Cap and Trade vs. Carbon Tax

Carbon Credit Capital, LLC

February 2010

Authors: Olivia Fussell[1]

Katarzyna Duda[2]

Chirag Oza[3]

[1] President of Carbon Credit Capital, LLC
[2] Intern, School of International and Public Affairs, Columbia University
[3] Intern, Stern School of Business, New York University

As the US Congress debates the current energy bills put before them by Congressmen Edward Markey (D-MA) and Henry Waxman (D-CA)[4], Senators Barbara Boxer (D-CA) and John Kerry (D-MA)[5], and Senators Maria Cantwell (D-WA) and Susan Collins (R-MA)[6] the main public policy direction--"cap-and-trade" versus a direct carbon tax remains unresolved among economists, politicians and the general public. While these two approaches differ in several substantive ways, both are supported by two identical assumptions. First, global warming has been anthropogenic or human induced. Second, since the cause of global warming is anthropogenic drastic climate change can be averted or mitigated through human action.

The aim of this paper is to summarize the mechanics and likely consequence of each policy option while illustrating the characteristics of the cap-and-trade alternative that make it the optimum of the two options.

Cap & Trade - Defined

In its most simplified form, a cap and trade system involves creating an economy-wide limit on the amount of CO_2e[7] that will be emitted in a given year. In the Waxman-Markey approach, any entity that emits more than 25,000 tons of CO_2e annually must participate in the cap and trade system. This would account for 85% of total US greenhouse gas emissions. Industries such as agriculture and forestry will not be covered by the cap, so their emissions will be brought down through a mixture of tighter regulation and domestic offsets (to be discussed later). In the European Union's cap and trade system called the Emission Trading Scheme (EU-ETS), about 45% of all emissions are under a cap.

Once the cap is set, the government issues allowances totaling the cap to emitters such as utilities and industrial companies. These allowances would be tradable in a regulated market. Two implementation choices are available: granting the allowances to emitters, or an auction. If fully auctioned, the revenue from the allowance sale goes to the government, which then decides how to spend it. The government can invest the proceeds in clean energy research or other national priorities or reduce other taxes, making the system revenue-neutral. If the allowances are given away with no cost to companies, the emitter recipient realizes the full value of their allotment in the marketplace. The policy choice between granting and auctioning is discussed in a subsequent section.

Each allowance is a permission to emit 1 metric ton of CO_2e within a given year. More carbon-efficient companies would be willing to sell surplus allowances, whereas major polluters would be

---

[4] The official name of the bill sponsored by Congressmen Markey and Waxman and passed by the House of Representatives on 26 June 2009 is the *American Clean Energy and Security Act of 2009*. Other acronyms are ACES, Waxman-Markey bill and, more officially, H.R. 2454.

[5] The official name of the bill sponsored by Senators Boxer and Kerry is the *Clean Energy Jobs and American Power Act*. Other acronyms are CEJAPA or the Boxer-Kerry bill. The bill is currently being deliberated in the Senate and some revisions are introduced to gain required support.

[6] The official name of the bill sponsored by Senators Cantwell and Collins is the *Carbon Limits and Energy for America's Renewal (CLEAR) Act.*

[7] The "e" in CO_2e stands for equivalent. If a greenhouse gas has been scientifically deemed to have a higher global warming potential than ordinary CO_2, then one molecule of that gas is set equal to several CO_2 molecules. For example, methane (CH_4) has 25 times the global warming potential of CO_2 over 100 years. Therefore, 1 CH_4 molecule equals 25 CO_2e.

looking to buy them in order to cover their needs. Buying and selling of allowances can occur both through over-the-counter brokers and on registered exchanges. The continuous buying and selling of allowances will result in an effective clearing price for the value of a single annual allowance. With appropriate transparency requirements in place, market-wide knowledge of this clearing price will allow companies to incorporate into their planning and investment cycles, a prospective and reliable estimate of their cost to pollute. If the initial cap is tight enough, the resulting price should send a signal to CO_2e major emitters to be frugal with their fossil fuel consumption or invest in less carbon-intensive technologies. Therefore, under cap and trade system investment in research and development is encouraged which in turn spurs innovation and job creation. Equally, it will reward the carbon-efficient companies by letting them profit from the sale of surplus allowances.

Each year, the overall cap would be brought significantly down resulting in a reduced supply of allowances and nudging the price of emissions higher. As this happens, more and more CO_2e emitters with allowance deficits will see the marginal cost of reducing their emissions go under the market allowance price, which will compel them to meet their compliance needs by reducing their emissions rather than by buying extra allowances in the open market. Each companies' market position will determine whether they can pass on all, some, or none of the cost of its compliance to their customers (i.e., other companies or individuals). In an industry with multiple players competing ruthlessly for customers, companies would probably have to absorb most of the costs, whereas in an industry with few competitors, cost transfer to the customer is more likely. In any case, the government should meet its goal of gradually reducing overall emissions.

Independent monitoring of company emissions is crucial for a cap and trade system to function effectively. If a company is proven to have emitted more CO_2e than that permitted by the number of allowances in its possession at the end of the year, it would face a penalty for non-compliance. Alternatively, as illustrated by the sulfur dioxide allowance market, utilities have a 60 day grace period when they can purchase on the market lacking allowances.

Three important implementation features need to be further resolved. First, the compliance monitoring should not rely on self certification. Second, the non-compliance penalty will need to be well over the market clearing price in order to disincentivize such behavior. In the EU-ETS, the penalty currently is a charge of €100 per ton of excess CO_2e and a requirement to purchase and surrender the due number of allowances. Third, the problem of "emissions leakage" from regulated to unregulated sources has to be considered and addressed.

Carbon Tax – Defined

Under a carbon tax, the government places a levy on the consumption of a greenhouse gas-producing energy source such as coal, oil or natural gas. The amount of the levy on each particular fuel varies based on how much CO_2e is produced by the combustion of that fuel. Therefore, coal should face a higher charge than oil, which in turn should face a higher charge than natural gas. The penalty mechanism works in a similar way to cap and trade, in that polluters are compelled to emit less CO_2e in

order to avoid paying the tax or penalty. Within a given industry, companies with lower emissions would be more profitable and in a stronger competitive position.

Ideally, in order to avoid constant political interference and the economic uncertainty flowing from that, the tax would be set to steadily increase over time without the need for new legislation. Similar to the scenario of fully auctioned cap and trade allowances, tax revenues would go into government coffers and the government may invest the proceeds into clean energy research or other national priorities or reduce other taxes, making the system revenue-neutral.

Similar to cap and trade, the question of which entity would bear the direct effect of a higher carbon price depends on the competitive structure of a particular industry. Also worth considering is where in the supply chain is the tax levied – on the producer, distributor or consumer. Let's take oil as an example. If the tax is levied at the gas pump, motorists would see the full effect. Consequently, they may choose to drive less and/or buy a more fuel-efficient car. On the other hand, if the tax is levied at the point of production (in other words, when the oil is extracted from the ground or when it reaches the refinery), oil companies or refineries would pay the tax. However, the tax would act as a disincentive to supply oil, so profit-maximizing companies may choose to supply less of it. Until driving habits change and the demand of oil decreases, the reduced oil supply would lead to higher prices at the pump.

In contrast to a cap and trade system, a carbon tax regime has no cap on emissions thus creating environmental uncertainty. All of the government's resources are spent in monitoring yearly aggregate emissions and making sure the tax is optimally high enough to change behavior. Overall emissions may turn out to be higher or lower than expectations. However, a tax would require less expensive monitoring of company-level compliance, since the tax is levied on the energy source and not on the actual CO_2e emitted. Therefore, by accounting for how much fossil fuel was bought or sold, the tax can be properly levied. However, having an international agreement on a global tax is highly unlikely if not impossible. This statement is supported by an example of the European Union's unsuccessful attempt to impose carbon tax in the 1990s within its multi-national structure. Also the Clinton administration unsuccessfully tried to introduce an energy tax in the mid 1990s but encountered strong opposition in Congress.

Cap and Trade - Explored

There are three main arguments that support cap and trade system.

First, a broad independent market mechanism will determine the price of polluting, knowing that in advance and being able to plan for it allows those companies that aggressively reduce their carbon dioxide emissions to benefit in a greater way than under the tax approach. The parties that can do this will do it more aggressively and better than they will under the tax approach, since they can "sell" the value of their efforts far beyond just their own CO_2 footprint. This leads to innovation and cross industry pollution reductions. A tax approach is not likely to do this.

Second, a cap and trade system puts a firm cap on annual economy-wide emissions. Each year, if the monitoring of compliance is robust and the penalty for non-compliance is sufficiently stiff, then

the government can be confident that it has met its emissions target. In contrast, under a carbon tax, emissions could turn out to be higher or lower than the initial forecast. Much of the climate research reaches the conclusion that emissions need to be reduced to a certain level by a certain year for the global thermostat to be stabilized. For example, the United Nations' Intergovernmental Panel on Climate Change (IPCC) in their *Fourth Assessment Report: Climate Change 2007 (AR4)* concludes that to allow global temperatures to only rise a manageable 2.0 – 2.4°C since the pre-industrial age; global CO_2e emissions in 2050 will need to be at 15 – 50% of 2000 levels.[8] Notwithstanding the cumbersome wide band in the reduction target to achieve the goal, governments can use this data in setting a reduction schedule to reach this emission level by 2050. As mentioned earlier, the cap would be lowered annually until the target is reached.

Third, it is potentially easier to have an international agreement on a global cap and trade system rather than on global carbon tax.

Flexibility is an important feature of a cap and trade system that distinguishes it from a carbon tax. An illustration of a flexibility arrangement are banking and borrowing of allowances from future years with a required payback at interest. These are permissible in the European Union's cap and trade system called the Emission Trading Scheme (EU-ETS). Banking and borrowing and allowing for allowances to span multiple years would be permitted if the Waxman-Markey bill became law. However, the multi-year financing idea is not clear. In contrast, under a carbon tax, what one emits over a year, one has to pay for immediately.

The use of carbon offsets to meet compliance is another feature of a cap and trade system that some say reduce emissions at the lowest cost possible. Currently an allowance in the EU-ETS costs about €14/t CO_2e. To illustrate using a simple example, let's say that a CO_2e reduction project in a developing country such as migrating the electricity generation of a rural power plant from coal to a biofuel costs about €10/tCO_2. Under current EU law, a European company could meet its compliance by buying the CO_2e credits generated from this project rather than purchasing a EUA (European Union Allowance). The total emissions reduction would be the same under both options, but achieved more cost-efficiently in the former. Also, under Waxman-Markey, US-based agricultural and forestry offsets (i.e. methane capture, afforestation, etc) would be allowed for compliance purposes since those two industries will not be included under the cap.

Supporters of a cap and trade envision a future period when there would be **one** global price on CO_2e emissions, similar to the commoditized oil market. This would happen when the different national or regional systems around the globe such as the EU-ETS and a future US scheme would be "married" creating a collective cap on emissions. An EU, US and other national/regional allowance scheme would become perfectly fungible. The main benefit would be a reduced risk of carbon leakage, i.e. companies relocating to jurisdictions with a less stringent cap. This benefit would be fully realized only if large developing countries such as China and India were also included in the global cap.

---

[8] *Fourth Assessment Report: Climate Change 2007 (AR4)*, Intergovernmental Panel on Climate Change, November 2007, page 67.

The domestic, US political arena may turn out to be an obstacle to a global system. As in any free trade regime, a single global system in carbon allowances will cause domestic prices to deviate from their original levels under a closed system. Emitters may see a price higher or lower than the one based on their original national/regional cap. Let's take a hypothetical example of two countries: A & B that have identical annual emissions but differing caps. Country A emits 100 tCO_2e per year and has set a cap of 90 tCO_2e for next year i.e. a 10% reduction. Assume an allowance price in closed market A of \$25/tCO_2e. Country B also emits 100 tCO_2e but has set a less stringent cap of 95 tCO_2e for next year i.e. a more modest 5% reduction. Assume a logically lower allowance price in closed market B of \$15/tCO_2e. Now, if countries A & B decided to combine their systems, the collective reduction in emissions would be 7.5% (lower than country A's but higher than country B's). This "new" combined target would have a distinct price somewhere in between \$15 and \$25/tCO_2e. If emitters in country A were able to easily migrate their emissions-generating activities to country B, then in theory this new price would slowly be reached anyway under a closed system. However, if that were not the case, the question that should be asked is: will emitters in country B raise opposition to this higher price? In the years to come, this example may become all too real since the EU will most likely have a more stringent cap than the US.

The Acid Rain Program – Lessons learned from Sulfur Dioxide Allowance Trading

The Acid Rain Program presents a successful case of a cap and trade system. Title IV of the 1990 US Clean Air Act Amendments regulates emissions of the sulfur dioxide from electric generating utilities. The Act aimed at reducing SO_2 emissions by 10 million tons below 1980 levels which represents a 50% overall reduction. The key feature of the act was establishing a firm cap on overall emissions and creation of tradable emission allowances. This design incentivizes the polluter to reduce its emissions and sell the difference between emissions and allowances on the market for profit or allow it to "bank" unused allowances for future years in expectation of a more stringent cap.

The target goal of emissions reductions has been achieved and exceeded and total abatement costs have been much lower than expected. At the same time, environmental and health conditions have improved. The example of the Acid Rain Program illustrates that market based instruments can be the best solution to achieve emissions reductions, cost savings and environmental benefits.

The example of the SO_2 allowance market provides at least three lessons for future consideration when designing cap and trade program for carbon dioxide emissions. First, the SO_2 allowance trading system shows the importance of flexibility to allow for a wide array of compliance options, both in terms of time and technology (i.e. "banking"). Second, the role of monitoring and enforcement has proved to be crucial for the success of the program. Diligent monitoring and a clear penalties system has built market confidence and resulted in universal compliance. Third, once the system of allowance allocation is established, the private sector is capable of making the system work.

A more recent US domestic implementation of a cap and trade system is the Regional Greenhouse Gas Initiative (RGGI), which sets a cap on stationary power plants with generating capacity of 25 MW or greater. The current goal is to reduce CO_2e emissions from the power sector by 10% from

beginning level in 2009, the year in which the program started.[9] While most scientists would not consider this goal very ambitious, a key feature that has met wide approval from policy experts is the full auctioning of allowances. As mentioned earlier, auctioning allows the government to collect revenue. Also, it allocates the allowances to those that need it most in a price-efficient manner by making large emitters pay upfront for their emissions. If auctioning does not occur, the allowance of allocations will enter the political arena where emitters with influence will try to obtain a large piece of the pie and then profit through market trading. This has been a problem in Phase 1 of the European Union's Emissions Trading Scheme (EU-ETS). Rather than having all companies within the EU bid for allowances side-by-side, each country was given a set of allowances (a political process in and of itself), which were then allocated to companies based in that particular country. In Phase 3, starting in 2012, the plan is to eliminate national allocations and auction over half of the allowances.

Carbon Tax- Explored

Carbon tax system presents two main advantages, compliance and coverage of all the industries. Taxing a source does not require as large a monitoring mechanism as a cap and trade system.

Price stability is a secondary benefit since to include the full cost of oil requires a material adjustment in its current price that will inject some instability, appropriately. Price stability is an important factor because companies can make better informed decisions about how to reduce their CO_2e emissions if they know its costs ahead of time. In contrast, under a cap and trade system, allowance prices fluctuate. The US climate bills try to temper the inherent price volatility of a cap and trade system by instituting *price collars* – essentially a price floor and ceiling, so that prices remain within a certain band during each allowance period. This is achieved by setting a minimum price at which allowances can be auctioned.

> "The current minimum reserve auction price will likely set a floor price for carbon prices. This is because as long as compliance entities need to purchase at least some allowances through the auction process, no holder of allowances would be willing to sell those allowances for less than the expected reserve auction price."[10]

However, this compels the question. If the majority of allowances will be given away for free, would the minimum price not benefit those entities that managed to obtain an initial larger-than- necessary free allocation? The price ceiling would be maintained by a trigger mechanism, under which allowances borrowed from future periods would be auctioned in the current period once the current price reaches a pre-determined high level. This way, the total emissions would remain constant. Assuming that post-facto legislation is not enacted to soften the adverse economic effects of subsequent cap stringency, this could work. However, an argument could be made that politics, as well as economics, will determine winners and losers in a cap and trade system.

---

[9] *About RGGI,* http://www.rggi.org/about, accessed October 8, 2009

[10] *Waxman-Markey: Unintended Consequences of the Auction Reserve Price,* http://www.watermarkeconomics.com/docs/WMauctionreserve.pdf, June 2009

As mentioned earlier, offsets can play a significant role in reaching emissions goals via a cap and trade system. Though usually not discussed outside of a cap and trade context, offsets can conceivably play a role under a carbon tax regime as well. For example, similar to 1 offset credit (1 tCO_2e) counting as 1 emission allowance, a reduction in emissions at an entity not covered by the tax could count as a tax credit. To use a hypothetical example, if a US company invested in reducing a Texas cattle farm's CO_2e emissions by 5 tons in year 1, then the company would claim a 5 tCO_2e tax credit. So, if it were originally scheduled to pay tax on domestic emissions of 25 tCO_2e now it would only have to pay tax on 20 tCO_2e. Of course, the US corporate tax code would have to be revised to ensure that any capital investments do not provide double tax benefits to a company via the depreciation write-down element and via the carbon tax regime.

CCC's Perspective

Both cap and trade and carbon tax will face wide ranging political opposition. One sense of public opinion is that it will oppose all new taxes. For this reason, cap and trade has been politically positioned as not a tax. This is a point frequently raised by Republican opponents to cap-and-trade.

For now, overall sentiment seems to be in favor of a cap and trade. However, certain members of the US Congress have put forward proposals that more resemble a carbon tax and others have loudly denounced the Waxman-Markey and Boxer-Kerry bills as hidden energy taxes akin to economic suicide. Until recently the US Chamber of Commerce was suggesting a public hearing on the validity of climate science. The publicized departures of well-known companies such as Apple and Pacific Gas & Electric from its member roll have tempered some of the rhetoric.[11] Whether much of this is conducive to healthy debate is unclear, yet it hopefully will compel the bills' sponsors to be more forthright in the unpleasant trade-offs that everyone will have to make. Ultimately though, what is important is that measures for action are being taken in the right direction. The debate about cap and trade vs. carbon tax aside, either option is better than doing nothing at all.

Carbon Credit Capital is in favor of cap and trade since we believe that only under this system, can greenhouse gas pollution be effectively and efficiently lowered. While this system has some political challenges and design obstacles it is feasible as shown by the example of EU ETS, SO_2 and RGGI.

[11] "The US Chamber of Commerce is feeling the heat", *Los Angeles Times*, October 12, 2009.