REPORT ON THE SECONDARY MARKET FOR RGGI CO_2 ALLOWANCES: FOURTH QUARTER 2011

Prepared for:

RGGI, Inc., on behalf of the RGGI Participating States

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POTOMAC ECONOMICS

February 2012

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The Regional Greenhouse Gas Initiative (RGGI) is a cooperative effort by participating states to reduce emissions of carbon dioxide (CO_2), a greenhouse gas that causes global warming.

RGGI, Inc. is a non-profit corporation created to provide technical and administrative services to the CO_2 Budget Trading Programs of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont.

A. INTRODUCTION

The primary market for RGGI CO_2 allowances consists mainly of the auctions where allowances are initially sold. Once a CO_2 allowance is purchased in the primary market, it can then be resold in the secondary market. The secondary market for RGGI CO_2 allowances comprises the trading of physical allowances and financial derivatives, such as futures and options contracts.

The secondary market is important for several reasons. First, it gives firms an ability to obtain CO_2 allowances at any time during the three months between the RGGI auctions. Second, it provides firms a way to protect themselves against the potential volatility of future auction clearing prices. Third, it provides price signals that assist firms in making investment decisions in markets affected by the cost of RGGI compliance.

This report provides a summary of activity in the secondary market in the fourth quarter of 2011 and discusses the results of our market power screens. Several patterns have emerged in this period in the secondary market:

- *CO_2 Allowance Transfers* – 4.0 million CO_2 allowances were transferred between unaffiliated firms in the fourth quarter of 2011. The volume of CO_2 allowance transfers decreased from 8.2 million in the third quarter when volumes were still elevated following the May announcement that New Jersey would leave RGGI after the first control period.[1] The volume of CO_2 allowance transfers increased from 0.6 million in the fourth quarter of 2010, reflecting that over-the-counter transactions have become more prevalent over the past year.

- *CO_2 Allowance Holdings* – Of the 441 million CO_2 allowances in circulation at the end of the first control period, 80 percent were held by firms that acquired them directly from an auction, 13 percent were held by firms that acquired them through the secondary market, and 7 percent were held by firms that acquired them from direct sales or allocations by individual states. The share of CO_2 allowances held by compliance entities and their affiliates was 98 percent at the end of the first control period.

- *Futures Prices* – CO_2 allowance prices remained stable in the fourth quarter of 2011, although trading volumes were very low. The volume-weighted average price of 2009 vintage allowances was $1.92 in the fourth quarter, consistent with the transaction prices

[1] See "http://www.rggi.org/docs/New_Jersey_Letter.pdf".

reported in the CO_2 Allowance Tracking System and with the clearing price for first control period allowances in the December auction.

We evaluate information on the holdings of CO_2 allowances and allowance derivatives as well as the demand for allowances to identify firms that may have acquired a position that raises competitive concerns. We find no evidence of anticompetitive conduct; however, we will continue to evaluate the competitiveness of the market.

B. BACKGROUND

The secondary market for RGGI CO_2 allowances comprises the trading of physical allowances and financial derivatives, such as futures and options contracts. A physical allowance trade occurs when the parties to the transaction register the transfer of ownership in RGGI's CO_2 Allowance Tracking System ("COATS"). Futures, options, and other financial derivatives are called "exchange-traded" when they are traded on a public exchange, and are called "over-the-counter" ("OTC") when they are not traded on one of the public exchanges. Many financial derivatives eventually result in the transfer of physical allowances (i.e., the transfer is registered in COATS), but this may occur months or years after the parties enter into a transaction.

Standard futures and options contracts for RGGI CO_2 allowances are traded on the Chicago Climate Futures Exchange ("CCFE"). Three categories of standard contracts are traded:

- Futures – Under these contracts, two parties agree to exchange a fixed number of CO_2 allowances of a certain vintage year at a particular price at a specific point in the future (called the "delivery month"). At the end of the delivery month, the contracted number of CO_2 allowances must be physically transferred to the buyer's account in the COATS registry and funds must be transferred to the seller. The vintage year refers to the compliance year of the CO_2 allowance that is to be transferred. One standard futures contract equals 1,000 RGGI allowances. [2]

- Call Options – Call options give the purchaser the option to buy a fixed number of CO_2 allowances of a certain vintage year at a particular strike price at any time prior to the expiration date. For example, suppose a firm holds a call option with a 2009 vintage year, $5 strike price, and June 2011 expiration date. If the price of the corresponding futures contract rose to $5.75, the firm could exercise the option to buy CO_2 allowances at $5 and immediately sell them at $5.75. Alternatively, if the price of the futures

[2] More precisely, a futures contract requires parties with an open interest to post financial assurance in an account with the exchange until the contract reaches expiration. The exchange continually withdraws and deposits funds according to changes in the prices of the contracts in which the party has interest. For example, if a firm buys a contract for 1,000 allowances at $3.50/allowance, the purchasing firm (firm with a long position) must put $3,500 in an account (or whatever share of the entire liability the exchange requires). If the futures price declines to $3/allowance, the exchange transfers $500 from the account of a firm with a long position to the account of a firm with a short position (firm that sold a contract), and the firm with a long position is only required to keep $3,000 in the account. At the end of the delivery month, allowances are exchanged for funds according to the closing price on the last day of the month.

contract stayed below $5, the firm would let the option expire without exercising it. One standard options contract can be exercised for 1,000 RGGI allowances.

- Put Options – Put options are similar to call options but they give the purchaser the option to *sell* a certain number of CO_2 allowances of a particular vintage year at a specified strike price any time prior to the expiration date.

Futures and options contracts are important because they allow firms to manage risks associated with unforeseen swings in commodity prices. Futures allow firms to lock-in the prices of future purchases or sales. Options allow firms to limit their exposure to price volatility. Call options protect the purchaser if the price of the commodity increases, while put options protect the purchaser if the price of the commodity decreases. Although options provide less certainty than futures contracts, they usually require less financial security, making them more attractive to some firms.

Public exchanges are attractive to firms that need a simple way to trade standard products. Moreover, public exchanges effectively eliminate the risk of default by counter-parties, since the exchange constantly monitors the account holdings of each participant to ensure that they have posted sufficient financial security to meet their obligations.

OTC trading is attractive to firms that prefer contracts with non-standard provisions. Firms with on-going business relationships may have other ways to manage the risk of default by the other party.[3] Compliance entities may prefer to buy RGGI CO_2 allowances bundled with other goods and services from their fuel suppliers or plant operations service providers. The OTC market allows parties to create contracts specifically tailored to their needs. In general, much more information is available about trading on public exchanges than trading in the OTC market.

The amount of *open interest* is the net amount of futures or options contracts that have been traded for a contract with a particular set of specifications (i.e., vintage year, delivery month, etc.), but have not reached the time of delivery, expired, or been exercised. For example, if Firm

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[3] For instance, firms may enter into forward contracts rather than futures contracts. The primary difference between a futures contract and a forward contract is that a futures contract typically requires parties with an open interest to post financial assurance which the exchange draws upon or adds to until the contract reaches

A sells 100 contracts of a particular type to Firm B, Firm A will have a short position of 100 contracts, Firm B will have a long position of 100 contracts, and the total open interest for the particular type of contract will be 100 contracts. Hence, the total open interest can be determined by summing across all of the long positions of market participants or by summing across all of the short positions.

expiration, while a forward contract requires that all financial settlement occur at expiration.

C. SUMMARY OF PRICES

This section of the report summarizes prices in the secondary market for RGGI CO_2 allowances during the fourth quarter of 2011. Figure 1 shows the transaction prices of actual CO_2 allowances and futures contracts for allowances on trading days. This section also summarizes the prices of options contracts for CO_2 allowances. For context, Figure 1 shows prices through the first five trading days of the first quarter of 2012 when settlement was completed for futures contracts for December 2011 delivery, and the figure shows volume-weighted average prices in the fourth quarter of 2011 compared to the previous quarter and to the fourth quarter of the previous year.

Key observations regarding RGGI CO_2 allowance prices:

- CO_2 allowance prices were stable in the fourth quarter of 2011 as the daily closing price of 2009 vintage allowances remained between $1.88 and $1.97 on days when trades occurred, relatively close to the auction reserve price of $1.89.
- CO_2 allowance prices were consistent with the previous quarter as the average daily closing price of 2009 and 2010 vintage allowances increased just 2 percent from the third quarter of 2011.
- The prices of futures contracts were generally consistent with the clearing prices in the December 2011 auction and with the transaction prices recorded in COATS.

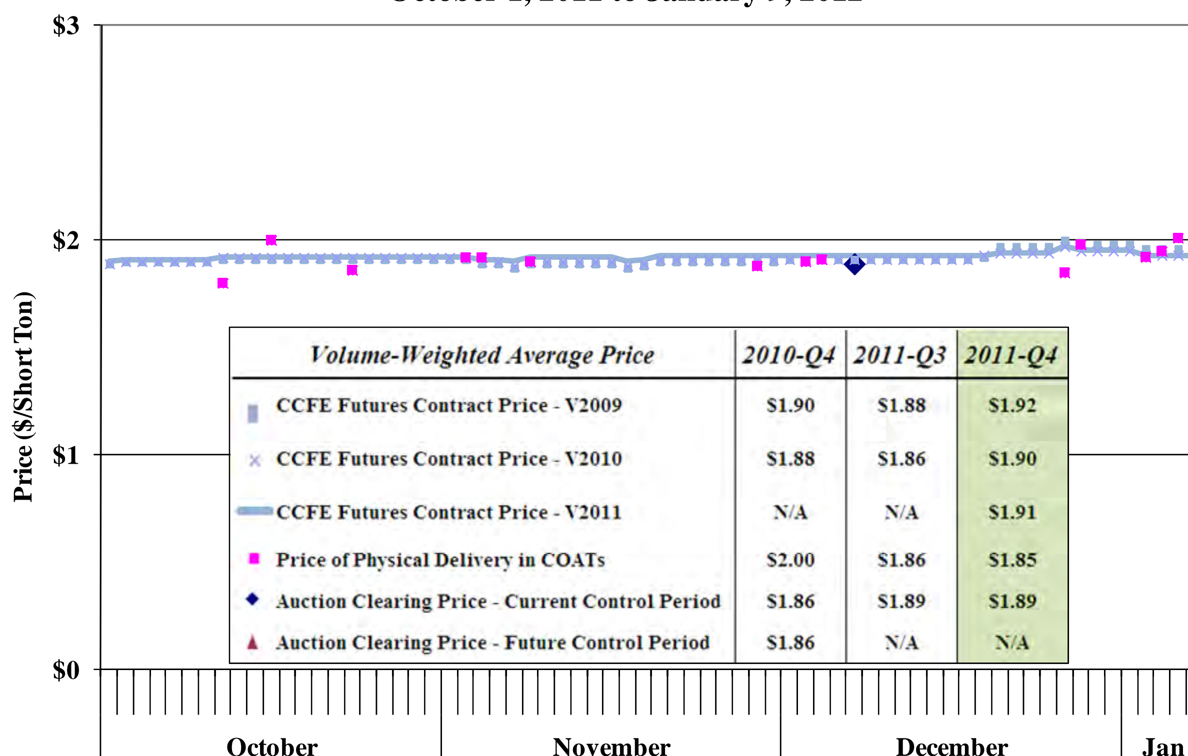
Prices of CO_2 Allowances and Allowance Derivatives

Figure 1 summarizes prices in the secondary market during the period. One light blue series shows the closing price on each trading day of the 2009 vintage CCFE futures contract with delivery at the end of the month.[4] A second light blue series shows the closing price of the 2010 vintage futures contract with delivery at the end of the month. A blue line shows the closing price of the 2011 vintage futures contract with delivery at the end of the month. The pink squares show the volume-weighted average price of physical deliveries in COATS on each day

[4] For instance, in October, the price of the futures contract for October 2011 delivery is shown.

when a transaction took place and where the parties recorded the transaction price.[5, 6] The blue diamond shows the clearing prices of CO_2 allowances sold in the RGGI auction held on September 7 for the current control period (i.e., 2009 through 2011). There were no CO_2 allowances sold in the December auction for the future control period. For comparison, Figure 1 also shows volume-weighted average prices for each category of prices in the fourth quarter of 2011, the previous quarter, and the fourth quarter of the previous year.

Figure 1: Prices in the Secondary Market for RGGI CO_2 Allowances[7]
October 1, 2011 to January 9, 2012



Volume-Weighted Average Price	*2010-Q4*	*2011-Q3*	*2011-Q4*
CCFE Futures Contract Price - V2009	$1.90	$1.88	$1.92
CCFE Futures Contract Price - V2010	$1.88	$1.86	$1.90
CCFE Futures Contract Price - V2011	N/A	N/A	$1.91
Price of Physical Delivery in COATs	$2.00	$1.86	$1.85
Auction Clearing Price - Current Control Period	$1.86	$1.89	$1.89
Auction Clearing Price - Future Control Period	$1.86	N/A	N/A

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5 Parties are required to report the transaction price if there is an underlying financial transaction related to the transfer of allowances between accounts.

6 Many of the transaction prices reported in COATS are associated with physical deliveries that result from the expiration of the previous month's CCFE futures contract. By the third business day following the expiration month of the futures contract, CO_2 allowances are exchanged for funds according to the closing price on the last day of the expiration month.

7 Sources: Auction clearing prices are available at "www.rggi.org/market/co2_auctions/results", CCFE futures contract prices are available at "www.ccfe.com/mktdata_ccfe/futuresSummary.jsf?symbol=rggi", and the prices of physical deliveries in COATS are based on information in COATS available at "https://rggi-coats.org/eats/rggi/".

Key observations regarding CO_2 allowance prices:

- CO_2 allowance prices were stable in the fourth quarter of 2011 as the daily closing price of 2009 vintage allowances remained between $1.88 and $1.97 on days when trades occurred, relatively close to the auction reserve price of $1.89.
- Due to the stability of prices, the historic volatility of 2009 vintage futures prices was 8 percent in the fourth quarter of 2011, down from 13 percent in the fourth quarter of 2010.[8]
- There were only slight differences between the prices of contracts for 2009 vintage, 2010 vintage, and 2011 vintage CO_2 allowances during the fourth quarter. This is to be expected, since they are interchangeable for compliance purposes in the RGGI program.
- CO_2 allowance prices were consistent with the previous quarter as the volume-weighted average price of 2009 vintage allowances increased just 2 percent from the previous quarter.
- The CO_2 allowances that were auctioned on December 7 for the current control period cleared at $1.89, which was equal to the reserve price in the auction. This was slightly lower than the futures prices, which closed at $1.91 on the day before the auction. No CO_2 allowances were sold in the December 7 auction for the future control period.
- The prices of physical deliveries reported in COATS have been generally consistent with the prices reported by the CCFE.

Prices of Options for CO_2 Allowances

The clearing prices of options contracts are important because they can provide insight about how the market expects the price of the underlying commodity to behave. The price of an option depends on two factors: (i) the expected value of the underlying commodity relative to the strike price of the option, and (ii) the expected volatility of the underlying commodity over the period before the expiration date. When call option price decreases coincide with put option price increases, it signals a decrease in the expected price of the underlying commodity. Conversely, when call option prices and put option prices move in the same direction, it signals a change in the expected volatility of the underlying commodity price.

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[8] Historic volatility is a measure of the standard deviation of the day-over-day percentage change in price. Volatility is normally expressed as an estimated standard deviation for a one year period, even if it is calculated

Key observations regarding prices of options for CO_2 allowances in the fourth quarter of 2011:

- There was no trading of options contracts during the fourth quarter of 2011, and there has been only one trade of options contracts since August of 2010.
- The low volume of options trading may reflect that firms perceive little risk from variations in future CO_2 allowance prices. Since the auction reserve price of $1.89 is indexed to inflation, compliance entities are unlikely to be able to obtain CO_2 allowances at a lower price in the future. Prices in the futures market have remained very close to the auction reserve price, suggesting that firms perceive little risk that CO_2 allowances will fall below this level.

from a shorter period of time.

D. VOLUMES AND OPEN INTEREST

This section evaluates the volume of trading and the open interest in exchange-traded futures and options as well as transfers of CO_2 allowances between unaffiliated parties as recorded in COATS. Figure 2 summarizes the volumes of futures and options contracts traded on the CCFE, while Figure 3 shows the open interest. Figure 4 examines the volume of CO_2 allowance transfers recorded in COATS and the net change in allowance ownership recorded in COATS.

Key observations regarding trading volumes and open interest:

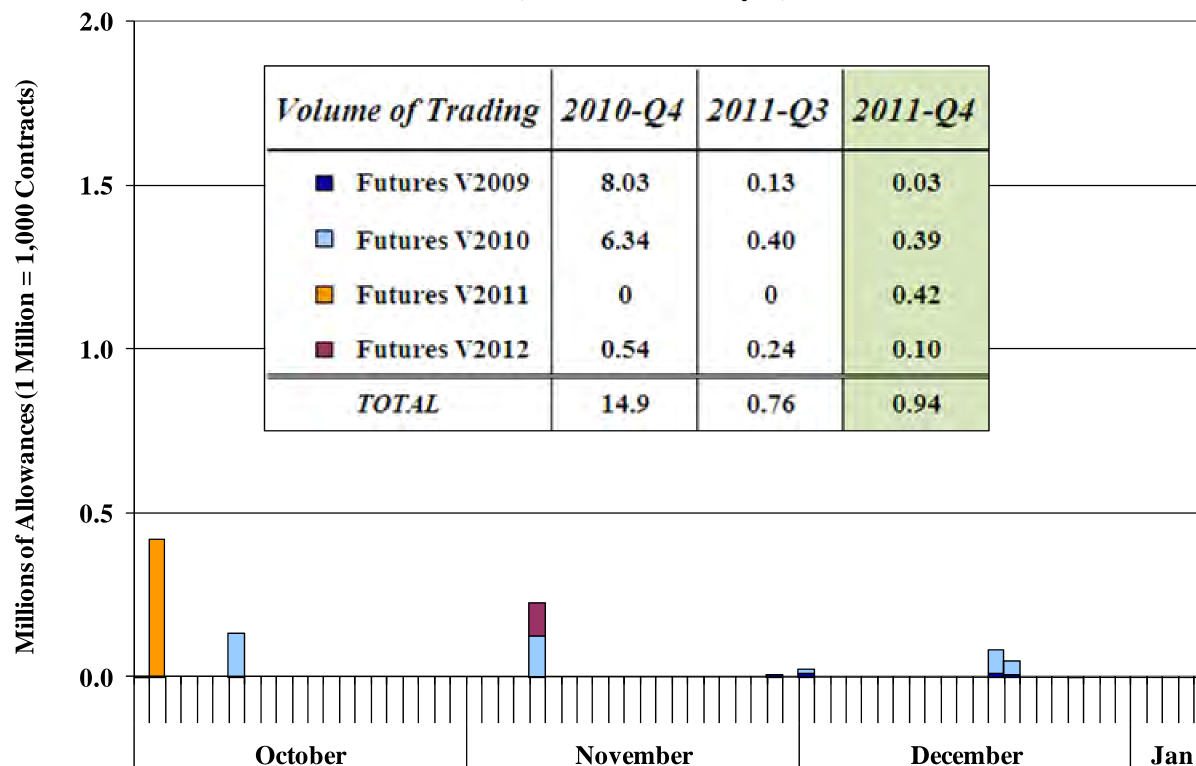
- The volume of futures trading was just 0.94 million CO_2 allowances in the fourth quarter of 2011, down from 14.9 million in the fourth quarter of 2010.
- Futures open interest was 6.0 million CO_2 allowances at the end of the fourth quarter of 2011, down from 21.1 million CO_2 allowances at the end of the fourth quarter of 2010 due to the reduced activity in the futures market in 2011.
- In the fourth quarter of 2011, 4.0 million CO_2 allowances were transferred between unaffiliated firms. The volume of CO_2 allowance transfers:
  - ✓ Decreased from 8.2 million in the third quarter when volumes were still elevated following the May announcement that New Jersey would leave RGGI after the first control period.
  - ✓ Increased from 0.6 million in the fourth quarter of 2010, reflecting that over-the-counter transactions have become more prevalent over the past year, while futures trading volumes have declined.
- The share of CO_2 allowances held by compliance entities and their affiliates was 98 percent following delivery of December 2011 contracts.
- Eighty percent of CO_2 allowances in circulation are held by firms that acquired them directly through the auctions, although there are some firms that have acquired most of the allowances they hold through the secondary market.

Volume and Open Interest in CCFE Futures and Options Contracts

Figure 2 shows the volume of trading on the CCFE each day for futures contracts according to the vintage year. The figure also shows the volume of trading for each product in the fourth

quarter of 2011, in the previous quarter, and in the fourth quarter of the previous year. The volume of options trading is not shown in the figure, since there were no trades during the study period.

Figure 2: Volume of Trading of CCFE Futures Contracts[9]
October 1, 2011 to January 9, 2012



Volume of Trading	*2010-Q4*	*2011-Q3*	*2011-Q4*
Futures V2009	8.03	0.13	0.03
Futures V2010	6.34	0.40	0.39
Futures V2011	0	0	0.42
Futures V2012	0.54	0.24	0.10
TOTAL	14.9	0.76	0.94

Key observations regarding the volume of CCFE futures trading:

- The volume of futures trading was just 0.94 million CO_2 allowances in the fourth quarter of 2011, up from 0.76 million allowances in the third quarter and down from 14.9 million in the fourth quarter of 2010.

Figure 3 shows the open interest on each day for the futures contracts shown in the previous figure as well as for options contracts. For comparison, Figure 3 also shows the total open interest for each product at the end of the fourth quarter of 2011, the previous quarter, and the fourth quarter of the previous year.

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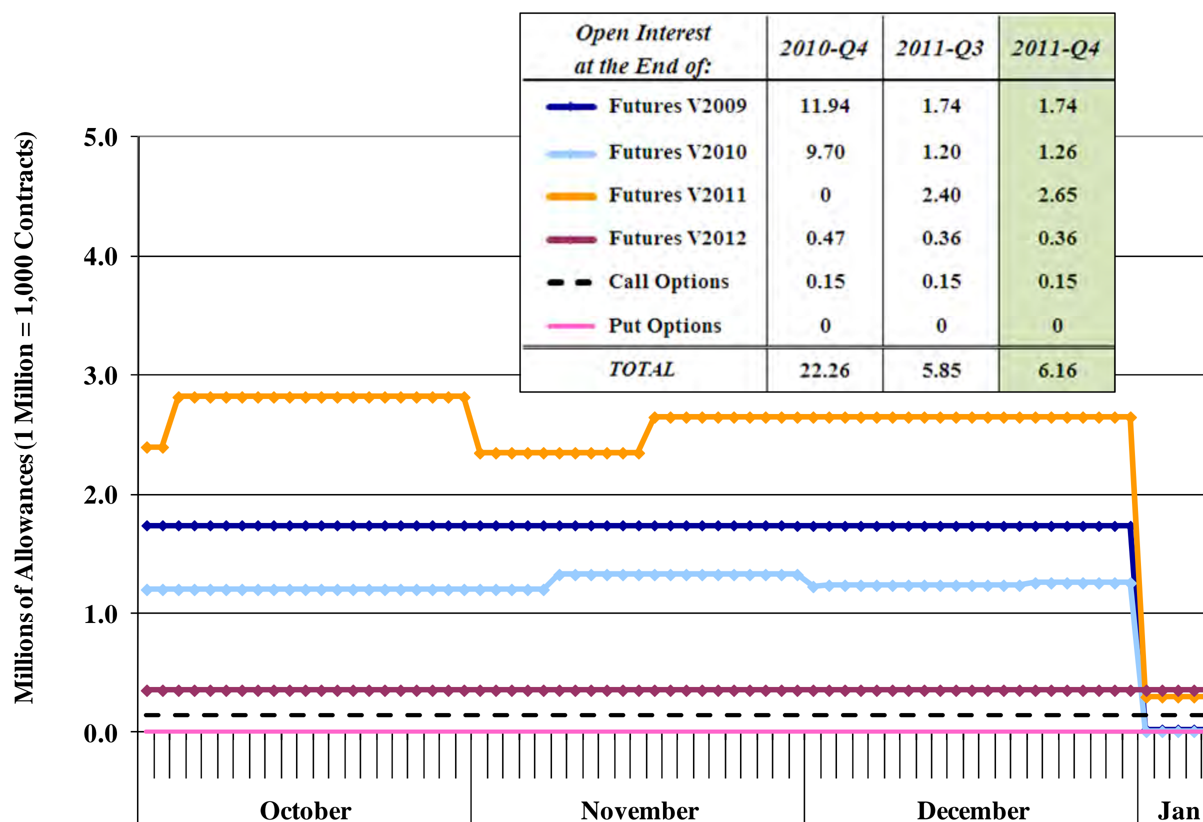
9 Sources: Options volumes are available at "www.ccfe.com/mktdata_ccfe/optionsSummary.jsf?symbol =rggi"

Figure 3: Open Interest in CCFE Futures and Options[10,11]
October 1, 2011 to January 9, 2012



Open Interest at the End of:	2010-Q4	2011-Q3	2011-Q4
Futures V2009	11.94	1.74	1.74
Futures V2010	9.70	1.20	1.26
Futures V2011	0	2.40	2.65
Futures V2012	0.47	0.36	0.36
Call Options	0.15	0.15	0.15
Put Options	0	0	0
TOTAL	22.26	5.85	6.16

Key observations regarding the open interest in CCFE futures and options contracts:

- Futures open interest increased from 5.7 million CO_2 allowances at the end of the third quarter to 6.0 million CO_2 allowances at the end of the fourth quarter of 2011.
- Futures open interest decreased 73 percent from 21.1 million CO_2 allowances at the end of the fourth quarter of 2010, reflecting less activity in the futures market in 2011.
- After the end of the fourth quarter of 2011, futures open interest fell 88 percent, reflecting that the vast majority of futures contracts were for December 2011 delivery.

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and futures volumes are available at "www.ccfe.com/mktdata_ccfe/futuresSummary.jsf?symbol =rggi".

10 Sources: Open interest in options is available at "www.ccfe.com/mktdata_ccfe/optionsSummary.jsf ?symbol=rggi", and open interest in futures is available at "www.ccfe.com/mktdata_ccfe/futures Summary.jsf?symbol=rggi".

11 The table in the figure reports the open interest at the end of each quarter just prior to the delivery or expiration of contracts at the end of the quarter.

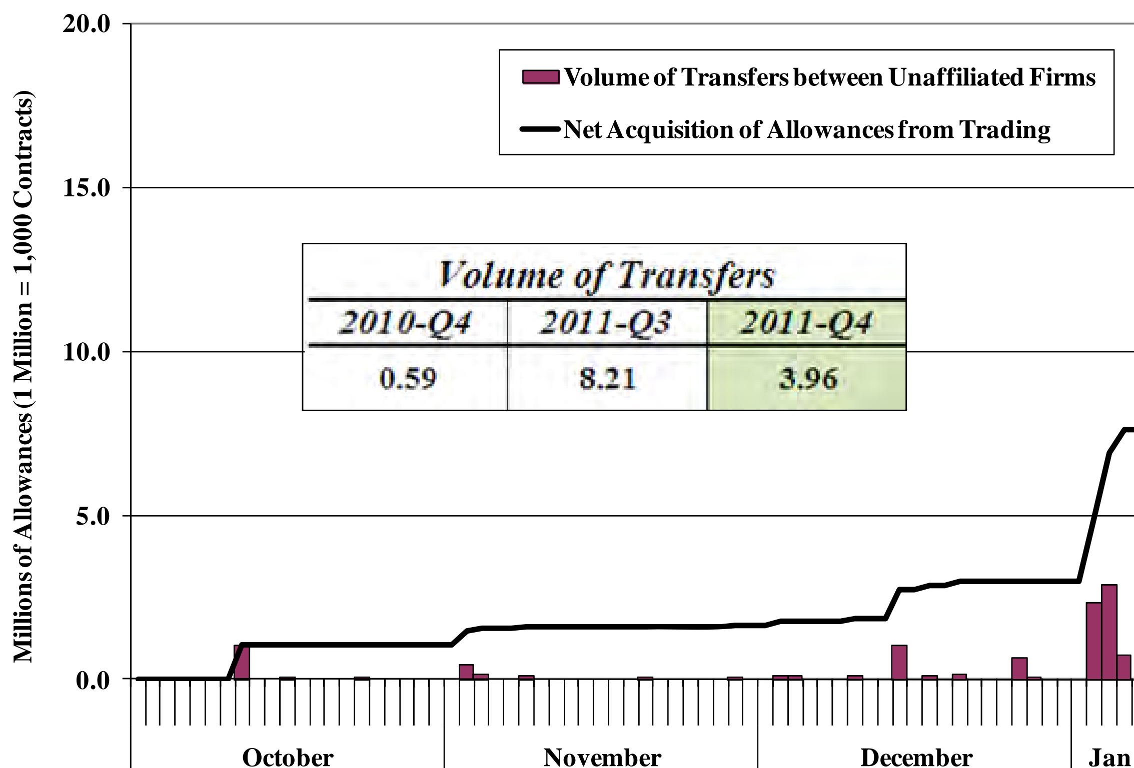
CO_2 Allowance Transfers Registered in COATS

Figure 4 summarizes transfers of CO_2 allowances between the COATS accounts of unaffiliated firms. The figure shows the volume of COATS transfers between unaffiliated firms and the net amount of CO_2 allowances that have been acquired as a result of transactions between unaffiliated firms during the fourth quarter of 2011.[12] The figure shows data through the first five trading days of January in order to include transfers that result from the delivery of futures and forward contracts with a December 2011 delivery month. The figure also shows the volume of transfers in the fourth quarter of 2011 compared to the prior quarter and to the fourth quarter of the previous year.

The net amount of CO_2 allowances that were acquired from transactions is smaller than the gross volume of transactions between unaffiliated firms because the net acquisition offsets sales against purchases for each firm. For example, if Firm A purchases 100,000 CO_2 allowances but then sells 20,000 allowances, the figure would show a net acquisition by Firm A of 80,000 allowances even though the volume of transfers would be 120,000 allowances.

[12] This excludes the majority of allowances, which are held by firms that purchased them directly in the auction, received them through allocations by one of the Participating States, or acquired them as a result of a transaction prior to the fourth quarter of 2011.

Figure 4: Net Acquisition of CO_2 Allowances from Trading[13]
October 1, 2011 to January 9, 2012



Key observations regarding the transfer of CO_2 allowances in COATS between unaffiliated firms:

- In the fourth quarter of 2011, 4.0 million CO_2 allowances were transferred between unaffiliated firms. The volume of CO_2 allowance transfers decreased from 8.2 million in the third quarter when volumes were still elevated following the May announcement that New Jersey would leave RGGI after the first control period.

- The volume of CO2 allowance transfers increased from 0.6 million in the fourth quarter of 2010. This reflects that over-the-counter transactions have become more prevalent over the past year, while futures trading volumes have declined.

- The net amount of CO_2 allowances acquired through the secondary market during the period shown in Figure 4 (3.0 million) is smaller than the total number of allowances exchanged between unaffiliated firms (4.0 million) because some firms both purchased and sold allowances during the period.

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[13] Source: CO_2 allowance transfers are based on information in COATS.

E. Open Interest of Individual Firms in Futures and Options Contracts

This section discusses additional information about the firms trading CCFE futures and options from the weekly Commitments of Traders ("COT") reports, which are published by the Commodity Futures Trading Commission ("CFTC").[14]

Participation in the market for RGGI CO_2 allowance derivatives remained low as the numbers of firms maintaining significant positions in each vintage continued to be lower than 20 throughout the fourth quarter of 2011. The CFTC does not publish information from the COT reports for a particular vintage at times when fewer than 20 firms have reportable positions, so no specific information was published during the third quarter.

Although firm-level information on open interest is not available, the information shown in Figure 3 provides an indication of the upper limits of the net long and net short positions of individual firms. Combined with firm-specific information about allowance holdings from COATS, the information on open interest that is shown in Figure 3 is useful for evaluating the potential for a firm to hoard RGGI allowances.

[14] Each day, firms with an open interest of 25 contracts or more are required to report their positions to the CFTC. The CFTC categorizes each firm as Commercial if it engages in trading primarily to supply its own need for allowances or Non-Commercial if it trades for another purpose. Hence, compliance entities are generally designated as Commercial and non-compliance entities are frequently designated as Non-Commercial. Each Tuesday, the CFTC publishes the COT report, which is a summary of the long and short positions of participants in the market.

F. Discussion of Market Monitoring

As the RGGI Market Monitor, we monitor trading in the secondary CO_2 allowance market in order to identify anticompetitive conduct. Additionally, the Commodity Futures Trading Commission ("CFTC") evaluates trading in the secondary CO_2 allowance market consistent with its role as the regulator of futures and option markets in the U.S. This section discusses two types of anti-competitive conduct for which we monitor. As in previous reports on the secondary market, we find no evidence of anti-competitive conduct.

In any commodity market, one potential concern is that a firm could hoard a substantial share of the supply of a commodity to influence prices or to prevent a competitor from obtaining CO_2 allowances. Hence, we screen information on the holdings of CO_2 allowances and allowance-derivatives and the demand for allowances to identify firms that might acquire a position that raises competitive concerns. During the first control period, hoarding was not a significant concern for the RGGI CO_2 allowance market because the amount of allowances that were available through the auctions was more than sufficient to satisfy the demand for allowances. During the second control period, which began in January 2012, the ability of an individual firm to hoard will be limited by the market rules, particularly the auction rules that limit the amount of allowances that can be purchased by a single party or group of affiliated parties in a single offering to 25 percent.

Another potential concern is that a firm expecting to purchase CO_2 allowances in the auction might sell a large number of futures contracts in an effort to push the futures price below the competitive level. Such a firm might profit from buying a large number of CO_2 allowances in the auction at a discount if the bidding in the auction were influenced by the depressed futures price. For this to be a profitable strategy, the firm would need to be able to substantially depress the futures price with a relatively small amount of sales—an amount smaller than the amount of CO_2 allowances it planned to buy in the auction. The best protection against this strategy is a market where other firms respond by making additional purchases. Firms that are looking for an opportunity to reduce their short positions or to purchase CO_2 allowances for their future

compliance needs help limit the effectiveness of a strategy to depress prices below the competitive level. Given current price levels relative to the floor price for CO_2 allowances, firms would have a strong incentive to make additional purchases if a firm deliberately attempted to depress the futures price. Nevertheless, the CFTC has access to confidential transaction data, which allows it to monitor for evidence of manipulative conduct.