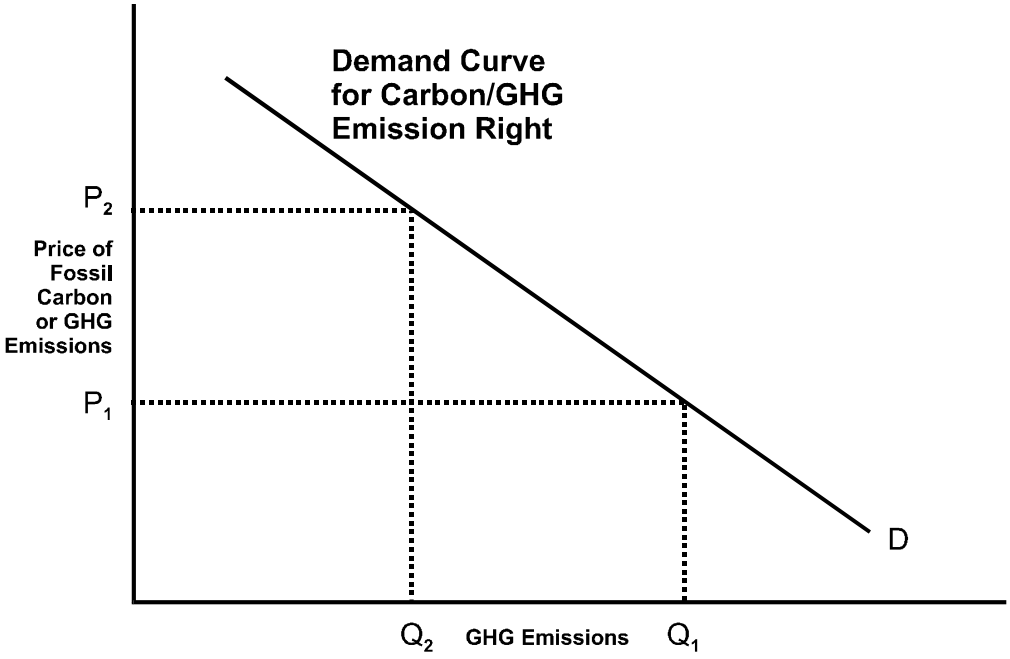
There are innumerable permutations in how an emissions trading system or carbon tax could work, but there are a number of basic elements that can be used by themselves or combined. Under a carbon tax or emissions charge, a charge is placed on emissions. In the context of greenhouse gases, this can be most easily accomplished by placing a charge or tax on the carbon content of fossil fuels. The revenue can be used to reduce other taxes, to reduce the debt or fund increased program spending. The tax would be highest per unit of energy on carbon intensive fuels such as coal and non-existent on renewable energy sources. Changes to the prices of energy will be reflected in prices for products. Energy providers have an incentive to switch to renewables, manufacturers to switch to more efficient production processes, and consumers to switch to products which consume less energy, especially fossil fuel energy, in their manufacture and use. Although taxes on carbon content of fossil fuels cover the great majority of most Annex 1 emissions (e.g. 84 percent of US emissions) a tax could be extended to many other emissions (e.g. greenhouse gases from industrial processes).

Figure 1 shows how a carbon tax works. In the absence of a carbon tax, the price of fossil carbon is P1, and the quantity demanded is Q1. A tax equal to P2-P1 raises the price of fossil carbon to P2. This reduces demand to Q2.

Under emission trading programs, like carbon taxes, individual polluters are given flexibility in how to reduce their emissions. Where an emitter can, at a low or negative cost, reduce emissions or energy use beyond what is required by regulation they can sell an emission reduction credit or an emission allowance to polluters who cannot reduce their emissions as easily. The purchaser of the credit or allowance is then allowed to emit more. Trading itself is not intended to reduce emissions; it is intended to reduce the cost of meeting a government imposed limit on emissions. (However, without trading, the government imposed limits may be impractical or not enforced.) The essential difference

between trading and a carbon tax is that under a trading regime government controls the quantity of emissions through regulatory limits, but not the price of emission rights. Under a tax, the price is set by government, but not the quantity. Under the example in figure 1, if government sets the quantitative limit on emissions at Q2, the price for emission limits will be the difference between the cost of fossil carbon (P1) and P2.

Figure 1



There are essentially three basic forms of trading that could be used to reduce greenhouse gas emissions. Any actual program is likely to combine these forms. The three forms are:

- *Downstream cap and emission allowance trading.* The quantitative limit on emissions is set by an explicit cap on actual emissions from defined sources during a defined time period. Government then makes a political choice as to how it allocates allowances to emit greenhouse gases. The total emissions permitted by all allocated allowances is equal to the cap. Allowances can be allocated through a number of different mechanisms; these including grandfathering based on emissions in a historic base period, auctioning, or allocation on the basis of production levels (e.g. one allowance per tonne of steel produced in a historic allocation base period). Those sources that expect to emit less than permitted by their allowances may sell surplus allowances to other sources whose emissions would otherwise exceed the allowances allocated to them. Over time, the number of allowances in circulation can be reduced and thus total emissions are reduced. Because of the administrative difficulty of making individuals, households and small businesses responsible for their emissions, the cap is likely only to apply to major industrial sources and other large emitters.

- *Upstream cap and carbon allowance trading.* This program is similar to cap and emission allowance trading but the quantitative cap is set by regulating the source of emissions rather than emissions per se. Rather than trading an allowance to emit a unit of greenhouse gases, allowances represent licences to sell or import carbon bearing fuels

for the purposes of combustion. Exemptions or credits would be available for fossil carbon exports or carbon sequestered in long lived products. Since carbon in fossil fuels is a very close proxy for the carbon dioxide emitted by burning those fossil fuels, and since carbon dioxide from fossil fuel combustion accounts for the overwhelming majority of greenhouse gas emissions, the limitations on carbon in fossil fuels reduces greenhouse gas emissions. The cap can also be extended to other gases and other sources that can be easily and accurately monitored. In order to match demand for fossil fuels with a limited supply, allowance holders will charge a premium on carbon based fuels. Carbon allowances are valuable and the holders of the allowances are not necessarily bearing the costs of emissions reductions. Because of this, in order for a upstream program to be socially acceptable, it is likely government would need to either auction allowances or tax back windfall profits, and use the revenue to reduce other taxes or invest in government programs and transition strategies.

- *Mandatory performance standards and credit trading.* The quantitative cap on emission is less explicit than other programs. Government, rather than prescribing a cap, prescribes numerous performance standards (e.g. *x* kg CO_2 per kWh/ *y* kg CO_2 per tonne of steel produced). Emitters who cannot cost effectively meet the applicable standard can buy credits from emission reductions at other locations. Credits can be generated by improving performance beyond required standards or by reducing emissions at sources not covered by a standard. However, in this case an absolute cap on emissions cannot be enforced. Design and renewal of performance standards will be subject to political bargaining.

The above classification of programs should not be taken as meaning there are only three ways of implementing emissions trading. As will be seen below, actual proposals often combine elements of programs. For instance, credit trading can supplement an upstream or downstream cap and allowance trading program. Credits can be generated by reducing emissions at facilities outside the cap, and used in lieu of allowances. Alternatively, downstream trading might be applied to the industrial sector while upstream trading or a carbon tax is applied to small sources.

SPECIFIC MARKET INSTRUMENT PROPOSALS

A number of nations have implemented or are preparing to implement market instruments in relation to climate change.[11]

In Europe, a number of countries have introduced carbon or general energy taxes.[12] Some of these include partial or full exemptions for industry. Tax revenue generation can be substantial: Finland's carbon tax amounts to $29 per tonne of carbon and makes no exemptions for industry; Sweden's carbon tax does include partial exemptions for industry but nevertheless raises an average of $89 per tonne of carbon emitted.[13] Austria,

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[11] A fuller description of different market instruments and proposals is found in Rolfe, Christopher, Michaelowa, Axel and Dutschke, Michael, *Closing the Gap: A Comparison of Approaches to Encourage Early Greenhouse Gas Emission Reductions* (Hamburg and Vancouver: HWWA and WCELRF, 1999). *Closing the Gap* will be available on HWWA's and WCEL's websites (respectively www.hwwa.de and www.wcel.org).

[12] An energy tax will be less efficient at reducing emissions than a carbon tax.

[13] Rolfe and Michaelowa, above at footnote 11.

Denmark, Netherlands, Norway, Italy and Germany also have energy or carbon taxes. The UK plans on implementing a tax by 2001.

Emissions trading has also progressed quickly in Europe. In May 1999, Danish parliament passed a bill that specified a trading system for the electricity sector.[14] Trading starts from Jan. 1, 2000 and annual allowances decline from 23 Mt of CO_2 to 20 Mt in 2003 (1990 emissions were 27 Mt). The allowances are grandfathered based on emissions in the 1994-1998 allocation base period. Certified emission reductions from CDM projects lead to allocation of additional allowances. Excess emissions are subject to a tax of 21 $/t C, which thus constitutes an upper cap for the allowance price. Revenues from that tax are earmarked for energy efficiency projects.

In early 1999 the Confederation of British Industry (CBI) and the Advisory Committee on Business and the Environment (ACBE) agreed to design an industry-wide scheme for emissions trading instead of being subjected to a carbon tax[15]. The draft system released in late 1999 allows both allowance and baseline-credit systems depending on the nature of sectoral targets. As part of this process the International Petroleum Exchange has proposed a downstream cap and emission allowance trading program that would cover 3,500 point sources accounting for 44% of UK emissions. The proposed system commences in 2001. A steadily declining cap is placed on emissions from covered sources. Allocation is based on a combination of grandfathering and benchmarking. Starting in 2008 permits are be auctioned. [16]

In 1998, the Norwegian government tasked a government commission with developing a proposal for the end of this year with implementation by the end of 2000.

In North America progress has been slow, with few concrete proposals. Since the Clinton administration backed off its energy tax proposals early in their mandate, there have been no high profile proposals for carbon or energy taxes. Resources for the Future, a Washington, D.C., based environmental think tank, has proposed adoption of an upstream cap and carbon allowance trading scheme in the US by 2002. Mindful of opposition in the US Congress to the Kyoto Protocol the RFF proposal's central features include a cap equal to 1996 emission levels, and a "safety valve" which ensures the effect on energy prices is limited. RFF proposes that 75% of carbon allowance auction revenues be recycled as direct payments to US households. The remaining 25% would be distributed to states based on vulnerability of their industries and energy use by low income households. West Coast Environmental Law is developing a similar proposal for Canada. From 1998-1999, the National Round Table on the Environment and Economy, a Canadian government sponsored forum for discussing integration of environment and economy, evaluated various emissions trading models. The Round Table made no recommendations on design or implementation dates.

Elsewhere, New Zealand has laid out three options for reducing greenhouse gas emissions prior to 2008. These include announcing the details of a downstream cap and emission

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[14] Folketinget (1999): *Act 376 of 2 June 1999 on CO_2 quotas for electricity producers*, Copenhague

[15] Confederation of British Industry (1999), "Emissions trading offers a way forward to reduce greenhouse gases and global warming", Press release, June 30, 1999.

[16] International Petroleum Exchange, "Design of a UK Greenhouse Gas Emissions Trading System" (August 1999).

allowance trading program; imposing a low level carbon charge in 2000; and implementing a downstream emissions allowance trading in 2000 and imposing an emissions charge on sources not included in the trading system.

CREDIT FOR EARLY ACTION

INTRODUCTION TO CREDIT FOR EARLY ACTION

Many North American proposals for encouraging early greenhouse gas emission reduction have focused on creating incentives for voluntary emission reductions without imposing new regulations or fiscal incentives. This appears to be due to a widely perceived lack of political appetite for mandatory greenhouse gas emission limits or carbon taxes. Indeed, within the US Senate there has been opposition to any regulatory initiatives to implement the Kyoto Protocol prior to ratification.

There are two aspects of the proposals for encouraging early voluntary action: Credit for Early Action and baseline protection. Under Credit for Early Action, credits are generated when an entity reduces its greenhouse gas emissions below a credit generation baseline. The baseline is set by reference to absolute emissions in a credit generation base period or emissions per unit of production in a credit generation base period. In some cases, entities can generate credits from reducing emissions at facilities that lie outside their operations. In these cases a separate baseline has to be created for the specific project.

Figure 2 provides an example of Credit for Early Action. A company gets credit for all the cumulative reductions below baseline. Some reductions (the area between credit generation baseline and BAU emissions) would have occurred anyway (i.e. they are non-additional reductions). Other reductions below business as usual are not credited.

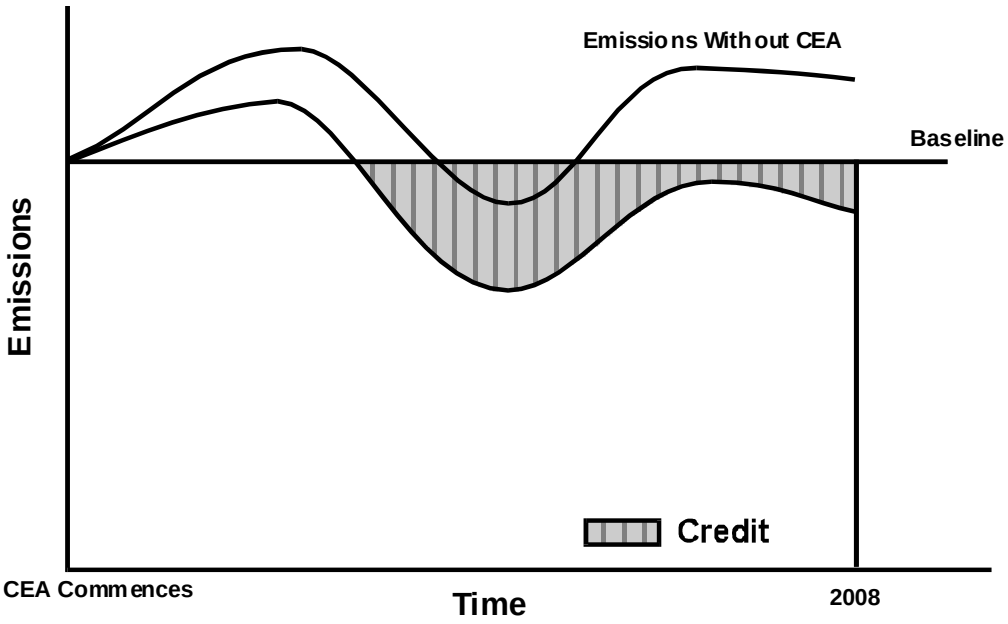
The credits are usable in any future where there is either a tax on greenhouse gas emissions or there are regulatory limits on greenhouse gas emissions. For instance, if an upstream carbon allowance trading program is implemented, emitters might receive allowances to import or produce fossil fuels. They could sell these to fossil fuel producers or importers. Credits are tradable, so that a company can profit from emission reductions even if it does not expect to need credits.

While Credit for Early Action involves the generation of credits that could be used under any carbon constrained future, baseline protection only comes into play if a future regulatory system uses "grandfathering." Grandfathering occurs where allowable emission levels or emission permits are given to emitters based on their emissions in an allocation base period. In the event of grandfathering, and in the absence of baseline protection, emitters who took voluntary action prior to the allocation base period would receive a smaller allocation. Baseline protection is intended to wholly or partly protect emitters from this possibility, thus wholly or partly removing a disincentive to early action.

Figure 3 indicates the relation between baseline protection and Credit for Early Action. In the figure it is assumed that credit is only given for absolute emission reductions. The area ACD represents the total credit generated. These cumulative reductions are rewarded with credits. Under baseline protection, in the event of grandfathering, the amount of reductions achieved in the allocation base period (BCDE) are added onto actual base period emissions (DEFG) for the purposes of calculating the allocation. Government

might, for instance, give emitters allowances equal to 85% of their protected base period emissions (BCFG).

Figure 2



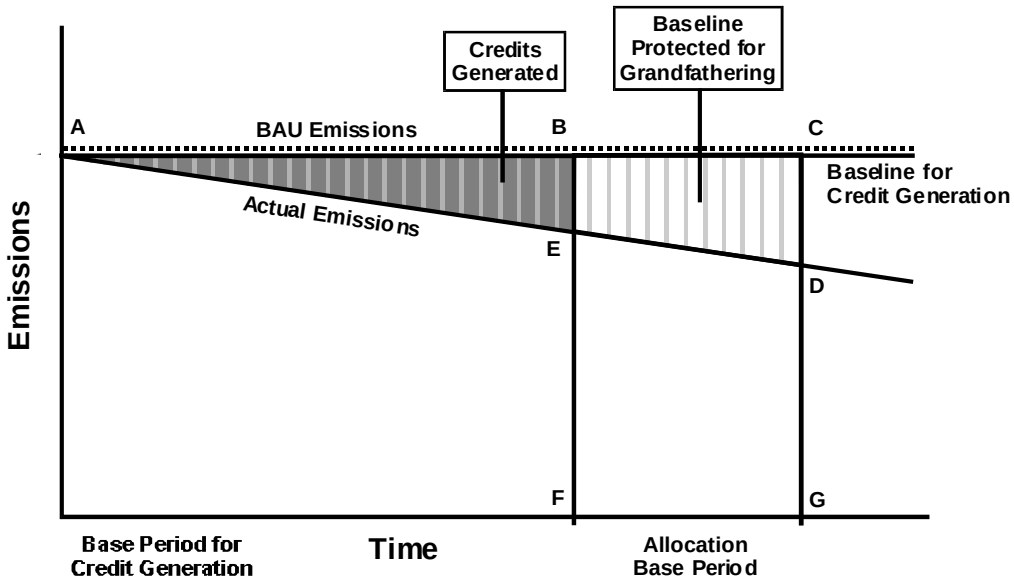
Credit for Early Action has several advantages similar to market instruments. In particular,

- *One Instrument encourages multiple adjustments.* Depending on its design one Credit for Early Action instrument can encourage many changes. These include production efficiency and shifts to renewable or less carbon intensive energy.

- *Incentive to Innovation.* Credit for Early Action creates an incentive to innovate.

However, as will be seen in the analysis below, Credit for Early Action does not create a clear price signal that values all emission reductions equally. While it is an incentive to low cost emission reductions, it may not achieve lowest cost emission reductions. Credit for Early Action is better described as a "quasi-market instrument."

Figure 3

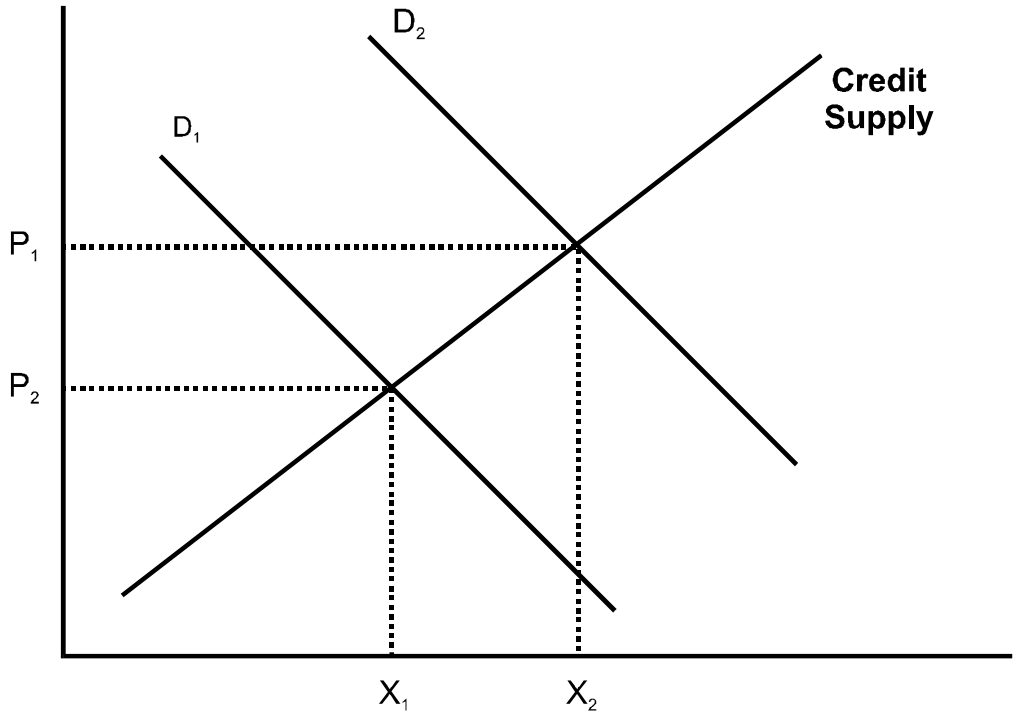


As indicated in figure 4, there are two main forces influencing the degree of emission reduction achieved through Credit for Early Action – supply and demand for credits. Below[17] we discuss the various factors that influence the supply and demand curves and the thus the effectiveness of a Credit for Early Action program.

Assuming that credits can be generated by activities that would have occurred in the absence of Credit for Early Action, and assuming that these credits will have the lowest cost, weak demand could lead to no additional emission reductions. For instance, if X_1 credits can be generated by activities that would have occurred anyway, a low level of demand (represented by D_1) will not result in any additional emission reductions. Trading will occur for easily verified, non additional emission reductions, but the costs of verification (even if they are purely transaction costs) will outweigh any added incentive for additional emission reductions created by the credit price P_1. This situation of low demand for credit could be the case if market participants expected the Kyoto Protocol to fail. On the other hand, if there is an expectation of entry into force of the Protocol, greater demand will result and additional emission reductions ($X_2 - X_1$) will occur. If major shortfalls between actual and allowed emissions are expected, or if high emission reduction costs are expected, the curve would move even further to the right.

[17] See *Credit for Early Action*, page 18.

Figure 4



CREDIT FOR EARLY ACTION PROPOSALS

In the United States, by the summer of 1998 the Environmental Defence Fund ("EDF"), the Center for Clean Air Policy ("CCAP") and the Coalition to Advance Sustainable Technology ("CAST") had all proposed Credit for Early Action programs. In October 1998, a bill based on the EDF proposal, the *Credit for Voluntary Early Action Act*[18], was introduced into the Senate. In March 1999 it was reintroduced with some minor amendments by the late Senator John Chafee as the Credit for Voluntary Reductions Act[19] (the "Chafee Bill"), and in July 1999 the *Credit for Voluntary Actions Act*[20] (the "Lazio Bill") was introduced into the US House of Representatives by Congressman Rick Lazio. In Canada, a group with representatives from several large emitters and several environmental organizations introduced the Canadian Early Emissions Reduction Program proposal ("CEERP") to a meeting of ENGOs, industry and government in March 1999.

Although the Chafee Bill, the Lazio Bill and the CEERP proposal have become the focus of discussion in Canada and the US, the debate over design elements of a voluntary incentive program has not narrowed appreciably.[21] Basic aspects of system design remain unresolved:

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18 U.S. Senate (1998) S. 2617, 105th Congress, 2d Session.

19 U.S. Senate (1999) S. 547, 106th Congress

20 U.S. House of Representatives (1999) H.R. 2520, 106th Congress.

21 A detailed description of each of the proposals in found in *Closing the Gap*, above at footnote 11.

- *Performance vs. Absolute Baseline.* Some proposals provide credit for reductions below a baseline that is set as an absolute tonnes of emissions figure. Others provide credit for reductions in emissions per unit output.

- *Stringency of baseline.* Proposals vary in terms of the stringency of the baseline. The Chafee Bill, for instance, has a flat absolute baseline, while the CCAP absolute baseline is a straightline between 1998 emissions and seven percent below 1990 emissions. The CAST baseline requires a 1.5 percent per annum improvement in performance; the Lazio performance baseline improves at a rate which exceeds domestic economic growth.

- *Tonne for tonne credit vs. discounted credit.* Most Credit for Early Action proposals provide one tonne of credit for every tonne of qualifying reductions. The CAST proposal discounts reductions occurring below a relatively weak baseline, while giving full credit for reductions below a stringent baseline.

- *Cumulative net reductions.* Under all proposals credit generation is cumulative and runs at least until carbon taxes or domestic emission limits are imposed. For instance, under the Chafee Bill, a one tonne per year reduction in 1991 could yield a 13 tonnes of credit if domestic limits are imposed in 2003.

- *Baseline adjustments.* Most proposals include some provisions for adjusting baselines. Absolute baselines are generally adjusted up or down for acquisitions, sales and new productive capacity. Both performance and absolute baselines can also be adjusted to reflect factors such as outsourcing.

- *Credit Generation Base Period and Credit for Past Action.* Credit generation base periods are the year or time period used to establish the starting point for a participant's baseline. Most proposals assume credit generation can commence immediately after the base period. Under CEERP, Chafee and Lazio Bills, participants can choose credit generation base periods between 1990 and 1998, thus allowing substantial credit for past actions and past reductions. In addition, the two American bills allow emitters to choose a later base period while receiving credit for verifiable past reductions (even if such reductions are not reductions below baseline). Other proposals require use of a more recent credit generation base period and provide limited or no credit for earlier action.

- *No cap on credits.* Several proposals include caps on total credit generation. These are enforced either by discounting total creditable reductions to fit within the budget or by allowing participants to reserve a portion of the limitted budget.

- *Upstream emissions and leakage from production shifts*. Provisions vary as to the treatment of activities that shift emissions or that reduce emissions at other locations.

- *Offsets.* Under some proposals, credit can be claimed for offset projects – i.e. projects not owned by the credit generator.

- *Baseline protection.* Some of the proposals offer full or partial baseline protection in addition to credit.

- *Recognition of carbon sequestration.* Proposals vary in terms of whether credit is available for carbon sequestration. The Chafee Bill gives credit for any increases in sequestration. Lazio provides a relatively complex formula for crediting sequestration.

These design elements are closely linked and decisions on one design element will fundamentally affect not only the program's environmental effectiveness, economic efficiency and equity, but also the choice of other design elements.

ANALYSIS

This part is a comparative analysis of the strengths and weaknesses of the Credit for Early Action approach versus market instruments approach. It begins by assessing the environmental effectiveness of market instruments and Credit for Early Action. It then discusses whether different instruments create an effective price signal that encourages least cost emission reductions. It then discusses the impacts of both on equitable sharing of emission reduction costs. Much of the analysis suggests significant advantages to the use of market instruments as opposed to Credit for Early Action. The question then becomes, does Credit for Early Action make sense as an interim strategy?

WILL CREDIT FOR EARLY ACTION PROVIDE CREDIBLE EARLY ACTION?

Credit for Early Action supporters have suggested that it is the only politically viable way of encouraging early reductions. This section looks at the level of emission reductions that might be achieved by a Credit for Early Action program versus environmental effectiveness of market instruments.

MARKET INSTRUMENTS

Because they generally create a clear market signal, environmental effectiveness of different market instruments is relatively easy to predict (at least in theory). As shown in Figure 1, above, the effectiveness and cost of market instruments are relatively simple to predict from a theoretical perspective. Cap and trade programs will reduce emissions to the defined cap. The difference between projected emission trends and the cap gives a good indication of environmental effectiveness of the program. The long and short term effectiveness of a carbon tax is harder to predict in practice, but is theoretically simple: if twenty percent emission reductions are possible over ten years at prices below $25.00 per tonne, a $25 per tonne charge should yield a 20% emission reduction in ten years. Economists will inevitably argue over business as usual emission trends and the effectiveness of different levels of carbon tax, but there is a theoretical basis for predicting effectiveness, and economists are familiar with the macroeconomic models that allow them to predict effectiveness.

CREDIT FOR EARLY ACTION

In comparison, predicting the effectiveness of a Credit for Early Action system is difficult. The effectiveness of an early crediting system is dependent on a number of variables.

Supply of creditable reductions

At the most basic level, as shown in Figure 4, above, the effectiveness of early crediting will depend on supply and demand for credits. On the supply side there are several determinants of effectiveness beyond simply the supply of low cost emission reductions that determines effectiveness of a carbon tax:

- *The number of creditable, low cost additional emission reductions.* The supply curve of emission reductions under Credit for Early Action is different from the supply curve of emission reduction under a carbon tax. In particular, some low cost reductions may not be pursued because they are not creditable.

- *The number of creditable, non-additional emission reductions.* Large amounts of credit from non-additional emission reductions will increase the supply of credit, and increase the volume of credits generated. However, it will depress prices and thus decrease the incentive for emission reductions that are additional to what would occur in the absence of Credit for Early Action.

- *Extent of non-creditable emission reductions necessary to generate credit.* More stringent baselines will — up to a point — increase the number of additional, non-creditable emission reductions that are pursued in order to begin generating credit.

Demand for credits

The market value of credits – and thus the demand for credits – will be determined by a number of intangible factors.

- *Perceptions as to the likelihood of future emission limits.* Early action credits only have value if there is future regulation of emission limits. If emitters expect the Kyoto Protocol to fail, there will be less demand for credit and fewer, if any, additional reductions.

- *Perceptions as to the future value of one tonne credits.* A Credit for Early Action system will be less effective if most emitters expect a low price for domestic allowances, AAUs, or CERs.

- *Discounting of future cost savings.* Both Credit for Early Action and market instruments encourage immediate investments in emission reductions in return for future gains. However, when gains accrue is pushed back under Credit for Early Action and they will be more heavily discounted.

- *Perceived risk of credits being discounted.* Several proposals include a credit budget — a limit on the total amount of the Kyoto Budget allocated to Credit for Early Action. If creditable reductions are discounted to avoid exceeding the budget, the value of a reduction becomes even more speculative.

Estimates of Effectiveness

Estimates as to the effectiveness of Credit for Early Action are thus varied. Some assume that firms representing all emitters would participate. Some assume half of large emitters would participate. Some assume that reductions would immediately drop to the Kyoto

target for all participating companies. Others assume a one percent improvement per year. WCEL was unable to find any analytical basis for any of these assumptions. There has been no analysis of the assumptions made. They represent guesses.

Design and Effectiveness

It is difficult or impossible to estimate the effectiveness of Credit for Early Action. However, there are a number of conclusions that can be reached regarding impacts of different design elements on effectiveness.

All of the Credit for Early Action programs reviewed for this report use a one-size-fits-all approach to baselines. This will work best if there is minimal variation among emitters' emission patterns and emission reduction costs relative to the chosen metric for setting baselines. If, for instance, all emitters can achieve a 1.5 percent per year reduction in emissions per unit of revenue (the CAST requirement) at no cost, there will always be an incentive to make low cost emission reductions. Similarly, if very few emitters exceed the 1.5 percent performance improvement rate in a business as usual scenario, there is little risk that a limited credit budget will be used to reward non-additional emission reductions. On the other hand, if there is great variability in emission patterns and costs, a Credit for Early Action system will be less effective. Participants with low cost emission reductions that lie above the credit generation baseline will have no incentive to pursue those reductions, and a limited credit budget may be spent rewarding non-additional emission reductions.

Unfortunately, at time of writing, the authors were unable to locate any attempt to quantify variability among corporate emission reduction patterns (either measured as absolute emissions (e.g. CCAP), absolute emissions adjusted for asset transactions and new sources (e.g. CEERP and Chafee) or measured as emissions per unit of production (Lazio, CAST). However, anecdotal evidence suggests that differences in technological opportunities and different opportunities to reduce emissions as capital stock is replaced make for significant differences in emission patterns among companies and sectors. For instance, business as usual projections for the US aluminium sector suggest that, despite modest growth, reductions of PFC emissions of twenty five percent between 1993 and 2010 will be achieved due to improved technology.[22] Indeed, business as usual emission reductions may be far higher. European and American aluminium industries are working towards PFC emission reductions of 45% or more between 1990 and 2000, using, in the case of the US industry "cost-effective approaches that make economic and environmental sense for the Partners."[23] Canadian Industry Program for Energy Conservation (CIPEC) reports 1990 to 1994 improvements in emissions per unit of output between sectors that vary between a decrease in efficiency of 4.9% (glass) to an improvements of 19.2% (pulp and paper).[24] In the case of utilities, declining performance baselines will give little

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[22] Mark Storey (1996): *Policies and Measures of Common Action: Demand Side Efficiency: Voluntary Agreements with Industry* Paris, OECD Environment Directorate, Second Draft.

[23] See website for the US EPA's Voluntary Aluminium Industry Partnership: *http://www.epa.gov/vaip/* Some US companies have reduced emissions by over 70%. In Norway, the aluminium industry has made considerable progress in achieving an agreed 50% cut in PFC emissions between 1990 and 2000: Personal communication with Peir Stiansen, Norwegian Ministry of Environment.

[24] Canadian Industry Program for Energy Conservation (1995): *1994-1995 Annual Report*, Toronto.

incentive for a hydro based utilities to meet new demand through investment in renewables.

Thus anecdotal evidence suggests that the combination of variability of individual corporate emission paths and one-size-fits-all credit generation baselines will inevitably tend to reward non-additional emission reductions. This, in turn, will reduce the incentive for additional emission reductions.

Another design element with major implications on environmental effectiveness is the existence and sign of a credit budget. All of the available estimates assume an unlimited budget for credit. As discussed below, a credit budget may be considered necessary for other reasons, but imposing such a budget will reduce effectiveness. If the budget is enforced by either a reservation system or first come-first serve allocation of credits, it is likely to favour non-additional emission reductions (such reductions will have already happened or already be planned and thus easiest to reserve). A dearth of data on variability in corporate emission patterns makes estimating creditable non-additional emission reductions difficult; however, case studies indicate that credit for non-additional emission reductions will be fairly common.[25] If the credit budget is enforced by pro-rating credits according to creditable reductions the added uncertainty in credit value will decrease investment in non-additional emission reductions.

Overly stringent baselines as well as overly aggressive baselines can reduce the effectiveness of Credit for Early Action. A stringent baseline will decrease the amount of credit generated by non-additional emission reductions; this will increase the price for credits and encourage more reductions. It will also reduce the amount of a limited credit budget used to compensate for non-additional reductions, thus ensuring more credit for additional reductions. Finally, more stringent credit generation baselines will lead to emitters pursuing additional emission reductions that are not creditable because they are above the baseline. As baselines become more stringent there will become an increasing number of additional, cost effective emission reductions that are not be pursued because the total cost of reductions to generate credits outweigh the value of the credit. This will decrease effectiveness in the case of an unlimited credit budget. However, by eliminating the amount of a limited budget used to reward non-additional reductions, it will increase the effectiveness of a limited budget up until such point as the baselines are so stringent that the budget is not fully used.

LEAKAGE

Programs can create situations where there is an economic benefit to shifting emissions to another location. This shift can occur either through market adjustments or deliberate attempts to game the system. A program that indirectly encourages shifting – also know as leakage -- will be less effective in reducing greenhouse gas emissions.

Generally with market instruments, the potential for leakage will be minimized if the system is comprehensive. On the other hand, Credit for Early Action programs inherently create incentives to shift production or consumption to goods with lower embodied emissions; to outsource production that involves higher emissions; and, to simply reduce

[25] See *Case Studies*, pages 67-75, in *Closing the Gap*, above at footnote 11.

production[26] but do not create an inherent cost to shifts in the opposite direction.[27] Credits may be generated for reductions at one location, but these may be completely offset by leakage from shifting production to other locations.

All Credit for Early Action proposals have some provisions against credit from displaced emissions. However, operationalization of these provisions is often undefined, and often certain types of leakage are ignored.[28] For instance, the Chafee Bill simply states that early emission agreements will ensure that only net emissions will be credited in circumstances where emissions are displaced to sources not covered by an early action agreement. The CAST proposal includes nothing aimed at capturing leakage from shifts in production to low emissions activities if they do not involve mergers, divestitures or outsourcing.

The challenge of operationalizing provisions against leakage is significant. For instance, quantifying the leakage associated with reductions in production or shifts in production mix is daunting, requiring knowledge of the emissions intensity of different products. Unfortunately, such information is often unavailable, difficult to produce or not sufficiently disaggregated.[29] Government administrators will have extreme difficulty assessing whether or not reductions are real.

Rules to avoid leakage may also create loopholes. For instance, under CEERP, if a firm sells a facility, the vendor's emission baseline will be adjusted downward to reflect the loss of the facility. If the purchaser is a non-CEERP participant the vendor will loose credits generated by the sold facility. Under these rules an entity could sell off facilities which have emission increases while maintaining ownership of facilities that have non-additional emission reductions. Owned by the same company the reductions would be cancelled out by the increases and no credits would result, but by selective asset sales, credits can be generated.

CONCLUSION

In comparison to market instruments, the environmental effectiveness of Credit for Early Action is difficult if not impossible to predict. The speculative nature of credits may make

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[26] See Michaelowa, Axel and Stronzik, Marcus, (1999) "Early crediting of emission reduction – a panacea or Pandora´s box?", FEEM Discussion Paper 48.99, Milan.

[27] See *Structural Changes Are Not Rewarded*, page 27.

[28] All proposals include provisions against credit generation due to corporate re-organizations or asset sales. For other types of leakage the Chafee Bill simply states that early emission agreements will ensure that only net emission reductions will be credited in circumstances where emissions are displaced to sources not covered by an early action agreement. The Lazio Bill requires rules to avoid credit for outsourcing production, but does not refer to rules to avoid credit from shifting production to less carbon intensive products (If units of productions were defined very narrowly, differentiating between products with different carbon intensities, this leakage would be caught by the Lazio Proposal). The CEERP proposal does not have any definitive rules guarding against leakage through reduced production, outsourcing or shifts in product, but suggests that the CEERP agency could review the credit created by entities that have taken no emission reduction actions. Under the CAST proposal, participants are required to report outsourcing that has an impact on emissions which exceeds a certain significant threshold of CO_2 emissions, and emission reductions associated with the outsourced activity are ignored for the purposes of crediting. Shifts in production to low emissions activities are not caught if they do not involve mergers, divestitures or outsourcing.

[29] See US Department of Energy, Energy Information Administration (1999c): *Changes in Energy Intensity in the Manufacturing Sector, 1985-1994*, Washington, p. 8.

them less effective in motivating additional emission reductions. Both too lax and too stringent a baseline reduces effectiveness, yet data is not available to choose the most effective baseline. The effectiveness of Credit for Early Action will also depend variability among company emission patterns relative to the chosen baseline metric but once again, the data to choose the appropriate metric is lacking. Finally, credit budgets could dramatically reduce effectiveness, but may be necessary for other reasons.

Both market instruments and Credit for Early Action can potentially create perverse incentives under which emitters can gain through activities that simply shift emissions elsewhere. However, the lack of a clear price signal in early crediting programs increases the potential for leakage significantly. In comparison, an upstream market instrument, by covering the vast majority of emissions, and all energy related emissions, minimizes potential leakage.

EFFICIENCY AND THE CREATION OF A PRICE SIGNAL

Above, in the "Introduction to Credit for Early Action" and "How Market Instruments Work" sections, this paper examined how both Credit for Early Action and market instruments create incentives to encourage emission reductions throughout the economy. While incentives are created in both cases, Credit for Early Action programs do not create the same clear price signal for reductions. There are several aspects to this distinction between Credit for Early Action and market instruments:

ACHIEVING COMPLIANCE WITH KYOTO AT LOWEST COST

In order to minimize the costs of complying with the Kyoto Protocol, policies should ideally shift investments in long lived capital stock that will affect emission levels into the Protocol's First Commitment Period and beyond. From the perspective of purely reducing compliance costs, policies need to balance the cost of premature retirement of long lived capital stock in the pre-commitment period, and ensuring that new capital investments are consistent with a low emissions future. If both these ends can be accomplished, it will avoid economic loss necessitated by unnecessary retirement of carbon intensive capital stock. Policies should also encourage technological research, development and innovations in order to reduce the costs of reductions in the long term.

To encourage investment in low carbon technological development and low carbon capital stock, policies need to increase the certainty that the resulting emission reductions will be valued. The problem with Credit for Early Action is that it does not provide a strong signal that future reductions will be valued; it does not provide market information on how much future reductions will be valued; and, eventually, it may unnecessarily accelerate premature retirement of capital stock (good for the environment, but not for minimization of costs).

Investments in long lived capital stock and technology have relatively long lead times between when capital planning, construction and research begin and when reductions first occur. These investments are already likely to be influenced by the possibility of future emission limits. If emission reductions are only expected to come on stream after the imposition of emission limits, credit for early action will not add value to these investments.

Moreover, even if emission reductions are expected earlier, Credit for Early Action initially only provides a weak signal that they will be valued. During the period prior to the coming into force of the Kyoto Protocol, the value of early action credits is dependent on perceptions regarding the likelihood of future emission limits and a number of other intangibles. Investors who discount the possibility of future limits are likely to continue discounting that possibility under Credit for Early Action.

Provision of baseline protection along with measures that reduce uncertainty by signalling the future value of low carbon technology are likely to have a greater impact than Credit for Early Action on innovation and investment. Early introduction of a market instrument (by signalling that government is serious) will give greater certainty, especially in the short term before the coming into force of the Protocol.[30]

On the other hand, as the entry into force of the Kyoto Protocol becomes certain, there is a risk that Credit for Early Action will over-value immediate reductions in emissions.[31] This is good from an environmental perspective, but in some cases, it may be economically preferable to delay reductions. Early introduction of a market instrument can also lead to emitters bringing forward abatement opportunities from later in the pre-commitment period. However, the risk of over-investing in quick reductions can be reduced under market instruments by choosing either a less aggressive reduction target (in the case of emissions trading) or a lower tax rate (in the case of carbon taxes) and slowly increasing the stringency of the target or tax as the First Commitment Period approaches. Similarly, both Credit for Early Action and market instruments may encourage reductions that do not continue through the First Commitment Period. While there is an environmental and learning value to such reductions, they may not reduce compliance costs. This problem is likely to be more significant under Credit for Early Action because the value of reductions are not phased in over time.

Specific elements of Credit for Early Action may also make programs less effective in encouraging low carbon technology innovations. For instance, CEERP imposes a liability for participants that fail to reduce emissions below a baseline. Participants that have net cumulative emissions that exceed their baseline (i.e. net "debits") are required to either purchase early action credits from other participants or Certified Emission Reductions under the Clean Development Mechanism. A participant that believes it might be able to reduce emissions using a new technology is discouraged from participating, because participating in anticipation of reductions from an unproven technology carries a risk. CEERP thus encourages easy reductions using known technologies while discouraging risky investment in the cutting edge technologies that are most important for reduction of long term compliance costs.

Similarly, proposals to implement credit budgets through a reservation system or through first come/first serve issuance of credits favour reductions that are already planned. Reservation systems may need to include a penalty for generating less credits than anticipated (this would be needed to avoid reserving more credits than can be reasonably

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[30] Centre for International Economics, *Early greenhouse action*, (Canberra: Australian Greenhouse Office, 1999) at 62 (available at http://www.greenhouse.gov.au/emissionstrading).

[31] Ibid.

expected). Like the CEERP debiting proposal, this encourages investment in known technologies over cutting edge technologies.

LEAST COST REDUCTIONS

Compared to market instruments, Credit for Early Action is not only problematic in terms of its ability to encourage least cost compliance with the Kyoto Protocol; it is also problematic in terms of encouraging least cost emission reductions.

Market Instruments

Under well-designed market instruments all emissions have the same opportunity cost. Under a cap and upstream carbon allowance trading program, if a one ton carbon allowance is auctioned for $20.00, it theoretically encourages all parties that can reduce fossil carbon consumption at a cost of $20.00 or less per tonne to do so. In a competitive market, any action that reduces emissions by one tonne should yield a $20 saving. Similarly, if the market price for carbon allowances is twenty dollars, recipients of free allowances will increase their prices in the same manner as if they were paying a twenty dollar per tonne carbon tax, or paying twenty dollars per tonne of allowances. Thus, price signals created by emissions trading or emission charges flow through the economy, are incorporated into the costs of carbon intensive products, and encourage substitution to less carbon intensive inputs.

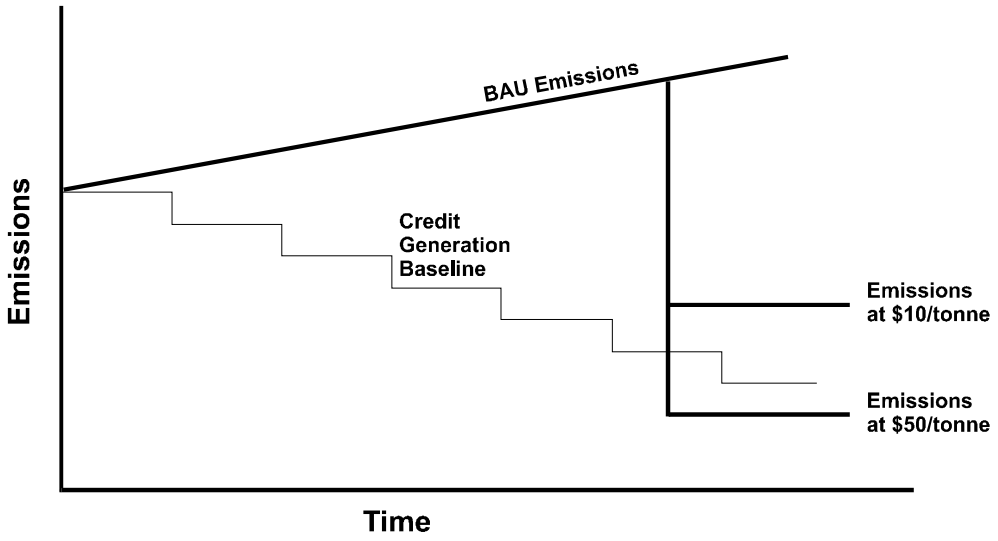
Credit for Early Action

While market instruments can be designed to impose equal opportunity costs for all emissions within the sectors subject to them, under Credit for Early Action the value of a reduction will be variable, and the market can not be relied on to yield the lowest cost emission reductions even if there is a liquid credit market. Governments can try to overcome these limitations, but efforts to do so will either be open to abuse or will rely heavily on bureaucratic oversight and tend to increase transaction costs. They may also decrease the environmental effectiveness of the program or have larger, possibly undesirable, impacts for the equitable sharing of emission reduction costs.

Some Reductions not Creditable

In the absence of offsets, the value of an emission reduction will depend on the relation between a firm's business as usual emissions and the baseline set by the state. For a firm with BAU emissions that are equal to or below its credit generation baseline, every tonne of reductions will have a value equal to the market value of a credit. However, to varying degrees, all existing Credit for Early Action proposals will create situations where business as usual emissions rise relative to the credit generation baseline. In figure 5, a firm can reduce emissions significantly at very low cost ($10 per tonne) but, even with those reductions, its emissions will remain above the credit generation baseline. The firm can only reduce its emissions further at very high cost ($50 per tonne). In this situation, even if the value of a credit is $15 per tonne, Credit for Early Action does not increase the attractiveness of making low cost emission reductions. (The company may still choose to make the low cost reductions in order to reduce its potential exposure under future mandatory programs, but in the example given, this choice is unrelated to the incentives created by Credit for Early Action.)

Figure 5



There are three potential responses to this problem: allow credits to be generated on a project by project basis through offsets; use less aggressive baselines; or establish individual baselines for individual companies reflecting business as usual emissions. Each possible solution creates problems.

Offsets. The Chafee Bill and CEERP proposal allow the use of offsets. Offsets are emission reductions at a location outside of a participant's operations that can be counted toward the participant's credit generation. Allowing the use of offsets in a Credit for Early Action program creates new problems. First, allowing offsets undermines the utility of standardized credit generation baselines. Participants' with business as usual emission trends that are below the standardized baseline would use the standardized credit generation baseline and generate credit for non-additional emission reductions. Parties with business as usual emission trends that exceed the standardized credit generation baseline would be better off not participating directly in Credit for Early Action. Instead, they could sell rights to claim offsets for projects under their control and buy back the resulting credits. This way credit could be generated even though an entity's emissions are above the credit generation baseline.

CEERP tries to address this problem by imposing an additionality requirement and allowing participants to adopt projects owned by other parties. Under CEERP it must be reasonably demonstrated that the adoption of the project will lower Canada's GHG emissions. Emissions associated with the adopted project are added to the participant's baseline, and the participant can claim emission reductions from the adjusted baseline. Although this still allows companies to secure credits without achieving firm-wide reductions, it aims at eliminating credit from single projects that would have occurred anyway.

Determining additionality is likely to prove difficult especially if many entities try to avoid entity wide baselines by allowing adoption of emissions from their facilities and subsequently purchasing credits. CEERP proposes determination of additionality based on factors such as comparison with prevailing practices and viability of a project under prevailing investment practices. These determinations will likely prove difficult for

agencies that are not familiar with a particular industry and have limited access to confidential information.

Less Aggressive Baselines. Another means of ensuring that all emission reductions are valued equally is to establish a lax approach to baselines. Less aggressive baseline ensure that more emission reductions are creditable. However, lax baseline would also mean that credit is given for a larger number of non-additional emission reductions. By definition, credit for non-additional emission reductions will not help reduce emissions. Even worse, it will increase the supply of credits, thus tending to depress the price for credits and reducing the number of additional emission reductions. It will also increase future compliance costs for non-participants.

Case By Case Baselines. Individualizing baselines so that they reflect business as usual emissions of a specific company can theoretically avoid excessive credit creation from non-additional emission reductions, but would be bureaucratically cumbersome and entail high transaction costs. For instance, entities participating in credit creation could be required to carry out a greenhouse gas emission reduction audit. The audit could identify all emission reduction opportunities, with an analysis of their cost and financial payback. The baseline from which creditable emission reductions are measured would be equal to the performance achievable by a firm if it implements all measures that have a pay back of a specified amount.[32] To the extent that the baseline is accurate it will ensure that all additional emission reductions have an equal value. However, like the assessment of additionality in the context of offsets, it creates an incentive for industry to exaggerate the costs of emission reductions, and as is dependent on the ability of government or auditors to accurately assess emission reduction opportunities. The potential for gaming has lead all of the leading Credit for Early Action proposals to focus on use of standardized one-size-fits-all baselines.

Structural Changes Are Not Rewarded

Many low cost emission reductions are likely to be the result of structural changes in the economy caused by shifts to production of more energy efficient products and shifts to inputs that have less embodied greenhouse gas emissions. As noted above, market instruments will lead to changes in prices that reflect the differences in emissions associated with different products, and changes in cost will lead to substitution of less carbon intensive inputs where they are most cost effective.

The following example indicates how, under a market instrument, the market can lead to investment in cost effective structural changes. A carbon charge or greenhouse gas emission charge is placed on carbon content of fuel and industrial emissions of other greenhouse gases. This will increase the price of emissions intensive aluminium relative to steel. Even if an allowance trading system with gratis allocation of allowances is used, economic theory suggests that the same increases in product prices will occur.[33] On the other hand consumers, faced with higher fossil fuel prices will be demanding lighter, more energy efficient cars, leading to an increase in demand for aluminium. If aluminium car

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[32] See Rolfe, Christopher (1999): *Early Crediting and Baseline Protection: Issues of Immediate Concern*, Vancouver (available at West Coast Environmental Law Association website: http://www.wcel.org).

[33] Steel and aluminium manufacturers will demand a higher price for their product that compensates for the fact that at lower prices they would be better off reducing production and selling allowances

construction is a solution to climate change, despite its high emissions intensity, aluminium will prevail in the market. If not a solution, other solutions will prevail. With a market instrument, economic theory suggests that the market will sort out the competing claims.

Unfortunately, this sort of adjustment is more difficult in a Credit for Early Action system. The voluntary nature of Credit for Early Action works against a shift to the product with lower lifecycle emissions. First, some proposals contain provisions that work against credit from reduced production of energy intensive goods. Performance baselines in the Lazio Bill and CAST proposals will not reward decreased production of energy intensive goods unless firms are able to increase production of other goods or services. Under CEERP, credit from reduced production risks being invalidated.

Second, even if credit is available for shifts away from greenhouse gas intensive products, some manufacturers of energy intensive products will face no downside to increasing output of these products. They may not be participants in the Credit for Early Action system. Alternatively, investment in new production facilities for energy intensive goods may be rewarded by an upward adjustment of baselines (as in Chafee and CEERP) or lead to credit generation if the new facilities are more efficient (CAST and Lazio). So long as some firms do not charge more for their products because there is no opportunity cost to producing energy intensive products, other manufacturers may be unable to increase prices and decrease production in a way that effectively reduces overall emissions through cost effective shifts in production. If producers were allowed to generate credit from reducing production of carbon intensive goods, equally carbon intensive competitors who are not participants in the early crediting system could simply increase their production, and there would be no overall reduction in emissions.

There is a risk that Credit for Early Action could even encourage changes that increase emissions. Under CEERP and the Lazio Bill, manufacturers of more energy efficient cars can gain credit. Car manufacturers will have a strong incentive to switch to aluminium. However, because Credit for Early Action is unlikely to yield adjustments to steel and aluminium prices that reflect their embodied greenhouse gas emissions, there is no countervailing incentive to switch away from aluminium. If steel components are better for reducing greenhouse gas emissions, Credit for Early Action could encourage a move in the wrong direction. While this risk could be dealt with through subjecting all credit generation activities to lifecycle analysis, disputes regarding the emissions impact of different products (e.g. aluminium vs. steel) are testament to the difficulty of doing life cycle analysis of large numbers of emission reduction activities.

Credit for early action systems can, of course, include design elements that encourage shifts to less carbon intensive inputs, but doing so may encourage changes in suppliers without changes in aggregate emissions. For instance, under the CEERP and CAST proposals, a consumer can get credit for switching from an electricity provider with high emissions to one with low emissions. Unfortunately, neither proposal guards against a nominal shift in supply arrangements with no changes in overall production of low and high emissions electricity. Credit generating industries could switch from buying coal fired electricity to hydro power, but consumers and non-credit generating industries could switch to coal, due to the price decrease caused by lower demand.

PERVERSE INCENTIVES

The lack of a clear economy-wide price signal in Credit for Early Action can reward activities which shift the location of emissions without achieving actual emission reductions (i.e. credit for projects which create leakage is probable). This may create perverse incentives for uneconomic activity. There are various ways in which credit could be given for emissions shifting. These and the difficulty in accounting for them are discussed above.[34]

CONCLUSION

Encouraging investments in innovative low carbon technologies, and shifting investments in long lived capital stock toward lower carbon alternatives are most important from the perspective of lowering Kyoto compliance costs. In the short term, the clarity of the price signal created by market instruments is likely to be more effective than current Credit for Early Action proposals in encouraging this type of investment. Indeed, specific aspects of some Credit for Early Action proposals may disadvantage these investments relative to investments in known technologies that have less permanent impacts on emissions or compliance costs. In the longer term, both Credit for Early Action and market instruments could lead to the acceleration of emission reductions beyond what is optimal from the perspective of reducing Kyoto compliance costs. This problem is less acute in the context of market instruments because they can be phased in over time.

Policies will be most efficient and most effective in causing cost effective emission reductions if all emissions have equal opportunity costs. Although some proposals for market instruments create differences in the opportunity costs of emissions, well-designed market instruments will create an equal opportunity cost for all emissions. Ensuring an incentive to pursue least cost reductions is more difficult in the context of Credit for Early Action systems. Reductions that are not below credit generation baselines have no incremental value. Moreover, incentives to reduce emissions through structural shifts to lower carbon intensity inputs may either be non-existent or ineffective.

DISTRIBUTING COSTS AND BENEFITS OF EMISSION REDUCTIONS

The design of market instruments or Credit for Early Action programs will have significant implications on how the costs and benefits of reducing emissions will be borne by society. All of the proposals considered for this report potentially involve transfers of assets that, for an economy the size of the US, range from tens of billions of dollars to hundreds of billions.

The distributional impacts of market instruments will depend on: the size of an emissions charge or stringency of an emissions cap; where low and negative cost emission reductions exist; and how either auction/emission charge revenue is recycled or how allocations of allowances or emission limits are set. In cap and trade programs with free allocation of allowances, the allocation formula will create winners and losers. Grandfathering will reward large emitters with low and negative cost emission reduction

[34] See *Leakage*, page 21.

opportunities; performance standards will reward efficient producers. With a carbon tax or a program where allowances are auctioned, the sharing of costs will be determined by the reallocation of revenue.

Generally, different market instruments can be designed to have the same distributional impacts. For instance, all revenue from a carbon tax could be recycled to emitters in proportion to their historic emissions. This would mimic the distributional effect of a downstream cap and emissions allowance trading program that grandfathers allowances. (Large emitters tend to oppose a carbon tax on the basis that politically it will be more difficult to achieve a distribution equivalent to grandfathering.)

Credit for early action will also create winners and losers. Assuming tonne for tonne credit is given and no credit budget, estimates of total amount of credits that might be generated by additional emission reductions under an American Credit for Early Action program range from four to 53 percent of the Kyoto budget.[35] At a value per tonne of carbon of $50 ($13.65 per tonne CO_2) this amounts to somewhere between 14 and 194 billion dollars.[36] Credit from non-additional emission reductions not included in these estimates could be in the same range.

The determinants of how this wealth is transferred are: the eventual value of credits; and how baselines relate to low and negative cost emission reductions. Firms that have business as usual emission trends that are lower than credit generation baselines will have windfall credits. Firms that have opportunities for low cost, creditable and additional emission reductions will also generally benefit.[37] While the creation of winners and losers

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[35] None of the estimates reviewed included credit for non-additional emission reductions. In all cases the estimates simply assumed a rate of participation and measured the difference between an assumed emission path followed by all participants and a baseline. In all cases the baseline was either the business as usual emission emissions projected for the US economy or a flat line from 1999 or 1996 to 1998 emission levels. The 4% figure is contained in Nordhaus, Robert et al. (1998): *Early Action & Global Climate Change – An Analysis of Early Action Crediting Proposals*, Pew Center on Global Climate Change, Arlington, p. 22. It assumes that 50% of emitters participate (no basis given for this estimate), that emitters choose 1996 to 1998 as their credit generation base period, and that baselines are not adjusted upward to reflect new sources or increments in productive capacity, and that all participants make absolute reductions of one percent per year. The 53% figure (also contained in Nordhaus et al.) assumes every emitter in the economy participates and is immediately successful in reducing emissions to seven percent below 1990 levels, and assumes that the baseline represents business as usual emission trends. The Natural Resources Defence Council estimates that 21 percent of the US Kyoto budget that could be spent on emission reductions from 2000 forward. This assumes 100% participation, credit for all reductions from business as usual and all emitters following a straightline emissions path from current levels to seven percent below. It should be noted that the 21% and 53% figures contain obvious overestimates of participation. These figures also assume business as usual is the baseline – something, none of the proposals explicitly call for. Nonetheless, use of business as usual emission trends may be an accurate representation of baselines used under proposals such as the Chafee bill. Since the Chafee Bill calls for baselines being adjusted upwards for new sources, business as usual emission trends would be an accurate representation of actual credit generation baselines if one assumes that all emissions growth is due to the addition of new sources and if one assumes that all new sources use most efficient commercially available technology.

[36] This is based on the following: US gross emissions in 1990 measured as CO_2 equivalent (5.8 billion tonnes) times Kyoto reduction target (0.93) times years in Kyoto budget (5) (yielding budget of of 27 billion tonnes CO_2 eq.) times conversion factor tonnes of carbon per tonne of CO_2 (.273) times fraction of budget used for credit (0,04 to 0.53) times $50 dollars per tonne carbon

[37] They may not benefit if there is a cap on the amount of the Kyoto Budget allocated to Credit for Early Action and there are so many creditable non-additional emission reductions that the additional reductions are no longer economic.

is inevitable, programs need to be carefully examined to determine if their distribution effects are reasonably equitable and politically acceptable. In comparing different programs several equity issues stand out:

HIGHER BURDEN FOR FIRMS WITH HIGHER COSTS OF ADJUSTMENT

Allocating portions of the Kyoto Budget on the basis of early action is a zero sum game. Whatever the form of future emission reduction regimes, all else being equal, Credit for Early Action will increase the cost of compliance for non-participants. These firms may be non-participants because they already face the highest costs of emission reductions. The only way early crediting will not increase the costs of compliance for non-participants is if it leads to major technological innovation (i.e. if it shifts the supply curve of emission reductions to the right). As noted above, Credit for Early Action is less effective than market instruments in encouraging innovation.[38] If larger amounts of credit are generated – either because the program is successful in encouraging wide ranging reductions, because of large amounts of credit from non-additional emission reductions or the implementation of emission reduction activities earlier in the pre-compliance period – the distributional implications will be greater.

POTENTIAL FOR LIMITED IMPACT AND SIGNIFICANT REDISTRIBUTION

It is possible that a relatively ineffective early credit system could still have profound distributional effects.[39] The same could be said of a downstream cap and emission allowance trading program or a system of mandatory performance standards and credit trading. The cap or standards could be lax allowing companies to bank allowances in the absence of additional emission reductions. As the cap becomes more aggressive the banked credits will have more value. However, as noted above, the very existence of a cap or performance standards sends a strong signal that should encourage further emission reductions.

The following is a list of different categories of credit generating activities with attempts to quantify the potential credit that might be generated.

- *Future additional emission reductions*. As noted above, estimates of total amount of credits that might be generated under an American Credit for Early Action program range from four to 53 percent of the Kyoto budget. Although these estimates depend partly on program design, the variability seems to be mainly based on the assumptions used, and there has been little or no analysis given to the assumptions.[40] At a value per tonne of carbon of $50 ($13.65 per tonne CO_2) this amounts to somewhere between 14 and 194 billion dollars.[41]

- *Future non-additional emission reductions.* The estimates for emission reductions resulting from credit for early action do not factor in credit for non-additional

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38 See *Achieving Compliance with Kyoto at Lowest Cost*, page 23.

39 See also Michaelowa/Stronzik (1999), above at footnote 26, for a microeconomic analysis of redistribution.

40 See footnote 35.

41 See footnote 36.

emission reductions.[42] Given indications of considerable variation in past corporate emissions paths, credit for future non-additional action is likely to be significant.

- *Credit for past action.* Past emission reductions (by definition non-additional) could also claim a significant portion of the budget. For instance, under the Chafee Bill rough estimates suggest that three to twelve percent of the US Kyoto Budget might be allocated to credit for past action.[43] Assuming one tonne allowances are worth $50 per tonne of carbon in the 2008 to 2012 period, this yields a total transfer equal to between 10 and 40 billion dollars. This is in addition to transfers of emission allowances under baseline protection provisions, which could amount to an additional transfer of two or more percent of the US budget for 2008 to 2012.[44]

- *Credit for Sequestration.* Credit for non-additional sequestration could also be extremely high. Again, using the methodology included in the Chafee Bill, it is possible that 27 percent of the US Kyoto Budget could be allocated on the basis of non-additional sequestration.[45]

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[42] See footnote 35.

[43] The 12% figure is based on the assumption that all entities reporting project based reductions under the 1605(b) program choose base periods that predate their reported reductions under the 1605(b) program. It also assumes that all reported project based emission reductions reported under the 1605(b) program from 1994 to 1998 are creditable, but that no other reductions are creditable. It is clear that some reductions reported under 1605(b) are unlikely to be creditable because they result from double counting. Others may not be creditable because they are not reductions below the Chafee baseline. On the other hand, the estimate of creditable reductions does not include entity level reductions not reported in project level reports. Nor does it include emission reductions not registered under the 1605(b) program. These emission reductions may be significant as companies may, for strategic purposes, choose to not report emission reductions. For instance, of the 13 primary aluminium firms in the US (a sector committed to 45% voluntary reduction under the Voluntary Aluminium Industry Partnership) only two had registered reductions under 1605(b) by 1997. The 12% figures is derived as follows: the sum of 1605(b) project-level emission reductions for 1994 to 1997 (74+146+154+166 million tons CO_2 eq.) plus estimated 1605(b) project level reductions for 1998 (263) times nine years (3,170 million tons CO_2 eq.) divided by US Kyoto budget of 27 billion tonnes CO_2 eq. (resulting in estimated 11.7% of Kyoto budget). The three percent figure is based on the assumption that all participants choose a base period of 1995-1998 and claim credit for reductions registered under the 1605(b) program. The 3% figures is derived as follows: 1605(b) project-level emission reductions for 1994 to 1998 (74+146+154+166+263 million tons CO_2 eq.) divided by US Kyoto budget of 27 billion tonnes CO_2 eq. (resulting in an estimated 2.97% of Kyoto budget). Project level emission reductions have been used rather than entity because the US Energy Information Administration has estimated the former but not the latter for 1998. Figures for project level reductions come from Testimony of Jay Hakes, Administrator of the US Department of Energy before House of Representatives Government Reform Committee on The Voluntary Reporting of Greenhouse Gases Program, July 15, 1999. Available at www.eia.doe.gov/neic/speeches/htest715/ testmony.htm

[44] Again this assumes that all project level reported reductions but no others are creditable. It assumes 85% of the US budget is allocated based on historic emissions in 2000 with adjustments to actual entity emissions as called for in the baseline protection provisions of the Chafee Bill. The figure is derived as follows: estimated 1605 project level reductions in 1998 (263 million tonnes CO_2 eq) divided by estimated 2000 emissions (6,444 million tonnes) multiplied by 0.85.

[45] This is based on US projections of net sequestration from land use change and forestry contained in Table C.2 of UNFCCC (1998). In 1990, the United States estimates that net sequestration from land use change and forestry amounted to 458,000 Gg of carbon dioxide removals. This goes to 411,040 in 2000, 403,700 in 2005, and 400,030 in 2010. Projections for annual sequestration from 1990 to 2007 were based on these figures and interpolation for intervening years, yielding a total of 7,330,950 Gg for the entire period (27% of the US Kyoto Budget). All of this would be creditable under the Chafee Bill. This figure may understate total creditable sequestration as the IPCC figure represents net changes to sequestration counting both land where there are increases in sequestration and land where there are decreases. However, under Credit for Early Action owners

In summary, reallocation of wealth through the crediting of non-additional emission reductions could be significant under Credit for Early Action.

REWARDING PAST ACTION

With the exception of emission trading using grandfathering, all market instruments will reward emitters who have taken early action to reduce greenhouse gas emissions. Both grandfathering and Credit for Early Action inherently involve a prejudice to emitters who have taken early action to reduce emissions. In the case of Credit for Early Action, emitters who commenced action prior to the start date of crediting are prejudiced. In the case of grandfathering, emitters who undertook reductions prior to the start date of the allocation base period or baseline protection program will be prejudiced.

Credit for Early Action programs and baseline protection have tried to mitigate this problem by providing differing degrees of credit for past action. Any rewarding of past action is difficult to justify in terms of environmental effectiveness, but may have some merit for reasons of equity. However, proposals for rewarding past action vary hugely in terms of their impact on distribution of wealth. Many proposals provide greater reward for past action relative to future action – something which is difficult to justify on any grounds.[46]

DIFFERING ABILITY TO COMPENSATE LOSSES, ASSIST IN ADJUSTMENT AND YIELD A DOUBLE DIVIDEND

A weakness of Credit for Early Action, performance standards and credit trading, and cap and trade programs that use grandfathering is that these programs do not yield revenue which can be used either to aid companies or communities with the highest adjustment costs or to reduce distortionary taxes. This is particularly problematic in the context of Credit for Early Action because it actually increases the compliance costs of non-participants – likely the same parties who face high adjustment costs.

In contrast, the Resources for the Future proposal could generate $36 billion in revenue in 2002.[47] Seventy five percent of the revenue is recycled to households ($270 per household in 2002).[48] A number of studies have suggested that using the revenue from auctions or carbon taxes to reduce distortionary taxes could significantly reduce the overall costs of emission reductions.[49] The RFF proposal also allocates funds for compensating or aiding in

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of land where there is a reduction in sequestration levels will not participate and these decreases in sequestration will not offset the total value of credit generated by sequestration. On the other hand, this estimate assumes that all forests are enrolled in the program. In fact nationally owned forests may be excluded from participation or only receive a limited credit.

46 For a fuller discussion on proposals for rewarding past action see *Rewarding Past Action* in *Closing the Gap*, above at footnote 11, on page 47.

47 Based on allowances selling for $25 per tonne carbon and the cap not being exceeded,

48 Kopp, Raymond et al., "Domestic Trading: A Credible Early Action" in National Roundtable on the Environment and the Economy, *Workshop on Progress Toward Development of Domestic Emissions Trading Programs for Greenhouse Gases: A Comparison of Progress Around the World, Proceedings from Workshop March 1 to 3, 1999, Toronto Ontario,* (Ottawa: NRTEE, 1999).

49 See B.S. Fisher et al., "An Economic Assessment of Policy Instruments for Combatting Climate Change." In James Bruce et. al. "Economic and Social Dimensions of Climate Change," above at footnote 6. at 410f.

the adjustment of adversely affected individuals, communities and corporations. Twenty five percent of revenue generated goes to states based on energy use by low income households and vulnerability of industry. States can then assist households, displaced workers and companies with transition costs and potentially compensate corporations for premature retirements of carbon intensive capital stock.

Downstream cap and emission allowance trading programs with grandfathering and potentially some forms of Credit for Early Action[50] do compensate large emitters that have to prematurely retire carbon intensive capital, but the value received in exchange for the cost of adjustment or premature retirement is accidental. Some companies receive windfalls (because of negative or low cost options); others pay higher costs. Moreover, no benefits flow to the employees dislocated by shutdowns or companies which are adversely impacted but are not large emitters (e.g. coal mines).

Credit for Early Action, downstream allowance trading with grandfathering and mandatory performance standards with credit trading are also likely to concentrate beneficiaries of climate change policy. Costs will be spread broadly throughout the economy in the form of less revenue for recycling (if carbon charges are imposed or allowances auctioned), in the form of lower *gratis* allocations of allowances, or in the form of more stringent standards. Credit for Early Action proposals vary in terms of the extent to which they involve entities other than large industrial emitters, but most programs are developed primarily for generating credit by large companies. This is particularly true in the case of credit for past action. The estimated ten to forty billion dollars that could be allocated to past actions under the Chafee Bill would likely be concentrated among the two hundred or so companies which reported under 1605(b) for 1998.[51] Indeed, 18 utilities reported a total 100 megatonnes of reductions (worth $ US 2.5 billion at $25 per tonne) under 1605(b).[52]

CONCLUSION

The distributional impacts of both Credit for Early Action programs can be significant and depend on program design. For an economy the size of the US, the value of credit generated will likely be in the tens to hundreds of billions of dollars range. This will increase the future compliance costs of non-participants. Likely this will be firms with the highest transition costs. Credit for Early Action provides no means to aid such firms and the communities dependant on them in the transition to a low carbon economy. Significant increases in compliance costs of others could occur even if a Credit for Early Action program is largely ineffective environmentally.

While it is possible that market instruments could have equal distributive impacts, there is far greater certainty that market instruments will be environmentally effective. Market instruments that generate revenue have the added advantage that revenue can be used to

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[50] Under Chafee, a firm could potentially generate credit from a shutdown if it can show that emissions did not simply increase elsewhere. Neither CEERP nor performance baseline proposals allow credit from shutdowns.

[51] 172 companies reported in 1998.

[52] National Environmental Trust, "Major Special Interest Provision Taints Legislation" (National Environmental Trust Background Paper, 1999).

aid those most adversely impacted by climate policies. These instruments also generate revenue that can be used to displace taxes that impede growth.

EARLY CREDITING AS AN INTERIM STRATEGY

Credit for Early Action is often promoted as an interim measure that could be put in place prior to the imposition of market instruments,[53] and as necessary in the immediate term to remove the disincentive created by the possibility that future market instruments will use grandfathering.[54] This section discusses whether or not Credit for Early Action is essential to removal of this disincentive, whether it is effective in removing this disincentive, and whether it is technically and politically easier to implement than market instruments. Other interim strategies are also discussed.

AN EASY FIRST STEP?

Politically, Credit for Early Action has the advantage that it does not impose any immediate costs on any parties beyond the cost of administering the system. As noted above, the costs of crediting early action are significant, but they are imposed at a later date. While this may be politically attractive, Credit for Early Action could nonetheless be a difficult first step if rewarding early action requires an exceedingly complicated administrative infrastructure.

Complexity and administrative cost appears to be inherent in the Credit for Early Action context, both because of the need to establish baselines and the need to guard against credit being generated by activities that do not reduce emissions. With regard to baselines, absolute emissions baselines like CEERP and Chafee require rules defining what constitutes a new source or a discrete investment in production and setting best commercially available emission standards. Early crediting systems that use an emissions per unit of output baseline (e.g. Lazio) need to develop rules to measure production of numerous products. As discussed elsewhere, this will likely prove difficult to regulate or administer.[55] If additionality requirements are incorporated into offset rules, regulators face a significant challenge.[56] The need to limit credit from activities that merely shift emissions has already been discussed.

On the other hand, complexity is not inherent in market instruments. The RFF proposal is an eloquent model of simplicity. Monitoring, reporting, auditing and enforcement provisions are important, but will only need to be developed for fossil fuel producers, importers and exporters. Rules are also needed for crediting the use of fossil fuel as feedstock in long lived products. Rules are needed for crediting reductions among the

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53 Coalition to Advance Sustainable Technology (1999): *CEO CAST: First Movers Coalition Early Action Crediting Proposal*, Washington, p. 9.

54 Testimony of Eileen Claussen before the Senate Committee on the Environment and Public Works, March 24, 1999.

55 See above under *Leakage,* page 41. (III.A.3**.)**

56 See Dutschke, Michael; Michaelowa, Axel "Creation and Sharing of Credits through the Clean Development Mechanism under the Kyoto Protocol", in Jepma, Catrinus; van der Gaast, Wytze (eds.) *On the compatibility of flexible instruments,* (Dordrecht: Kluwer, 1999), at 47-64 regarding difficulty operationalizing additionality in the context of the CDM.

relatively small number of emission sources not covered by a cap. Other than this, the system uses the market to ensure that reductions are rewarded.

Credit for early action may also be more challenging with regard to the monitoring and verification requirements it imposes. Monitoring and verification are as important under Credit for Early Action as in any tax or regulatory system. As with market instruments or the tax system, there are incentives to cheat, and cheating comes at a cost in terms of environmental effectiveness and compliance costs of others. However, unlike market instruments, Credit for Early Action raises a number of additional compliance issues. If past reductions are creditable, they will need to be verified. Moreover, there will be issues such as verification of production levels (if performance baselines are used), verification of outsourcing activities and verification of whether new sources use best available technology.

REMOVING A DISINCENTIVE

As discussed above, grandfathering occurs where emission allowances are allocated in proportion to emitters' emissions in a historic baseline year or baseline period or where performance standards are based on historic performance. For instance, emission allowances might be distributed to firms in 2005 in an amount equal to 95% of their emissions in the 2003 "allocation base period." If a firm is able to defer making emission reductions at no or little cost, in the event of grandfathering, it will be in a better position if it defers its emission reductions until sometime after the allocation base period. This creates a disincentive for early action.[57] A similar disincentive is created by the possibility that firms that are likely to be excluded from the mandatory coverage of a cap and trade program will only be able to generate emission reduction credits from reductions that occur when the program is in force.

Various approaches have been developed to eliminate these disincentives. Early crediting itself can partially or fully remove the disincentive. In addition, various proposals have been made for baseline protection, either as an alternative to or in addition to Credit for Early Action. Baseline protection is a measure that only comes into effect if there is grandfathering. It gives an upward adjustment to an emitter's allocation base period emissions.

Some approaches to baseline protection may not fully remove the disincentive in all cases. Under the Chafee and Lazio Bills, tonnes of credits generated during the allocation base period are added onto the emitters' actual emissions for the purposes of grandfathering. However, if an emitter's actual emissions fall above the credit generation baseline despite emission reduction action, the emitter will receive a higher allocation if they take no action. Thus, in figure 6 a company may make substantial reductions and receive no baseline protection. In figure 7, actual emissions fall beneath the credit generation baseline, but the company only receives partial baseline protection. The more stringent the credit generation baseline, the more likely this approach to baseline protection will not fully remove the disincentive to early action.

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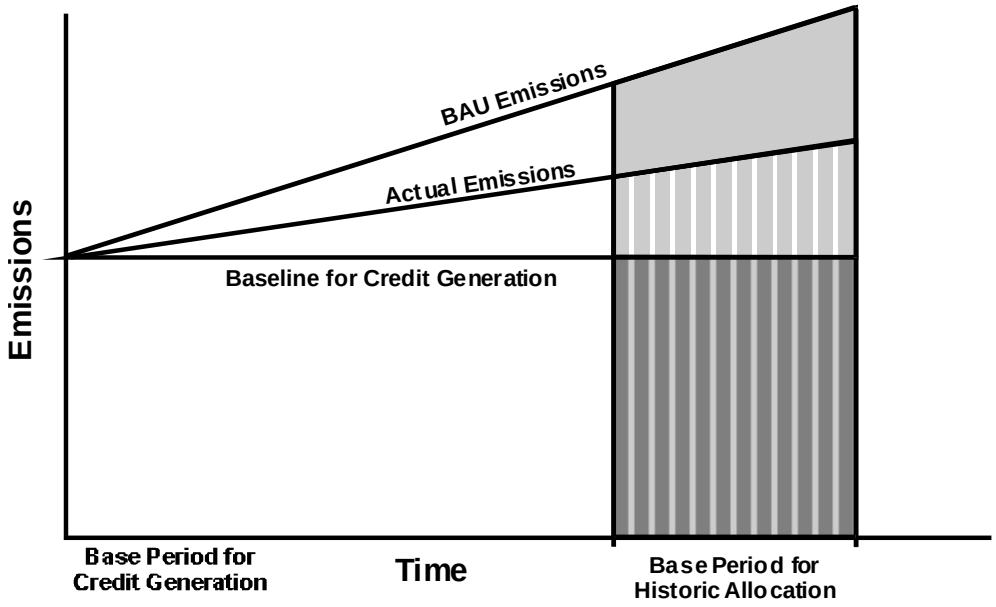
[57] The disincentive does not always mean firms are better off without making emission reductions. If a firm adopts technology that locks it into a pattern of high emissions, it may have greater compliance costs than a firm that adopts low emissions technology and receives a lower allocation.

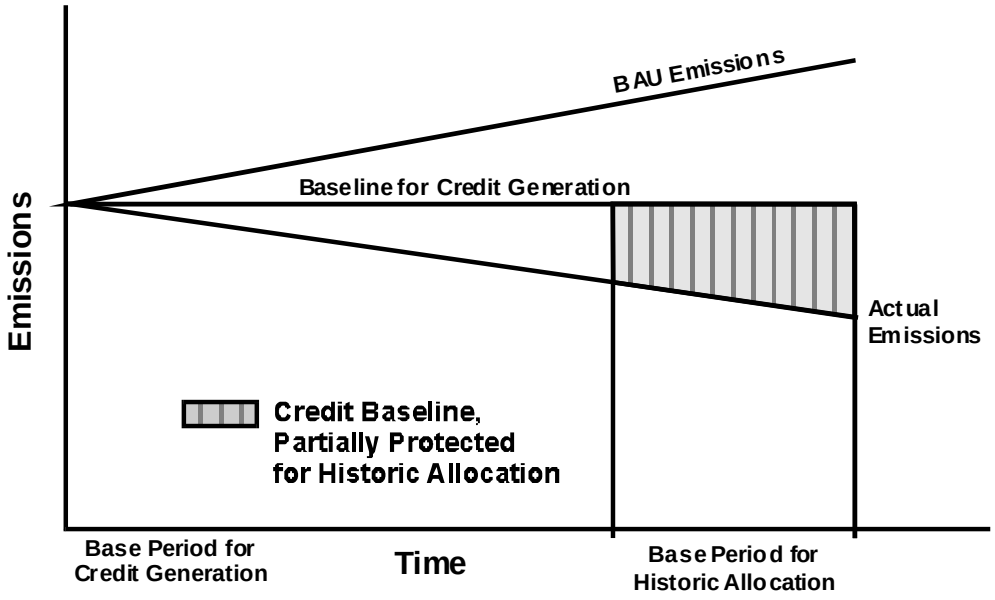
The use of "reconstructed baselines" is intended to remove this possibility.[58] The reconstructed baseline essentially tries to reconstruct business as usual emission levels in the base period. Emitters estimate what emission levels would have been if qualifying actions had not been taken prior to the allocation base period. For emission reduction actions to qualify they only need to result in real, measurable and verifiable emission reductions. This ensures that no prejudice will arise from early action even in the absence of Credit for Early Action. The baseline protection concept could extend beyond sources that receive an allocation under grandfathering. This would avoid a disincentive for early action created at sources that are likely excluded from a future downstream cap and emission allowance trading programs but might be potential emission reduction credit generators in a hybrid cap and credit program.

Figure 6



[58] This approach is discussed in the Options Report of Canada's Credit for Early Action Issue Table. The table is a joint industry, government, environmentalist forum for discussing Credit for Early Action.

Figure 7



ALTERNATIVE INTERIM STRATEGIES

Credit for early action is not the only interim strategy to use while market instruments are being implemented. There are a number of steps government could take which will help firms invest appropriately in emission reduction and fall short of immediate implementation of market instruments designed to reach the Kyoto target:

- Announcing a commitment to reconstructed baselines in the event of grandfathering. This creates its own Credit for Early Action, as firms either receive a surplus (or less of a shortfall) of emission allowances (in the event of a gratis allocation) or have to pay less for emission rights (in the event of an emissions charge or auctioned allowances). A commitment to reconstructed baselines does not commit government to the development of elaborate rules (rules for reconstructing baselines will be necessary if government eventually uses grandfathering to allocate allowances).

- Announcing the general nature of future market instruments and their implementation date will help reduce uncertainty and provide a signal to firms to reduce emissions. Some program designs may provide a clearer signal. For instance, the transparency of the cap on emissions in a cap and trade program may send a stronger signal to firms than the announcement of mandatory performance standards and credit trading. In the latter firms may believe there is more scope to negotiate favourable performance standards.[59]

- The detailed definition of a downstream cap and emission allowance trading regime or a regime of performance standards and credit trading will also create signals among emitters. In particular it would allow forward markets to develop in emission allowances or credits.

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[59] Centre for International Economics, above at footnote 30, p. 51.

CONCLUSIONS

Credit for early action may be politically easier to implement in the short term than market instruments because any potential costs are deferred until the future. However, it could increase the eventual compliance costs of many sectors of the economy and thus could lead to greater resistance to Kyoto Protocol ratification in the longer term. This is especially true if credits are concentrated among relatively few participants, and if they represent a large portion of the Kyoto Budget.

While both Credit for Early Action and market instruments can be complex in design, a degree of complexity is inherent in Credit for Early Action because of its reliance on rules rather than actual market signals (such as scarcity of emission rights or costs for emissions). A workable Credit for Early Action program will be more complex and require more administrative infrastructure than a simple (but potentially very effective) market instrument.

Credit for Early Action helps counteract the disincentive created by the possibility of grandfathering, but it does not necessarily do so. Baseline protection – in particular, baseline protection that bases allocations on the "reconstruction" of business as usual emissions during the allocation base period – can eliminate the disincentive created by the possibility of grandfathering and can be adopted in the absence of a Credit for Early Action program. Although designed to remove a disincentive, full baseline protection also guarantees that, all else being equal, emitters will be better off taking early action.

The possibility of Credit for Early Action also creates a disincentive. So long as governments are discussing whether and how to pursue early crediting, firms may hold emission reduction projects in abeyance, waiting until rules are known so that they can maximize credit. It is better to clearly reject the Credit for Early Action concept than to continue the debate without implementing Credit for Early Action.

While the added certainty of guaranteed baseline protection helps ensure consistent signals in favour of emission reductions, it will still not necessarily ensure the optimal emissions path. Announcements of future policy can further increase the signals favouring early action, but firms may gamble that government will change its mind. The early introduction of market instruments and/or other policies are likely needed to achieve the lowest cost future emission reduction path. Early measures to encourage reductions need not represent the final design of market instruments for meeting the *Kyoto Protocol*. For instance, the RFF proposal is intended as an interim measure that ensures some level of emission reduction, but not sufficient reduction to meet the *Kyoto Protocol*.

FINDINGS AND RECOMMENTATIONS

FINDINGS

The environmental effectiveness of Credit for Early Action is extremely difficult to predict. A lack of data on individual corporate emission patterns makes choice of effective baselines difficult. Too lax, too stringent or otherwise inappropriate baselines could reduce environmental effectiveness. Finally, credits are a speculative commodity, and it is uncertain whether the market will value them sufficiently to invest in significant reductions. There is a risk that the value accorded to credits will be insufficient to encourage additional emission reductions, especially during the time period prior to the coming into force of the Kyoto Protocol. While a limited credit budget is essential for other reasons, a Credit for Early Action program with a limited credit budget is likely to be environmentally ineffective unless combined with very stringent baselines.

Unlike well-designed market instruments, Credit for Early Action programs do not impose an equal opportunity cost on all emissions. Thus, they will not yield lowest cost emission reductions. Reductions that result from structural changes in the economy and changes in consumption patterns will often be impossible to credit, and some reductions will not be valued because they do not fall below a credit generation baseline.

Credit for Early Action programs will also fail to achieve compliance with the Kyoto Protocol at lowest cost. Minimizing Kyoto Protocol compliance costs requires investment in research, development and innovation, and shifting investments in long-lived capital stock. During the period prior to the coming into force of the Kyoto Protocol, Credit for Early Action programs will add little certainty to the value of these investments. Moreover, because of the long lead time between when investments occur and when reductions occur, Credit for Early Action may be ineffective in encouraging incremental investments in reductions that reduce long term compliance costs. (If there is five years between when planning for a project begins and when the reductions occurs, and mandatory trading begins in 2005, Credit for Early Action yields no incremental benefit.)

Once the Kyoto Protocol comes into force, Credit for Early Action will tend to accelerate emission reduction projects that can be quickly implemented. Although this is positive from an environmental perspective, it may add to compliance costs. In comparison, market instruments phased in over time provide a strong signal regarding the value of

investing in long term emission reductions while at the same time avoiding the "over-acceleration" of emission reductions.

Credit for Early Action will increase the compliance costs for those who are not able to participate effectively in the program. Under a program that has no limit on the amount of credit created and weak credit generation baselines, the impact on compliance costs could be extreme. Increases in costs will primarily be borne with those already facing high compliance costs.

Credit for Early Action could have major distributive effects while having very limited environmental impacts. Both credit for past action and credit for emission reductions or carbon sequestration that would have occurred anyway could overwhelm the generation of credit from incremental emission reduction projects.

Credit for Early Action is inherently more complex and requires more bureaucratic oversight and regulation than well-designed market instruments. Credit for Early Action is often promoted as an easily implemented interim measure because it does not impose any immediate costs beyond administration. However, inherent difficulties in design could delay implementation well beyond the timeframe in which effective market instruments could be designed and implemented.

Emission rights may, in the future, be allocated based on emitters' historic emissions. This creates a disincentive to emission reductions. Early crediting may not remove this disincentive. Baseline protection – guaranteeing that any grandfathering will be based on business as usual emissions – can effectively counteract this disincentive.

RECOMMENDATIONS

Government should immediately implement a baseline protection policy. Baseline protection should be designed to remove the disincentive to early action in all cases.

Government should proceed immediately to implement market instruments that create incentives throughout the economy to reduce greenhouse gas emissions. A tradable emissions cap on fossil fuel producers and importers would be the simplest, most efficient and most effective instrument. Until the ratification of the *Kyoto Protocol*, such a cap could simply stabilize emissions at current levels. Most of the revenue from the auctioning of carbon rights could be returned to households while a portion could be returned to states or provinces whose economies would otherwise bear an undue proportion of emission reduction costs.

In the absence of the political will to immediately implement market instruments, legislating market instruments for future implementation is preferable to Credit for Early Action.

Whether Credit for Early Action is better than the absence of measures to reduce greenhouse gas emissions will depend on the design of Credit for Early Action and whether it can be implemented quickly. Extending the debate on Credit for Early Action will create a disincentive to taking action until such time as rules are developed. Governments should reject the Credit for Early Action concept unless they are able to proceed with announcement of detailed system design in the very short term.

If a Credit for Early Action does proceed, limiting the amount of the Kyoto budget used for credits is essential to ensuring that the system does not increase the future compliance costs of non-participants to a point where ratification of the Kyoto Protocol would be difficult. However, the environmental effectiveness of a Credit for Early Action will be significantly reduced if there is only a limited credit budget. First come- first serve allocation of the credit budget, discounting qualifying reductions or allowing emitters to reserve a portion of the credit budget all tend to reward or encourage non-additional emission reductions over additional. The best means of limiting the impact of early crediting on non-participants and ensuring additional emission reductions is by having very stringent baselines supplemented by a limited credit budget.

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