

Carbon Emission Reduction Policy: Is Cap and Trade the Way?

James Dulgeroff
California State University San Bernardino

Introduction to the Climate Change Legislative Quandary

The 111th Congress is busy at work fashioning the latest in a series of attempts to propel cap and trade legislation out of committee, onto the floor, and into the hands of President Obama. Like the problems with health care in the Clinton years, climate change legislation is being strongly advocated by a President who cannot seem to muscle enough support without a bill that becomes so complicated that very few people understand how it works. What starts out as a simple proposition to put an absolute cap on major sources of carbon emission, gets complicated by a series of difficult questions. Should there be a safety valve? Should the carbon allowances be auctioned off, or should the federal government forego the revenue and simply grant the allowances to the firms that currently emit high levels of carbon? If the government does auction the allowances, what should be done with the revenue? Can government revenues be utilized to offset the regressive nature of increasing prices for energy by offering credits to low income households? Or, should the money be utilized for research and development of renewable energy? Will the creation of a new market for carbon allowances get off the ground in a climate where financial markets themselves are failing to establish trust even for well recognized market brand names? These are just a small sampling of real concerns that must be answered in a comprehensive piece of legislation that may be changed to the point that no one understands exactly what overall economic and budgetary impacts it will have.

The aim here is to put forth some simple principles of an effective cap and trade program. Cap and trade will need to be part of a more comprehensive set of policies that, taken together, will be more effective than just a cap and trade system alone. By itself cap and trade does not directly reduce GHG emissions. This scheme is designed to reduce compliance costs in the context of a wider effort to reduce GHG emissions. Following Hackett (2006) these are the essential components of a well designed cap and trade system for carbon reduction:

- 1.) Legislation would be enacted to place an overall cap on carbon emissions from major sources. The Environmental Protection Agency (EPA) would set an economy wide cap, measured in metric tons of CO₂ equivalent, and the cap could be reduced over time.
- 2.) The cap is partitioned into tradable quota shares which are assigned to the various sources. These allowances (each allowance equal to 1 ton of CO₂) are usually set relative to historical emissions during some baseline time period which establishes the baseline carbon inventory.
- 3.) The EPA would be charged with setting up, or farming out to some existing exchange, the formation of a well functioning competitive market for trading emission allowances. Producers that reduce their emissions may sell their allowances, presumably at a profit, to firms that wish to increase their carbon emissions beyond their baseline allowance. The cap on carbon is reached at a fraction of the cost of a scheme in which all firms are required to cut back by an equal percentage to meet the

emission cap. In addition, this program creates a profit incentive for firms to innovate to reduce their carbon footprint.

4.) Effective sanctions should be put in place for any enterprise going over its allowance allocation, along with a requirement that all new firms must purchase allowances from existing firms.

5.) Policy stability that will be sufficient to hold the cap in place over a long investment time horizon—any easing, analogous to a housing bubble, would destroy long term viability for investment in an allowance trading system (which would, ideally, be a single market for clearing allowances and derivative contracts).

Cap and trade will be the most likely political scheme to successfully reduce greenhouse gas (GHG) emissions. The list above is an ideal basic structure with the EPA auctioning off the allowances, instead of giving free allowances and then letting them trade. A government auction would generate revenues that could be redirected toward making the green economy work more efficiently and equitably. Political concessions, however, will work to favor the states whose votes swing on moving away from some elements of a well designed, ideal program. To the extent that this does happen, other policies can be used in conjunction with cap and trade, to speed along GHG levels to the near-term levels of 15 to 20 percent reduction. This level of reduction is realistic given the reduction in emissions already coming forth in federal control of sulfur dioxide and the response to the Renewable Portfolio Standards (RPS) in place in California.

There is a large political divide on the issue of GHG reduction. Can these reductions be achieved at a relatively modest cost to the overall economy? This issue is not completely settled. It is clear that there are certainly more and less costly ways to design a particular cap and trade regime. A review of the literature on cap and trade allows us to set out a number of specific characteristics of a well-designed cap and trade program.

A Comprehensive, Absolute Cap for Level-one Emitters

It seems clear that Congress is most likely to pass a cap and trade bill. A tax on carbon is a remote possibility. Many economists feel that a tax per unit on carbon emissions would be less complicated than the many variations proposed for implementation of cap and trade. One significant criticism of a tax is that it is not a guarantee of putting a stringent cap on carbon emissions. A carbon tax cannot guarantee any given level of emissions reduction. The term level-one emitter refers to high-carbon intensive production processes associated with electricity production and energy intensive industrial processes. Early action on limiting emissions in these areas is absolutely necessary if the targets for 15 to 20 percent reductions from current levels are going to be realized. There is a general agreement that failure to achieve such early action targets will make future requirements more difficult. The goal is to keep overall atmospheric concentrations of carbon dioxide below 550 ppm (double the pre-industrial carbon levels). Action to keep carbon levels below this threshold will require 80 percent emission reductions by 2050, a target that would require extreme measures if the near-term 2020 targets are not met. It should be noted that failure to meet these targets could mean overall reductions in global output per capita of between 5 to 11 percent according to Nicholas Stern, former head of the World Bank. (Stern, 2007)

A well designed cap and trade program would have an advantage over a carbon tax given that there is strict adherence to an overall cap on carbon emissions. A tax on carbon would give a more certain price signal, and a cap on carbon provides more certainty about restrictions on emissions. If the major goal is to reduce carbon, then cap and trade would seem to be the most feasible in terms of political support and keeping the emission target in plain view. On the other hand, a poorly designed program will bring a host of difficulties. To build the best program possible the following components should be pursued.

Cap Needs to Cover 90 Percent of All Emission Sources

A national cap and trade plan needs to be comprehensive in terms of its coverage of economic sectors. Part of the impact of required allowances is to push the price of energy from carbon intensive sources, like coal, to the point where substitution of renewable energy sources, or cleaner technologies for producing electricity from coal (e.g., carbon sequestration), are relatively cheaper. This promotes the substitution to cleaner technologies. The California Air Resources Board (CARB) is targeting reductions

in highly polluting sectors, using the cap and trade system to encourage additional cuts. The more comprehensive the coverage of sectors, the less chance there is for offsets to delay the needed cuts in capped sectors. Offsets are credits that polluters in capped sectors can purchase from reductions made by offset providers in uncapped sectors. Currently, the CARB cap and trade plan limits the use of offsets to 49 percent of reductions in capped sectors during a three-year period. This way, offsets cannot be used as a way of delaying emission reductions for decades. (Freeman, 2008)

Immediate actions, covering more sectors are, therefore, desirable because they more effectively force compliance in all industries. This promotes efficiency and eliminates the “gaming” of the system for delays in implementation. Thus a strong program will cover all major sources of emissions directly or indirectly. Electric utilities, transportation, energy-intensive industries, agriculture, commercial buildings and residential homes all add up to some 90 percent of emission sources. This comprehensive coverage is included in the CARB’s scoping plan for carrying out AB32 which the California Global Warming Solutions Act of 2007. This is also the plan for the Western Climate Initiative and its Climate Action Plan involving the partnership of seven western states and four Canadian provinces in a comprehensive cap and trade scheme. Obviously, the wider the geographic participation and the broader the number of economic sectors covered, the more cost savings and pollution reduction is expected. In addition, wider scope should also be taken to mean a more inclusive coverage of heat-trapping gases. While carbon dioxide gets most of the attention, there are other gases such as methane and hydrofluorocarbons that are even more insidious in terms of speeding global warming.

Carbon Market Structure on a Solid Foundation

One looming criticism of carbon markets is that they would allow emitters to game the system more easily than a direct carbon-fee or carbon tax per unit output. Taxes would presumably lead to immediate incentives to substitute away from carbon intensive techniques. The signal is clear and the tax could be administered through the existing tax system. The American tax system is very complex, and some firms would be willing to “pay to pollute” rather than reducing emissions. Technology development costs and high cross-price elasticities create some uncertainty as to just how high a tax would have to be to obtain any given amount of carbon emission reduction. By contrast, a well designed cap on emissions puts an absolute limitation of carbon which can be explicitly lowered to ensure the target reductions are reached. A safety valve could be inserted into a cap and trade that puts a ceiling on how high the allowance prices can go. If some maximum has been reached then the price of allowances would hold constant, much like a carbon tax would operate. At this price there would be little difference between the effect of a carbon tax and the sale of allowances.

The market for carbon allowances already exists in the United States with the implementation in 2008 of the Regional Greenhouse Gas Initiative (RGGI) in the northeastern states. It is possible, given the lessons learned in cap and trade in Europe and in the United States, to design a system of allowance trading that is fair and efficient.

The Government Accounting Office and the Congressional Budget Office have published research related to several recent bills aimed at establishing a national cap and trade system for greenhouse gas (GHG) reductions. A comprehensive cap and trade bill could create 130 billion allowances over the life of the legislation which stretches to 2050, and promises an 80 percent reduction compared to current GHG emission levels. Initially Jon Anda (2009), former President of Environmental Markets at the Environmental Defense Fund, believes that as few as 5 billion allowances will be outstanding in the initial year of a cap and trade program. At \$20 per allowance (one allowance per ton of carbon emitted) this would amount to \$100 billion in allowances as the program gets off the ground. 5 billion allowances initially trading in a market that will grow to 130 billion allowances over the life of the policy will produce a considerable market for trading derivatives. The demand for such derivatives needs to be channeled into a transparent and well regulated market for such instruments. Trading needs to take place on designated contract markets. Offsets should not be a very large fraction of the initial program. Likewise, some part of the initial allowances could be allocated as free allocations to the high cost emitters. This would ensure a fluid market with more liquidity than would otherwise be the case.

The Environmental Protection Agency (EPA) will need to oversee the emission trading market. Strict monitoring and enforcement arrangements will be necessary for the trading of allowances and offsets. The government should consider the inherent risk associated with derivatives in the market for allowances. If the reduction targets are relaxed then this could be analogous to the problems of declining housing values that led to the collapse of collateralized obligations in the wider securities market meltdown. Given the current climate of market uncertainty, the government may need to explicitly guarantee that enough of the unsold future allowances get distributed in time for the expiration of the listed derivative contracts. An existing exchange could perform the function of providing one central limit order book for clearing all carbon allowances. This would be in place of a plan for listing allowances on a National Market System which would somehow link several competing exchanges. A single entity and a centralized clearing house would be less cumbersome and more transparent.

Auctioning Allowances to Generate Government Revenue

Auctioning of allowances by the government is an indispensable element in a well designed cap and trade program. As is the case with the purchase of offsets, small proportions of the allowances may be permitted. Permitting a large share of free allocations of allowances will result in economic rents for the very industries that should be hard pressed to substitute away from carbon intensive production processes. Giving away the allowances would allow windfall profits for high carbon emitters and may even encourage gaming of the system by exaggerating emission for the baseline year. There is some evidence that this has happened in the European Union cap and trade system. An allowance auction would let the market set the price of carbon, and allowances would theoretically go to their highest and best valued uses (promoting efficient allocation). Giving away the carbon allowances is more politically palatable, but it could distort the market and result in windfall profits for the heaviest polluters. Safety valves, the purchase of offsets, and allowance giveaways are all complications of cap and trade that could distort market signals and prevent the manifestation of a clear market incentive for investment in new technology in those sectors with heaviest carbon intensity. The market signal will work toward effectively reducing carbon best if there is no safety value and minimal free allowance allocation. In addition cost-containment mechanisms such as offsets, banking and borrowing of allowances could be set up in a manner which promotes stronger reduction criteria. For example, borrowing could be set up to allow more emission today if a company agrees to make sharper reductions later (increasing emissions by 1 ton today, in exchange for promising to cut emissions by 1.5 tons in the future). There is some certainty that giving away too many free allowances would inhibit the correct market signal at the outset of the program, would delay technological innovation and just like too much borrowing would retard progress toward the near-term goal of 20 percent reductions from the current baseline. An initial auction would consist of a small number of allowances in the first year, with an auction of three to five years worth of allowances up front. Banking and borrowing in a short-run time frame would guarantee the near-term goal and allow some flexibility. The initial allocation would be around 5 billion allowances and a conservative estimate of \$20 per allowance would generate about \$100 billion in revenues.

Government Revenues and Subsidies to Promote Efficiency and Equity

Given a conservative estimate of several hundred billion dollars in revenue being generated by government auction of the allowances, these monies could be channeled into investments in smart grid technology, clean and renewable energy projects, and energy efficiency projects in industry and transportation. In order to address the main equity concerns regarding the fact that the cost of allowances will be passed through to consumers in the form of higher energy bills, there has been broad based political support for providing taxpayers with direct payments out of the allowance auctions to help them cope with higher energy prices. Still, over the years 2012 to 2019 several hundred billion in revenues could accommodate investments in a variety of clean technology areas that would lower energy prices over time and use more monies raised for direct investment that would increase the number of green technology jobs in a number of areas.

The industry groups shown in Table 1 are taken from a report from the National Resources Defense Council (2004). These industries are likely to be funded at around \$15 billion per year according to the latest projections for spending of revenues anticipated in currently proposed federal legislation. The

overall split between promoting equity with compensation for consumers experiencing higher energy bills and the longer term investment in lower cost, low-carbon technologies will promote long term sustainability goals.

Cap and Trade is Not a Silver Bullet

While it is true that cap and trade legislation is a priority for the Obama administration, the broader goals of energy efficiency and the responding to the threat of global climate change make it incumbent upon all nations to coordinate their efforts. In 2005 the European Union (EU) implemented a cap and trade scheme named the EU Emission Trading Scheme (EU ETS). The program covered 27 countries and the first phase of the program covered electric power and energy intensive industries—the so-called level-one emitters. That program has been criticized because it gave out too many free allowances with generous caps for the heavy emitters. The United States should learn from the design flaws in the EU scheme.

Given that there are global efforts associated with the Kyoto Protocols on carbon emission trading and the EU ETS efforts at cap and trade, the United States should consider the economic advantages of linking a domestic cap and trade program to the programs already existing in Europe and other nations that have adopted emission cap requirements. Copenhagen climate change talks are scheduled for December 2009 and the Obama administration is cautiously optimistic that the United States will be far enough along on GHG legislation to sign some sort of agreement on a world-wide cap and trade program. Still, cap and trade should be viewed as just a smaller piece of the big puzzle that leads to successful policies to reduce greenhouse gases. California has set a goal of reaching the 1990 level of carbon emissions (roughly a 20 percent reduction from its 2009 baseline) by 2020. The California Global Warming Solutions Act of 2007 uses a broader approach to promote a low-carbon economy. Cap and Trade is being used alongside a Renewable Portfolio Standard which requires that 20 percent of the electricity generated will come from renewable sources by 2020. This would require California electric utilities to double the amount of electricity generated from renewable sources such as wind and solar energy. In addition, California is considering a carbon fuel standard in the CARB scoping plan. California has adopted fuel economy standards that are more stringent than federal standards for fuel economy. Policies to encourage regional coordination of local government land use policies to encourage more mixed-use and “smart growth” have been adopted. There are stronger energy efficiency policies and incentives for both businesses and households to make investments in low-carbon technologies. CARB is also considering implementing a set of carbon fees in some energy intensive industrial processes and carbon fees for SUVs and cars that have low fuel efficiency.

Any federal legislation should take a cue from the comprehensive scoping plan that is being adopted in California as it begins to actuate its cap and trade part of a much more comprehensive set of solutions. The long run prospect is that energy efficiency will improve and that higher investment in low-carbon technologies will provide more jobs and a moral compass to point the rest of the United States and the globe toward a more sustainable growth path.

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Table 1:
Cleantech Industry Categories for Allowance Revenue Investment Funding

Industry Group:	Examples:
Advanced Materials and Nanotechnology	<ul style="list-style-type: none">- Non-platinum catalysts for catalytic converters- Nano-materials for more efficient and fungible solar panels
Agriculture and Nutrition	<ul style="list-style-type: none">- Innovative plant technologies and modified crops designed to reduce reliance on pesticides or fungicides
Air Quality	<ul style="list-style-type: none">- Stationary and mobile emission scrubbers- Testing and compliance services
Consumer Products	<ul style="list-style-type: none">- Appliance efficiency- Biodegradable plasticware- Recycling and packaging
Enabling Technologies and Services	<ul style="list-style-type: none">- Advanced materials research services for more efficient cooling and heating
Energy Generation and Storage	<ul style="list-style-type: none">- Solar photovoltaic and solar thermal technology- Wind power- Hydrogen generation- Batteries, grid and power management
Environmental Information Technology	<ul style="list-style-type: none">- Regulatory compliance software- Geographic Information Systems (GIS)
Materials Recovery and Recycling	<ul style="list-style-type: none">- Chemicals recovery and reprocessing in industrial manufacturing- Remanufacturing
Transportation and Logistics	<ul style="list-style-type: none">- Fuel cells for cars- Diesel retrofit equipment- Hybrid electric systems for cars and trucks
Waste and Water Management	<ul style="list-style-type: none">- Biological and chemical processes for water and waste purification- Fluid flow metering technology- Water recycling and conservation