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The Basics of a Cap-and-Trade Program

Emissions trading programs have been used in air quality improvement and pollution reduction initiatives in the U.S. for decades, and trading programs that are well-designed and implemented successfully have proven cost-effective and have shown the ability to reach environmental goals quickly. Policymakers are now considering creating an emissions trading program for carbon dioxide (CO_2) and other greenhouse gases (GHGs), possibly modeled after the U.S.'s highly successful acid rain trading program, as an economical and fair way to curb global warming.

How Trading Programs Work

A cap-and-trade system starts by establishing an overall cap, or limit, on the number of emission units all regulated entities may release in a given time period. Companies are either given a limited quantity of emissions permits, also known as allowances, for free, or can buy them in an auction, or both. If pollution reduction measures such as improving energy efficiency, installing lower-emitting technologies, or changing production practices, are not enough to lower company emissions below the cap, businesses can meet their individual limits by purchasing additional allowances in a carbon market. If a company reduces its emissions below the limit, it can sell excess permits for profit. Businesses must also accurately measure and report emissions to guarantee that the overall cap is achieved. The potential to gain income by operating under the emissions cap, as well as the flexibility to buy allowances in order to help meet the cap, are what make cap-and-trade programs attractive to many businesses.

The Case for a Greenhouse Gas Cap-and-Trade Program

While temperatures rise, scientists and, more recently, economists are warning against delaying action.[1] (See also the Pew Environment Group's fact sheets, "Key Findings of the IPCC Fourth Assessment Report, 2007," and "The Stern Report on the Economics of Climate Change.") Greenhouse gas emissions must be significantly reduced in the near future, and a cap-and-trade program is a cost-effective and efficient way of achieving low emissions relatively quickly. Features of a cap-and-trade program include:

- Suitability: A GHG cap-and-trade program is a unique opportunity for a trading scheme with no borders; GHGs are not limited by geographic constraints due to localized impacts, which means their caps don't have to be either. Thus, trading can be national or international in scope, and cost savings will likely increase as the program expands.

- Experience: The EPA has experience with other trading programs, some of which have been overwhelmingly successful. The Acid Rain Program, perhaps the most successful U.S. pollutant trading program, has given industry experience in minimizing costs, which is significant because a GHG cap will most likely cover many of the same entities. In addition to previous federal laws, we can also learn from state, regional, and foreign GHG trading initiatives that are now underway. (See the Pew Environment Group's fact sheets, "Designing Climate Change Legislation: Learning from the EU Emissions Trading Scheme," and "U.S. State and Regional Action on Global Warming.")

- Support: The majority of Americans agree that we should be working to reduce global warming pollution, and even leaders in the energy industry are advocating for regulation now instead of more costly mandates later. In April 2006, General Electric, Shell, Exelon, and Duke Energy all told Congress that they were in favor of an economy-wide, federal cap-and-trade program. Exelon testified that "Greenhouse gases arise predominately from the use of fossil fuels…Successfully reducing those emissions will require both a comprehensive regulatory program, and substantial new investment in low carbon energy alternatives."[2]

Experience: The Acid Rain Cap-and-Trade Program

In the 1980s, scientists realized that acid rain was severely damaging America's forests, lakes, streams, and even buildings and infrastructure. The major causes were found to be sulfur dioxide (SO_2) and nitrogen oxides (NO_x), pollutants generated by power plants and other industrial and vehicle production. Similar to CO_2, SO_2 and NO_x emissions that collect in the atmosphere pose dangerous risks to the environment and human health. Congress recognized that these emissions must be reduced, and so in 1990 the Clean Air Act was amended to cap SO_2 and NO_x emissions by 10 million tons and 2 million tons, respectively, below 1980 levels.

The Acid Rain Program, as it is known today, is an oft-cited cap-and-trade success story for good reason. The caps have significantly reduced acid rain and decreased the corresponding health and environmental risks. According to the EPA, the program has resulted in:

- ✓ Near Perfect Compliance: over 99%,[3]
- ✓ Cost Savings: the program cost 50% less than originally predicted and is predicted to result in $122 billion in annual benefits by 2010,[4] and
- ✓ Air and Environmental Quality Improvements: early reductions cut emissions by 25% more than was mandated[5], resulting in safer air and water across the country.

Experience: The EU Emissions Trading Scheme

In 2003, the European Union approved the creation of an Emissions Trading Scheme (EU ETS) in order to help prepare itself for the mandatory limits on greenhouse gas (GHG) pollution it had agreed to under the United Nations Kyoto Protocol. The EU ETS has allowed European nations to develop important infrastructure, such as emissions registries, and gain experience with the carbon market before the beginning of the first Kyoto Protocol compliance period (2008–2012). More than 99% of companies complied with the new rules. Yet, despite the EU's pioneering role and early progress in designing an effective emissions trading system, it has made missteps. U.S. legislators considering a domestic carbon cap have the opportunity to learn from the shortcomings of the EU ETS, which are not pre-determined outcomes of any trading regime.

Based on the EU experience, the following are four key elements that should be included in a U.S. cap and trade program:

- ✓ *Accurate emissions data.* A complete registry of the emissions from all covered entities is vital to ensuring equitable and effective allocation of permits and relative stability of carbon pricing.
- ✓ *An auction for pollution credits.* Free credit giveaways can lead to windfall profits and do not guarantee that costs are not passed on to consumers. A significant portion, if not all, of allowances should be auctioned, generating revenue that can be used to protect vulnerable populations and spur clean technology innovations that ultimately lower the cost of compliance.
- ✓ *Limiting international offsets to verifiable, climate-smart projects.* To protect investments and meet a cap in the most economical way, international offset projects should be limited and must achieve climate benefits that are measurable, verifiable, and permanent.
- ✓ *Long-term emissions targets for all major greenhouse gases from all sectors*. Industries covered by a pollution cap need the clarity provided by a long-term target – or targets – in order to make the most cost-effective investment decisions and changes to production practices. Further, including all global warming pollutants from all major emitters helps share the burden of compliance.

Caps and Coverage

An emissions cap which declines steadily over a long timeframe provides slow and steady reduction mandates, giving industries time to adjust practices at lower cost, achieve greater emission reductions, and better plan for future investments. Since greenhouse gases are generated by multiple sectors and emissions need to be reduced across the board, the cap set should cover all the large sources in the economy. An economy-wide cap ensures that all sectors operate under the same limit. This would theoretically level the playing field by requiring all sectors to address greenhouse gases emissions on the same timetable and enable all to participate in the same market. Certain complementary government policies like requirements for industrial energy efficiency, renewable

electricity, and standards for auto fuel economy can help ensure that the cap levels are reached. Plus, energy efficiency and conservation measures help businesses and consumers save money; reducing electricity demand can keep total electricity bills from rising even if electricity prices increase. California provides a good example: efficiency measures save more than 10 million tons of CO_2 every year and have lowered electricity bills by $12 billion per year or $1,000 per household.[6] (For more information, see the Pew Environment Group's factsheet, "Federal Global Warming Emissions Reduction Policies.")

Allowance Allocation

Windfall profits in the electricity sector were an unintended consequence of free allocation within the EU ETS. In countries such as Germany, the power producers received permits at no cost but decided to charge consumers the full market price of these allowances.[7] As a result, electricity prices rose, yielding large profits for utilities.[8] If allowances had been auctioned, revenues could have been redirected to assist low-income customers and other vulnerable populations, as well as to other beneficial purposes such as helping industries retool production and supporting the development of clean energy and carbon sequestration technologies.

The EU's free allowance approach also resulted in inequitable allocations. In some cases, more efficient plants received fewer allowances than dirty plants, because allocation was based on historically high levels of emissions. This approach penalizes early actors who have taken steps to clean up their business practices. An auction, however, would reward more efficient operators who would have to purchase fewer allowances than less efficient competitors. In the case of an auction/allocation hybrid system, some free allowances could be distributed based on emissions per unit of output. Efficient plants that pollute less within a given industry would enjoy an advantage.

The first multi-state mandatory carbon market in the United States is the Regional Greenhouse Gas Initiative (RGGI). Recently, the initiative has declared that they plan move away from free allocation and intend to auction the majority of allowances. RGGI states initially agreed to sell at least 25 percent of the allowances, committing the revenues to consumer benefit and strategic energy projects. But as the program has evolved, the states have decided to sell most of their allowances and direct the proceeds to public benefit.[9]

Cost-Saving Mechanisms

A potential problem of cap-and-trade systems is the uncertainty of the carbon market. Inherently, any change in demand for permits will result in price variations. To help address vulnerability to demand and price shifts, cost-saving mechanisms can be implemented in the cap-and-trade program, such as offsets, banking, and borrowing.

Offsets: Offsets are emission reduction projects undertaken at sources outside of a cap-and-trade program. Sources covered by the cap can 'offset' their own emissions by purchasing emissions reduction credits generated through projects at facilities not covered by the cap. For example, investing in projects that capture methane from landfills, increasing CO_2 sequestration potential by protecting or planting trees, and implementing energy efficiency technologies can in some cases help emitters meet their cap in less-costly ways. Offsets also allow entities like farms, which may not be covered under a cap-and-trade program, to participate in the market. Appropriate regulations must be in place to ensure that offsets produce measurable, real, and additional emission reductions[10] and have clear ownership. Regulators must also be able to verify such projects. Through the Clean Development Mechanism of the Kyoto Protocol, developed countries can use offset projects in developing countries to assist with target compliance.[11] The northeast Regional Greenhouse Gas Initiative allows certain types of offsets as well.[12]

Banking and Borrowing: Markets can also be designed to allow firms greater flexibility in compliance by either "banking" or "borrowing" their allowances. Banking allows firms to save, or "bank," any excess allowances for future use or to sell later on.[13] Borrowing allows program administrators or covered entities to use in the current year allowances that will be issued in a future year, under the condition that they will "pay back" these allowances (perhaps with interest) by reducing emissions more in the future. Borrowing entails the risk that program administrators or firms will fail to pay back their allowances and the emission cap could thus be exceeded. Unlimited borrowing of allowances can lead to indefinite postponement of needed emissions reductions.

Safety Valve: A safety valve is a mechanism that would set a ceiling price for allowances and enable the selling authority to sell an unlimited number of permits at this price level. While originally meant to protect companies against unacceptably high allowance prices, safety valves are a risky cost-containment tool because of their potential consequences. Safety valves that are set at low price levels would undermine the environmental goals of the cap, and have the potential to cause a price collapse by flooding the market with unlimited allowances. Additionally, it is unlikely that an international trading program would contain safety valves, making a U.S. trading scheme with this mechanism difficult to link with the international carbon market.[14]

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[1] The Intergovernmental Panel on Climate Change, the Nobel Peace Prize-winning body of 2,500 scientists from around the world, has concluded that in order to limit global warming to 2.8-3.2ºC above pre-industrial levels, or an atmospheric GHG concentration of 550 parts per million (considered a "medium" climate stabilization scenario), industrialized nations like the United States would need to cut their emissions by 10-30% relative to 1990 levels by 2020 and up to 90% by 2050. For more information, see <www.ipcc.ch/ipccreports/ar4-wg3.htm>, p. 776. A 2006 study commissioned by the UK Treasury on the economics of climate change found that the total global costs of global warming in a business as usual scenario would reduce the standard of living, based on consumption per person, between 5% and 20%. For more information, see <www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/sternreview_index.cfm>.

[2] Testimony provided to the U.S. Senate Committee on Energy and Natural Resources. John W. Rowe, Exelon Corporation. April 4, 2006. Other testimonies of the conference can be found at <energy.senate.gov/public/index.cfm?FuseAction=Conferences.Detail&Event_id=4&Month=4&Year=2006>.

[3] U.S. Environmental Protection Agency (EPA), November 2007. *Acid Rain Program 2006 Progress Report*, <www.epa.gov/airmarkets/progress/arp06.html>.

[4] EPA, "Acid Rain Program Benefits Exceed Expectations," <www.epa.gov/airmarkets/cap-trade/docs/benefits.pdf>.

[5] EPA, September 22, 2004. "Clean Air Status Report: Three Decades of Progress," p. 8, <www.epa.gov/mikeleavitt/acidrain922.pdf>.

[6] Romm, Joseph. 2007. *Hell and High Water*. Harper Collins Publishers: New York, NY, p. 164; and California Public Utilities Commission and California Energy Commission, August 2006. "Energy Efficiency: California's Highest-Priority Resource."

[7] Steven Mufson, "Europe's Problems Color U.S. Plans to Cut Carbon Gases," *The Washington Post*, (April 9, 2007), p. A01, <www.washingtonpost.com/wp-dyn/content/article/2007/04/08/AR2007040800758.html>. See also Sijm, J., Neuhoff, K, and Chen, Y., "CO_2 cost pass through and windfall profits in the power Sector," *Climate Policy*, June 19, 2006.

[8] Electricity prices in Europe rose approximately 10%, or 2 cents per kilowatt-hour, in 2005 and 2006 (source: conversation with Felix Matther, Institute of Applied Ecology, Germany, June 1, 2007). However, rising electricity rates were due mainly to the increased price of natural gas, rather than compliance with the EU ETS. For more information, see: Jill Duggan, U.K. Department for Environment, Food and Rural Affairs, "EU Cap and Trade Programme," Testimony before the House Energy and Commerce Committee, March 29, 2007, p. 3, <energycommerce.house.gov/cmte_mtgs/110-eaq-hrg.032907.Duggan-testimony.pdf>; and Sijm et al, *Op. Cit.*

[9] New York State Department of Environmental Conservation. 2008. "How RGGI's Cap-and-Trade System Works," <www.dec.ny.gov/energy/39276.html>

[10] "Additional" means that the emissions reductions achieved are in addition to those that would otherwise have occurred in the absence of the project under a business-as-usual scenario.

[11] The CDM is designed to promote sustainable development in developing. It enables industrialized countries to invest in emission reduction projects in developing countries and to receive credits for reductions achieved. For more information, see the United Nations Framework Convention on Climate Change site at: <unfccc.int/kyoto_protocol/mechanisms/clean_development_mechanism/items/2718.php>.

[12] For additional information, see the RGGI final model rule, available online at <rggi.org/docs/model_rule_corrected_1_5_07.pdf>.

[13] Banking allows firms to better cope with uncertainties and unexpected circumstances that may lead to high allowances prices at a future date, and has proved important to the success of past emissions trading programs, such as the Acid Rain Program in the U.S. See Jacoby, H. and D. Ellerman. July 2002. *The Safety Valve and Climate Policy, Report No. 83.* Massachusetts Institute of Technology Joint Program on the Science and Policy of Global Change at <web.mit.edu/globalchange/www/MITJPSPGC_Rpt83.pdf>.

[14] Jacoby, H. and D. Ellerman, *Op. cit.*

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