Energy Efficiency and Emission Trading Schemes

Joel Sandersen, Ryan Holl, and Steve Heins, Orion Energy Systems

ABSTRACT

Properly designing a greenhouse gas commodity market to trade allowances or offsets presents a serious challenge to policy makers, commodity brokers and sectors that are affected by the cost and profit potential that a market brings. In order for any commodity market to be successful, the market must have an inventory, a registry, liquidity, demand and standard contract specifications. This paper takes a look at the United States' environmental regulation and commodity markets and explores some of the differences between the European Union Emission Trading Scheme and the Voluntary Chicago Climate Exchange. This paper is intended to help advance a trading protocol that adheres to objective and economic principles for the emerging greenhouse gas legislation in the U.S.

Introduction

The issue of climate change is gaining increasing importance through the social, political and economic realms of human society. The issue itself, and the regulation of the associated pollutant emissions that cause it, are local, national and global issues. Therefore, it is clearly important that we understand how the proposed systems for regulating these emissions are designed and implemented. To this end, this paper will compare and contrast two Climate Change systems, namely the Chicago Climate Exchange (hereafter CCX) and the European Union's Emissions Trading System (hereafter EU-ETS) and determine what lessons can be learned from these systems for future emissions regulations.

Environmental Commodity Markets

In 1970, the United States passed the Clean Air Act, which was designed to regulate U.S. air pollution levels. In particular the act regulated the amount of Sulfur Dioxide (SO_2) a chief cause of Acid Rain, which electric utilities and other power providers could emit while generating electricity.[1] The program was initially a failure, but was amended in 1990.[2]

The 1990 Amendment created an overall cap on SO_2 emissions by electric power generators. The first EPA auction for credits was completed by the Chicago Board of Trade in 1993.[3] The first required compliance year by the electric utility sector was 1995.[4] This meant that by 1995, the electric utility sector was going to be allowed to only emit a capped amount of SO_2 emissions, and firms who violated their capped levels would be subject to significant punishments.[5]

To meet their SO_2 pollution reduction obligations, utilities have a number of different pollution abatement strategy options. These options included:

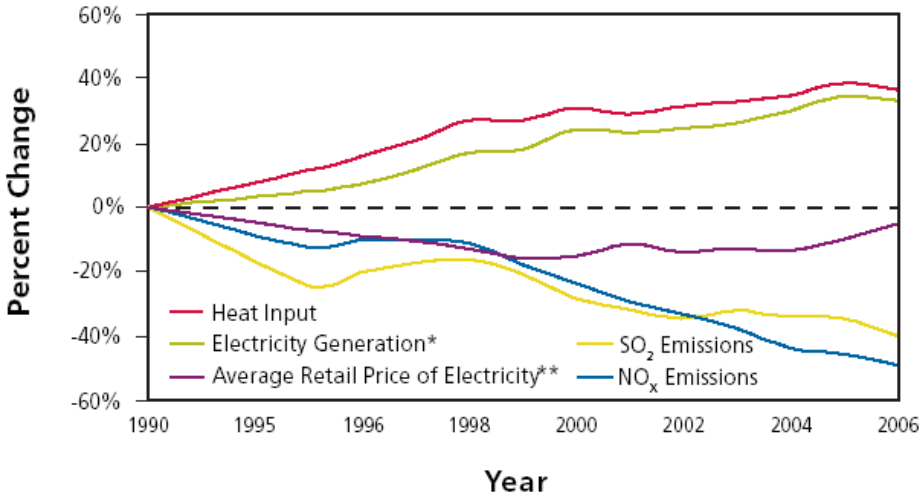
- Employing a different grade of coal, which was lower in sulfur content (thereby reducing emitted SO_2 pollutants)

- Implement "scrubbers" – infrastructure investments, which reduced the overall SO_2 pollutant emissions, through the use of lime or limestone, released by a particular utility's generating facilities;[6] or
- Modify their existing infrastructure to generate electricity through use of a different primary (i.e., retrofitting coal-fired power plants into cleaner burning natural gas fired power plants)

These strategies allowed utilities to reduce their overall pollutant emissions, which in turn reduced their need to purchase auctioned allowances. In addition, pollutant reduction activities, which occur during the interaction periods can allow a utility to bank – save for their usage for compliance with future year caps – or sell the excess allowances created by their pollutant reduction activities. To begin with, the SO_2 reduction programs began with allowances for all emitters.

Since the overall pollutant levels are capped and periodically reduced, the overall impact for the economy and society as a whole is a reduction in pollutant emissions. For example, by 2006, through compliance with the U.S. SO_2 reduction program, U.S. SO_2 emissions had fallen 40% below the 2006 Cap Level.[7] Moreover, the results of the program have shown significant reductions in both SO_2 and NO_X emissions as compared with 1980 emissions levels as can be seen in Figure 1.

Figure 1. Electric Utility Trends[8]



* Generation from fossil fuel-fired plants.

** Constant year 2000 dollars adjusted for inflation.

The idea behind this market-based system to reduce pollution is to mitigate price risk and encourage low cost economically viable solutions for reductions. Overall, most parties consider the cap and trade system for the SO_2/ NO_X reduction a very successful approach.

Greenhouse Gas Environmental Commodity Market Challenges

In contrast, there are multiple pollutant or pollutant classes commonly associated with global climate change. These pollutants include:

- Carbon Dioxide (CO_2)**:** Carbon dioxide enters the atmosphere through the burning of fossil fuels (oil, natural gas, and coal), solid waste, trees and wood products, and also as a result of other chemical reactions (e.g., manufacture of cement).
- Methane (CH_4)**:** Methane is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from livestock and other agricultural practices and by the decay of organic waste in municipal solid waste landfills.
- Nitrous Oxide (N_2O)**:** Nitrous oxide is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste.
- Fluorinated Gases**:** Hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride are synthetic, powerful greenhouse gases that are emitted from a variety of industrial processes.[9]

These emissions are emitted across multiple sectors of the economy and can affect the atmosphere on a global level. These additional complexities make creating a framework for compliance or voluntary pollutant reduction markets for greenhouse gas commodities significantly more difficult to implement and navigate. In order for any commodity market to be effective, the following components must be present:

- Legally binding agreements for reductions,
- A central registry or bank;
- A standard contract specification; and
- Long term credit worthiness

European Union Emissions Trading Scheme (EU-ETS)

According to the European Commission, the EU-ETS, which began operation in 1995, "is the world's largest company-level 'cap-and-trade' system for trading in emissions of carbon dioxide (CO_2) and has quickly become the main driving force behind the expansion of the emerging global carbon market."[10] The EU-ETS allows member states to allocate emission allowances to the pollutant emitters within their borders and the EU-ETS allows for the trade in these emission allowances both intra- and internationally to assist entities in meeting a portion of each member state's emission reduction targets. In addition, the EU-ETS allows the use of mechanisms established under the Kyoto Protocol – Clean Development Mechanism (CDM) and Joint Implementation (JI) Projects – to provide member states and entities additional avenues for emission reductions through the use of offset projects. The scheme was developed as the cornerstone of the European Union (EU) strategy for cutting greenhouse gas (GHG) emissions.[11]

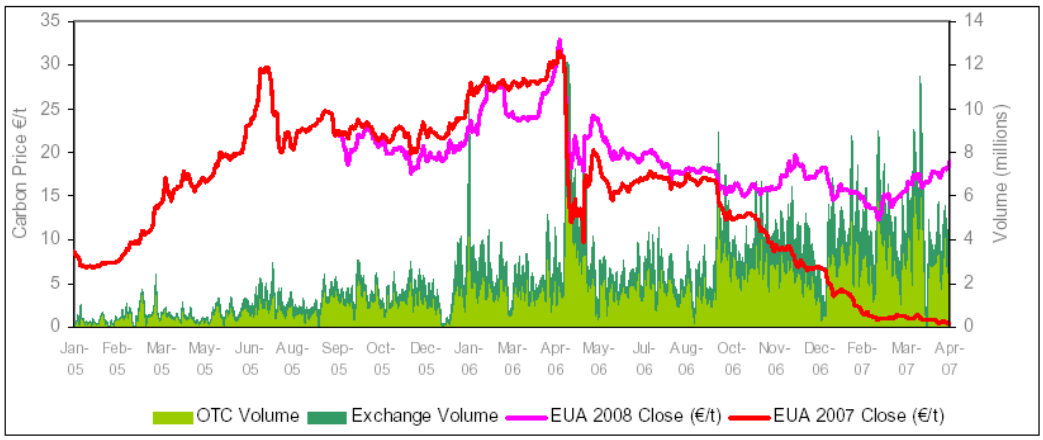
The 2005-2007 trading period covered CO_2 emissions from power and heat generating industries and select energy-intensive industrial sectors, which include energy generation and production, oil refineries, mining and metal processing, cement production, glass production, lime production, brick and ceramics production and the manufacture of pulp and paper production.[12] The problem with this approach is that it only covers approximately 50% of the commercial and industrial, which inevitably leads to picking winners and losers: It also has an arbitrary political component. Many experts believe that any cap and trade system must include all of the commercial/industrial community.

The major financial instrument associated with the EU-ETS is the EU Emission Allowance (EUA).[13] One EUA represents the right to emit one ton of Carbon Dioxide equivalent (CO_2e) and these pollutant emission rights are distributed in the EU countries by each of the Member States' governments through National Allocation Plans (NAP) by a number of different methods.[14] The methods of allocation can include:

- 'Grandfathering' – allowances granted to firms on the basis of their extent of emissions associated with previous operation of their facility;
- 'Benchmarking' – allowances are granted based upon specific pre-established benchmark levels; or
- 'Auctioning' – allowances are granted to firms based on their willingness and ability to pay the price determined by the open market.[15]

In the initial allowance allocations by the EU Member States significantly more allowances were issued than were actually required.[16] Since the majority of the National Allocation Plans developed by the EU Member Nations were based on estimates provided by the entities to the emission caps,[17] the supply of available allowances exceeded the actual demand for them. Therefore, the price of these emissions in the tradable market collapsed severely[18], as can be seen in Figure 2 below.[19] Another emerging problem is that the allowances are not being issued in a timely fashion. For example, the 2008 allowances have not been issued even though they are five months into 2008.

Figure 2. EUA Price & Volume



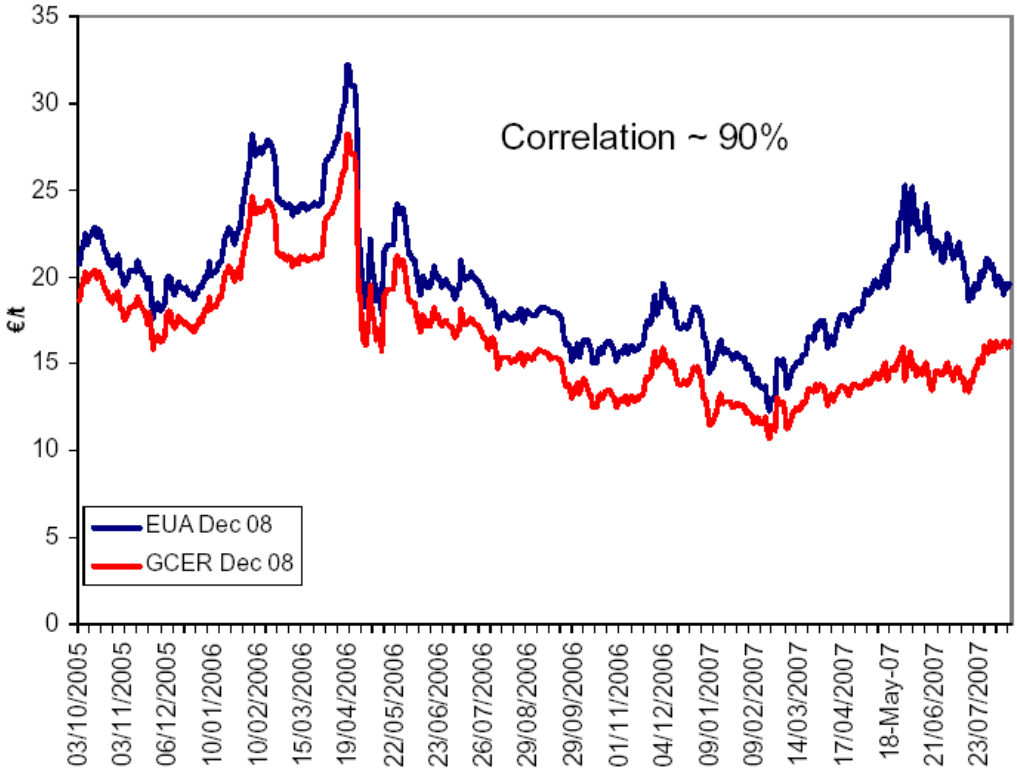
Since the failed allocation process caused a collapse of the value of a phase one EUA, the European Commission has taken a strict approach to NAP for 2008-2012 to ensure member states meet their Kyoto targets.[20] The number of allowances issued should encourage a reduction to 5.7% below the level of 2005 emissions. However, Environmental Finance Magazine, May 2008, reported that CO2 emissions have risen by 1% in 2007.

Companies can also buy project based emission offsets from direct and indirect sources based on rules established by the United Nations Framework Convention on Climate Change (UNFCC) processes known as a Clean Development Mechanism (CDM) – emissions reducing project in the developing world – and/or Joint Implementation (JI) – projects in the industrialized

world and transitional economies.[21] These projects create a cost effective means for carbon-constrained industries in the EU Member States, and/or the Member States themselves, to comply with their annual reduction targets. In addition, these projects transfer technology from the industrialized EU Member States to developing and transitional economies, which otherwise may not have been able to implement these projects.

The credits delivered by the emissions reductions generated by CDM projects are called the Certified Emission Reduction (CER); while the credits associated with the emissions reductions for JI projects are called Emission Reduction Units (ERU).[22] Although EAU's, CER's and ERU's are equivalent in the value of emissions reductions they provide, a price premium has developed on emission reductions in the form of EAU's. This suggests that the market values emissions reduction projects in the industrialized world as higher quality (or more reliable) reductions as compared to their counterparts from projects in developing and transitional economies, as can be seen in Figure 3.[23]

Figure 3. EUA & CER Spread



Holders of CER's or ERU's are entitled to use them to offset their own carbon emissions as one way of achieving their reduction targets. Each CDM project must meet the following criteria and be approved by the UNFCC:

Location. Each CDM project must be implemented in a developing country. This is intended to help channel business investment in developing countries.

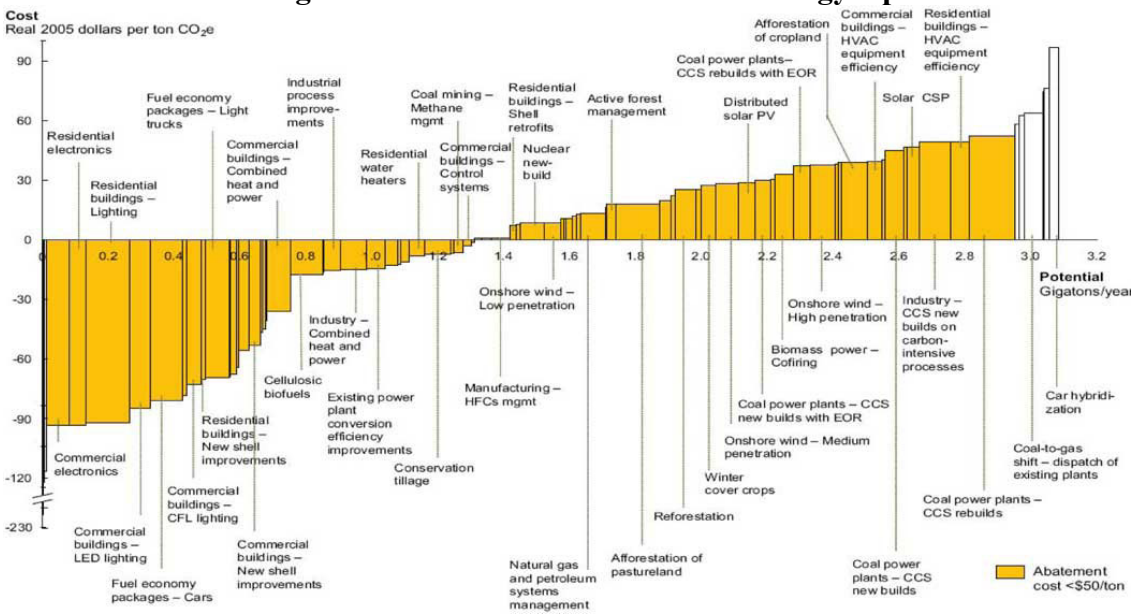
Measurement and verification protocol. Each CDM project must present a project specific measurement and verification protocol to ensure the project truly happened and reduced direct or indirect emissions. Different sized projects have different measurement and verification protocols. Approved independent third parties certify projects.

Additionally. The CDM has developed a tool to establish if a project is additional. The tool makes each project demonstrate that it passes legal, technical, financial, social and common practice test to define if the project is "business as usual." It is up to a costly and time-consuming bureaucratic process to decide each project protocol as additional.

It is worth mentioning that the CDM has two different tests; one test is that the project reduces emissions and secondly the project must provide economic development benefits to the host country. Some say that this methodology creates complexity and subjectivity, while diluting the key mission of emissions reduction.

Then, there is one more major flaw in the ETS: It does not allow properly measured, verified and certified energy efficiency projects to participate in the emissions trading marketplace. As the following McKinsey study highlights, energy efficiency is a remarkably efficient way of achieving large-scale emission reductions, which can be done on a company-by-company basis if it is properly incentivized, in terms of energy efficiency rebates, tax incentives and emission credits.

Figure 4. Emissions Reduction Technology Options[24]

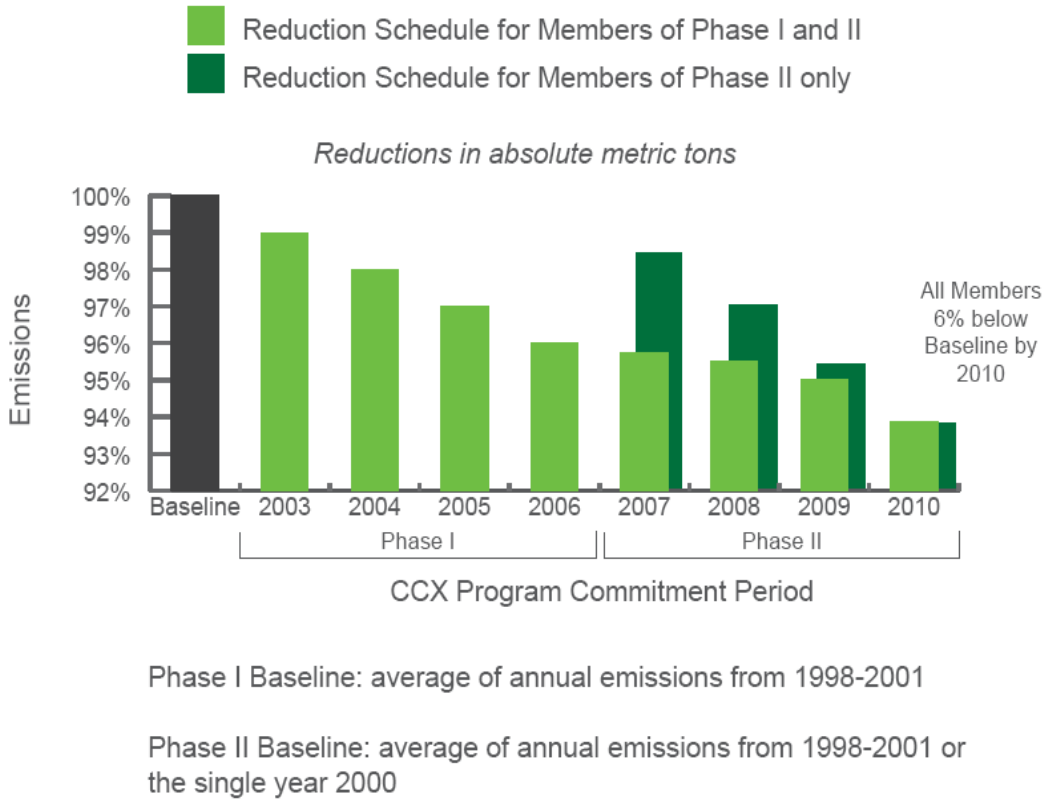


Chicago Climate Exchange (CCX)

CCX launched in 2003 and is the world's first and North America's only active voluntary, legally binding trading system to reduce emissions of all six major greenhouse gasses (GHG). CCX is a voluntary member driven organization. Almost all sectors of the economy are represented.

The exchange members make legally binding pledges to reduce emissions to established baselines. Phase I (2003-2006) required a 4% reduction below the baseline, which is calculated by the average annual emissions from 1998-2001. If members reduce emissions below their target, they may gain a surplus of emission offsets, which can be sold on the CCX exchange. Credits are sold to other members that do not meet targets and environmental carbon retirement organizations.

Figure 5. CCX Emissions Reduction



Phase I Baseline: average of annual emissions from 1998-2001

Phase II Baseline: average of annual emissions from 1998-2001 or the single year 2000

This type of initiative is effective, because, much like the philosophy behind the EU-ETS discussed above, climate change is a global, rather than a local problem.

The standard financial contract is a Carbon Financial Instrument (CFI). A CFI is an allowance to emit for members or an offset generated from an approved project type. If the CFI is given to members to use as their, baseline it is an allowance. If it is generated by an approved project it is an offset. The financial value and standard for allowances and offsets are the same. The holder of a CFI has the right to emit 100 tons of Carbon Dioxide equivalent during the specific vintage year.

CCX approved projects must undergo independent third party verification reviews to establish their reduction value. The protocols are submitted to Financial Institute National Regulatory Association. There are approved protocols for 8 different project types. Below are the common links between each protocol:

Location. CCX approved projects must be developed in North America.

Measurement and verification protocol. Each project is subject to independent third party validation, based on a measurement and verification protocol approved by the CCX.

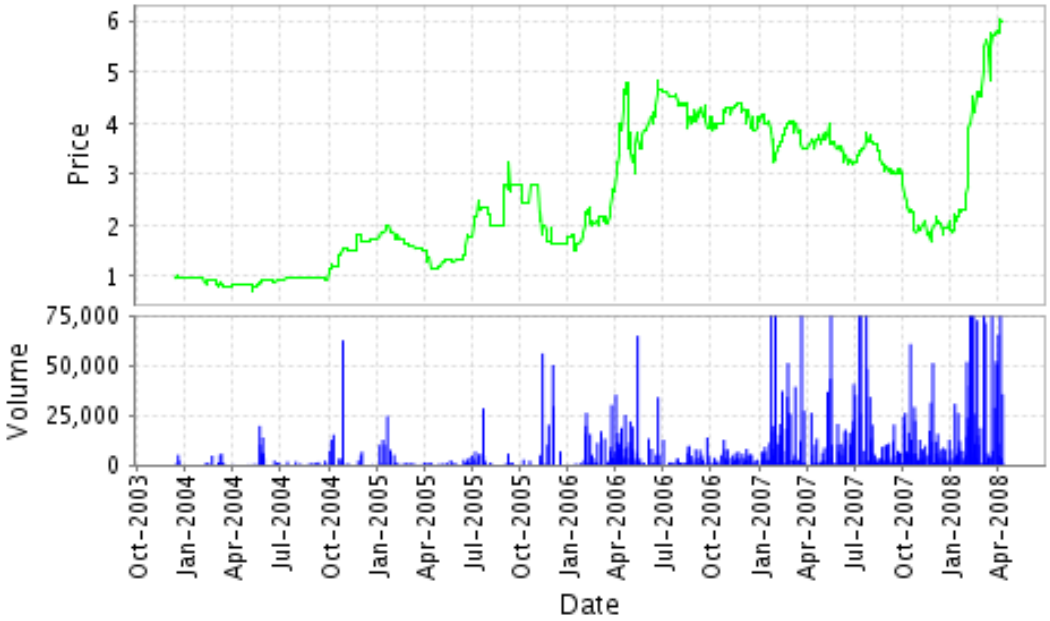
Type of project. There are 8 qualified project types

Additionality. There is only one additionality test, "performance additionality," which means that the project delivers on its emission reduction promise and it not mandated by law.

The CCX protocol has a major advantage over the ETS: It allows certified energy efficiency projects to qualify for trading. Once American industry and politicians begins to understand the importance of "throwing the kitchen sink at energy efficiency" (to quote Marty Kushler of ACEEE at a recent energy conference), it is very likely that to be the first and best investment in emissions reduction.

Since inception, the CCX has traded over 30 million tons. Prices have ranged from 80 cents to $6.05,[25] as can be seen in Figure 6.[26]

Figure 6. CCX CFI Price and Volume Chart



Authors Thoughts and Conclusions on the U.S. GHG Carbon Market Development

The numerous components of environmental commodity markets formation can create significant challenges in developing and implementing a cohesive framework to effectively reduce greenhouse gases. That said, however, the U.S. EPA's program has demonstrated that a cap-and-trade pollutants reduction can be effective in achieving the societal goals of reducing emissions without being an economic hindrance. An environmental commodity market must have a reduction target, include manageable emitting sectors and allow offset project participation for cost effective management of growing demand for energy or products that cause carbon dioxide emissions.

Overall, the CCX protocol has finally provided a more or less objective set of tests that provides for the transparency and certainty of emissions credits, without the potential of lengthy delays, project subjectivity and political misadventures created by EU-ETS additionality tests. In fact, the complexity of the current ETS protocol has created long queues of emission trading applicants who have been waiting over 2 years for validation and verification.[27] At a recent sustainable manufacturing conference Christina Page, Yahoo's Director of Climate and Energy Strategy, stated that Yahoo had completed two CDM projects in 2006 and they are still waiting for ETS verification.

Other issues that need to be resolved are reductions targets, so-called off-ramps, non-compliance, sectors to be include in trading scheme, which emission reduction options should be included in any trading scheme and finally, which allocation protocol to use initially, allowances or auction.

First, a properly designed reduction target creates demand for carbon offsets and emission allowances. The reduction target should create a scarcity premium. While the Lieberman-Warner bill is attempting to stabilize emissions to 1990 levels by 2020 and 65% below 1990 levels by 2050, the reduction targets need to be flexible, especially when one considers the unknowns contained in the next 44 years.

Second, a good market design will lessen the need for "off-ramps. Therefore, the inclusion of an "off-ramp" provision that allows different mechanisms to prevent the price of allowances from rising dramatically will be less problematic, because it is less likely hat it will invoked.

Third, a program without a non-compliance provision does not have the requisite teeth to ensure that entities do meet their mandatory reduction targets. If an entity cannot meet their reduction target they should be assessed a significant fine, and also have the reduction added to their targets for the following year.

Fourth, as stated before, we believe that a properly designed scheme needs to include all emitters in the commercial and industrial sectors.

Fifth, we think that energy efficiency is the most economic option for emission reductions, if they are properly E,M&V-ed project. In addition, the only additionality that matters is performance additionality, which thankfully provides an objectivity and transparency to any given project. Quite possibly, the extra economic value provided emissions trading might be the catalyst to actually transform the market for energy efficiency while achieving large-scale emission reductions.

Sixth, the approved cap and trade program needs to avoid the imperfections of the nation by nation system to allocate the allowances, as seen in the EU-ETS phase 1 as it created a windfall profit scenario for a few companies at the expense of the other participants. Meanwhile, we are most troubled by the immediate auctioning component currently being advanced. It is worth repeating that the successful SO_2 cap and trade program in the Nineties started with allowances for all emitters. Consequently, we favor a strictly measured and verified approach to "free" allowances to prevent the gaming that happened with ETS two years ago.

Finally, any trading system needs to create a proper baseline founded on good economics and bipartisan politics, without placing an immediate tax on current consumption like auctioning would. Ultimately, we think that the U.S. business community will be able to support such a starting point.

[1] U.S. Environmental Protection Agency (USEPA), Acid Rain and Related Programs, pg. 3.

[2] Ibid.

[3] Sandor, pg. 14.

[4] Ibid.

[5] Ibid.

[6] See discussion of Coal Scrubber Technology from the Gerson-Lehrman Group; available at http://www.glgroup.com/Dictionary/EI-Coal-Scrubber.html.

[7] US EPA, Acid Rain, pg. 4.

[8] Source: Energy Information Administration (electricity generation, retail price); EPA (heat input and emissions, representing all affected ARP units), 2007 cited in US EPA, Acid Rain, pg. 7.

[9] US EPA, "Green House Gases," pg. 1.

[10] European Commission, pg. 5.

[11] Ibid., pgs. 3-4.

[12] Ibid., pg. 7.

[13] Point Carbon, pg. 5.

[14] Ibid.

[15] Ibid., pg. 6.

[16] European Union, pg. 9; approximately 95% of the emission allowances were provided free of charge to emitters who were regulated by the program for the 2005-2007 program phase, and approximately 90% of the allowances have been allocated without charge for the 2008-2012 program phase.

[17] Point Carbon, pg. 6.

[18] Capoor and Ambrosi, pgs 14-15.

[19] DEFRA, pg. 1.

[20] European Commission, pg. 11.

[21] Ibid., pg. 17.

[22] Ibid.

[23] Schneider, pg. 7.

[24] Creyts at al., p. 20.

[25] CFI Price as published on April 8, 2008 on Chicago Climate Exchange for 2008 CFI at 3:12 pm. Available at www.chicagoclimatex.com.

[26] Chart is sourced from the Chicago Climate Exchange and is available at: http://www.chicagoclimatex.com/market/data/summary.jsf.

[33] Capoor and Ambrosi, pg. 4.

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Definitions

Listed below are a few important terms to understand when discussing greenhouse gas commodity markets.

Emission allowance. An emission allowance is "an authorization to emit a ton of a pollutant,[27]" issued by the entity requiring the emissions reductions. Typically these allowances are the chief instruments for controlling emissions levels and effecting reductions in over all levels of pollutants.

Emission offset. Projects "reduc[e] or avoid … emissions in one place in order to 'offset' … emissions occurring somewhere else."[27]

Direct emission. "Those emissions from sources owned or controlled by the organization."[27]

Indirect emission. "Those emissions which occur due to the organization's actions but the actual emissions are produced by sources owned or controlled by another entity."[27]

Additionality. Concept that argues that "emissions reductions are 'additional' if they occurred because of the presence of incentives associated with existence of GHG markets, voluntary or mandatory."[27]

Offset Project Participation

Location. Offset participation guidelines should be designed such that projects in the United States should receive priority. This means moving beyond the typical CDM and JI mechanisms to look at other options for emission offset reductions, including indirection emission reductions through the use of energy efficiency and emerging technologies at end-use facilities throughout the country. By establishing the offset participation guidelines to focus on local (i.e. U.S. projects), the program will help blunt the potential negative impacts associated with the pollutant emission regulations.

Measurement and verification protocols. The acceptance and administration of Measurement and Verification Protocols should be managed and catalogued by the United States Environmental Protection Agency. The funding for this administration program can be captured from the proceeds delivered by the auctions of pollutant allowances in the environmental commodity market.

Additionality. As long as a project is voluntary, certified, measured and verified that it did reduce emissions for the vintage year it should qualify. In other words, the only additionality test should be "performance additionality."

System Component	CCX	EU-ETS
Launch Date	2003	2005
Legally Binding Reductions	Legally Binding Voluntary Commitment	Kyoto Protocol
Sector Participants	Members based: utilities, manufacturing, universities, states, transportation	Power and heat generation and major energy-intensive industries (40% of total GHG)
Allocation and Offsets	Voluntary commitments for reduction and allocations	Allocation and offset participation
Exchange Structure	Self-Administered	Externally Administered
Inventory System	CCX Registry	Community Independent Transaction Log
Contract Specifications	Carbon Financial Instrument (CFI)	EU Emission Allowance (EUA) Certified Emission Reductions (CER)
Offset Project Types	8 qualified project types	Kyoto Clean Development Mechanism (CDM) and Joint Implementation (JI) Project
Project Location	North America	Developing Countries
Offset Project Certification Third Project Oversight	Financial Industry Regulatory Authority (FINRA)	United Nations Framework Convention on Climate Change (UNFCCC)
Measurement and Verification	CCX approved verifiers	UNFCCC approved verifiers
Additionality Components	Legal	Legal, Financial, Technical, Social, Common Practice