
RGGI Inc.



**REPORT ON THE SECONDARY MARKET
FOR RGGI CO₂ ALLOWANCES**

Prepared for:

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

Prepared By:

**POTOMAC
ECONOMICS**

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The Regional Greenhouse Gas Initiative (RGGI) is a cooperative effort by participating states to reduce emissions of carbon dioxide (CO₂), a greenhouse gas that causes global warming.

RGGI, Inc. is a non-profit corporation created to provide technical and administrative services to the CO₂ 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 allowances consists mainly of the auctions where allowances are initially sold. Once an allowance is purchased in the primary market, it can then be resold in the secondary market. The secondary market for RGGI 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 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 second quarter of 2009 and discusses the results of our market power screens. Several patterns have emerged in this period in the secondary market:

- RGGI futures prices were more stable in the second quarter of 2009 than in previous periods, indicating greater certainty about the value of RGGI allowances in the future.
- The volume of trading continued to grow rapidly in the second quarter of 2009 as the volume of futures contract trading increased more than five-fold from the first quarter of 2009 to the second quarter.
- The net transfer of ownership of allowances between unaffiliated firms more than doubled from the end of the first quarter of 2009, showing that market participants are obtaining allowances through the secondary market to an increasing extent. However, the vast majority of allowances held have been acquired through RGGI auctions.
- The number of participants in the market for RGGI allowance derivatives increased over the period. More than 30 firms had significant financial positions in RGGI futures and options contracts by the end of the second quarter of 2009, as compared to 26 at the end of the first quarter.

In the initial period of trading in the secondary market, we find no evidence of anticompetitive conduct. Participation by a large number of firms is an encouraging sign of competitiveness and

efficiency in the secondary market. Nevertheless, we will continue to evaluate the competitiveness of the market.

B. BACKGROUND

The secondary market for RGGI 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 CO₂ 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 allowances are traded on two public exchanges: the Chicago Climate Futures Exchange ("CCFE") and the Green Exchange, an initiative of the New York Mercantile Exchange ("NYMEX"). Three categories of standard contracts are traded on these public exchanges:

- **Futures** – Under these contracts, two parties agree to exchange a fixed number of 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 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 allowance that is to be transferred. One standard futures contract equals 1,000 RGGI allowances.
- **Call Options** – Call options give the purchaser the option to buy a fixed number of 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 2009 expiration date. If the price of the corresponding futures contract rose to \$5.75, the firm could exercise the option to buy allowances at \$5 and immediately sell them at \$5.75. Alternatively, if the price of the futures 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 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.¹

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.² Compliance entities may prefer to buy RGGI allowances bundled with other goods and services from their fuel suppliers or 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.

¹ 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 firm 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 firm's account (to the account of a firm with a short position), and the firm 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.

² 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 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 allowances during the second quarter of 2009. The first figure shows the transaction prices of actual allowances and futures contracts for allowances, while the second figure shows the prices of options contracts for allowances. For context, the figures in this section also show prices from March 2009 through the first full week of July 2009 when settlement was completed for futures contracts for June 2009 delivery.

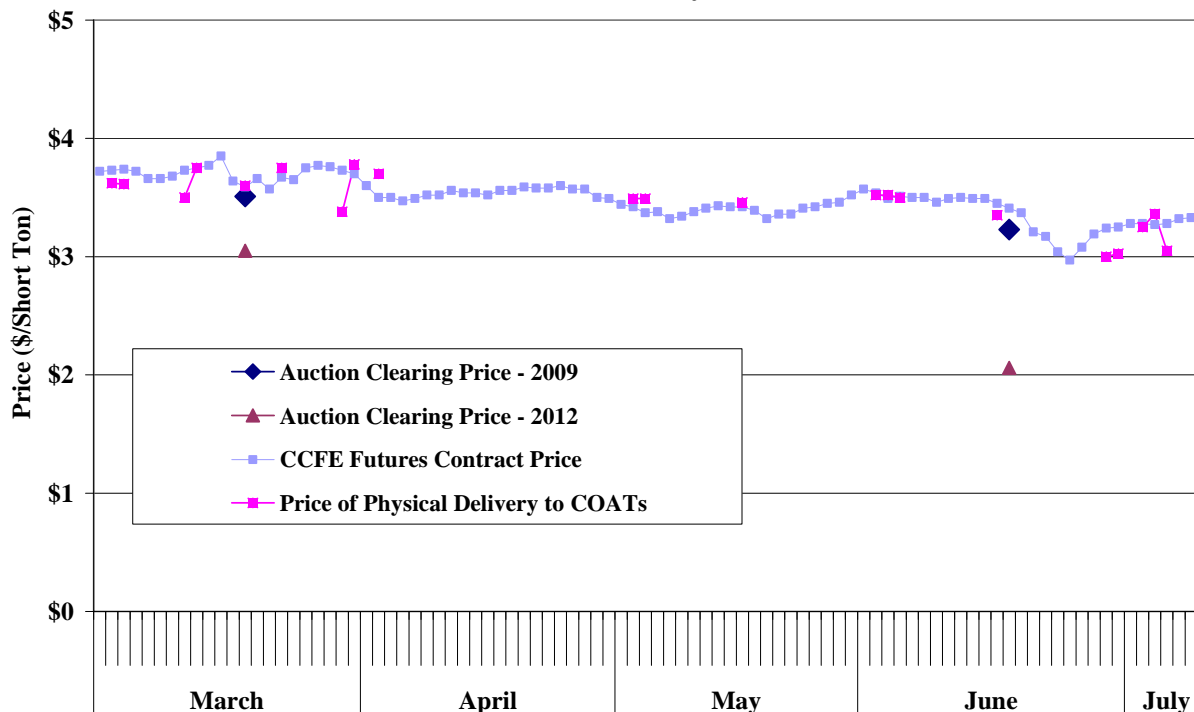
Figure 1 summarizes prices in the secondary market during the period. The light blue line shows the closing price on each trading day of the CCFE futures contract with delivery at the end of the month.³ Futures prices are not shown for the Green Exchange where very few contracts have been traded thus far. The squares show the volume-weighted average price of physical deliveries to COATS on each day when a trade occurred and where the parties recorded the transaction price.⁴ For comparison, Figure 1 also shows the clearing prices in the RGGI auctions held on March 18 and June 17.

Information about the value of RGGI allowances comes from the trading of standard futures contracts on the CCFE. For the period shown in Figure 1, the daily closing price for CCFE futures contracts averaged \$3.49 and ranged as low as \$2.97 on June 24 and as high as \$3.85 on March 16. CCFE futures prices were relatively constant during the period, although there were brief periods of increased volatility in the days following the March 18 and June 17 auctions. Overall, the historic volatility of CCFE futures prices has declined markedly since the inception of the RGGI futures contract in August 2008. The average daily change (up or down) in the closing price has declined from \$0.09/day in the fourth quarter of 2008 to \$0.06/day in the first quarter of 2009 and \$0.04/day in the second quarter of 2009.

³ For instance, in April, the price of the futures contract for April 2009 delivery is shown.

⁴ Parties are required to report the transaction price if there is an underlying financial transaction related to the transfer of allowances between accounts.

**Figure 1: Prices in the Secondary Market for RGGI Allowances
March 2, 2009 to July 10, 2009**



Sources: Auction clearing prices are available at "www.rggi.org/co₂-auctions/results", CCFE futures contract prices are available at "www.ccfе.com/mktdata_ccfe/futuresSummary.jsf?symbol=rggi", and the prices of physical deliveries to COATS are based on information in COATS available at "https://rggi-coats.org/eats/rggi".

The clearing prices in the March 18 and June 17 auctions for the 2009 vintage allowances were slightly lower than CCFE futures prices.⁵ Relative to CCFE futures prices, allowances were sold at a 2 percent discount in the March auction and a 5 percent discount in the June auction. CCFE futures prices bounced up in the two weeks immediately following the March auction before returning to a level more consistent with the auction clearing price. The opposite pattern occurred after the June auction as futures prices dipped for several days before returning to a level slightly higher than the auction clearing price.

⁵ We also reviewed OTC transaction prices reported by Point Carbon and Platts, which have been very consistent with the CCFE futures prices for comparable contracts. Point Carbon publishes an OTC price assessment weekly in "Carbon Market North America." Platts collects OTC data that is available by subscription.

Figure 1 also shows the clearing prices for the 2012 vintage allowances that were sold in the March 18 and June 17 auctions. The 2012 vintage allowances cleared at a 13 percent discount to the 2009 vintage allowances in the March auction and a 36 percent discount in the June auction. During the period shown, there was only one trade of a CCFE contract for 2012 vintage allowances for just 10,000 allowances at a 2 percent discount to the comparable contract for 2009 vintage allowances, and there have not been any transfers of 2012 vintage allowances registered in COATS.

The prices of physical deliveries to COATS have been generally consistent with the prices reported by the CCFE. This is particularly true for the physical deliveries to COATS that result from the expiration of the previous month's futures contract. Several business days after futures contracts reach expiration, allowances are exchanged for funds according to the closing price on the last day of the expiration month.^{6, 7} However, in some cases, the prices of physical deliveries to COATS have been substantially higher or lower than prices on the CCFE. Such cases can occur when the delivery results from: settlement of a forward contract signed at an earlier date when the futures price was higher or lower,⁸ the exercise of an option with a strike price substantially higher or lower than the futures price, or settlement of a contract bundling the sale of allowances with additional services. Hence, the usefulness of the transaction prices reported in COATS is limited by the fact that transferring parties do not necessarily report all of the important details related to the transaction.

⁶ Physical deliveries to COATS generally occur on the third business day following the expiration day of the futures contract. For instance, contracts for June 2009 delivery resulted in transfers in COATS on July 6, 2009.

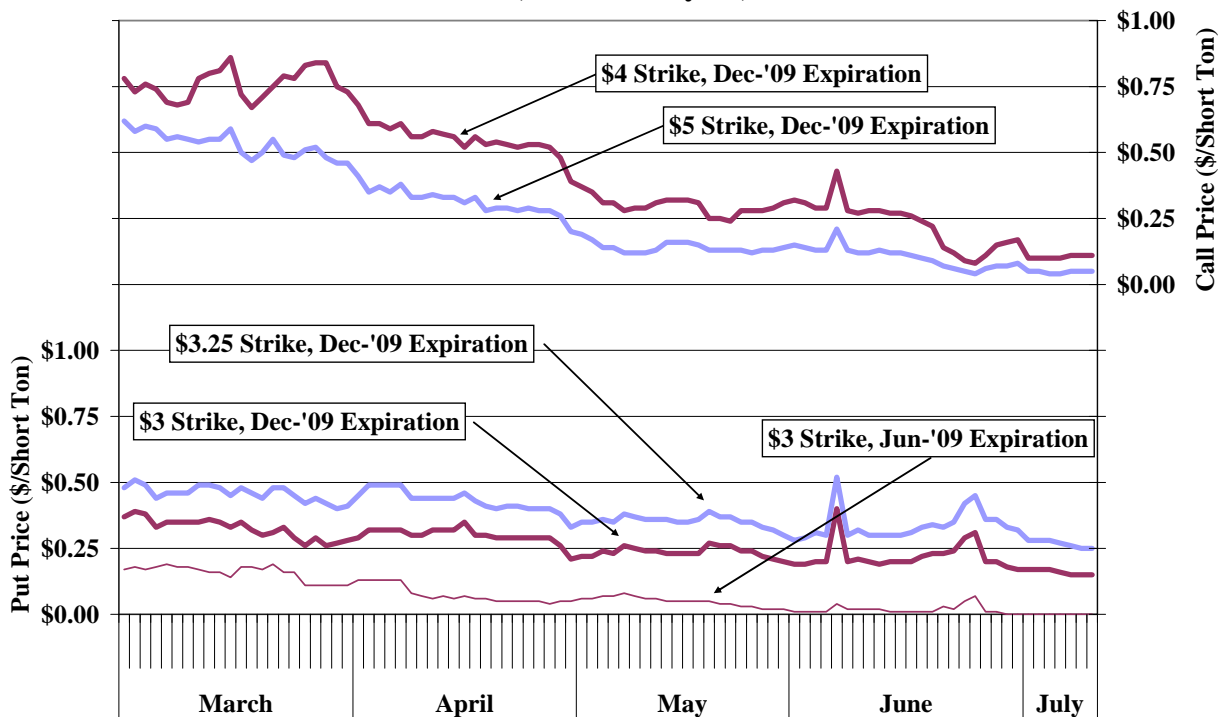
⁷ A futures contract requires parties with an open interest to post financial assurance in an account with the exchange until the contract reaches expiration. The exchange continually withdraws and deposits funds according to changes in the prices of the contracts in which the party has interest. For example, if a firm buys a contract for 1,000 allowances at \$3.50/allowance, the firm 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 firm's account (to the account of a firm with a short position), and the firm is only required to keep \$3,000 in the account.

⁸ 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 expiration, while a forward contract requires that all financial settlement occur at expiration.

It is notable that futures price volatility declined after the March 18 auction. Figure 1 shows that futures closing prices remained between \$3.32 and \$3.60 from April 1 until the June 17 auction. Likewise, futures closing prices dipped after the June 17 auction before settling into a range between \$3.24 and \$3.33 from June 29 to the end of the period on July 10.

Figure 2 summarizes the prices of five options contracts at the close of the trading day from March 2, 2009 to July 10, 2009, although a total of 16 different options contracts were traded during the period. Figure 2 illustrates how option prices vary by the strike price and expiration date and how they respond to news affecting the outlook for RGGI allowances. The top half of the figure shows the prices of two call options, one with a strike price of \$4.00 and one with a strike price of \$5.00. The bottom half of the figure shows the prices of three put options, two with strike prices of \$3.00 and one with a strike price of \$3.25. For the put options with \$3.00 strike prices, one has a June 2009 expiration and one has a December 2009 expiration.

**Figure 2: Prices of Put and Call Options for RGGI Allowances
March 2, 2009 to July 10, 2009**



Source: Options prices are available at "www.ccf.com/mktdata_ccfe/optionsSummary.jsf?symbol=rggi".

Figure 2 shows the importance of the strike price to the value of an option. For an option with a particular expiration date, a lower strike price makes a call option more valuable and a put option less valuable. For example, the call options with December 2009 expiration (the two thick lines in the top half of Figure 2) track closely throughout the period, with the \$4 strike option trading at a premium over the \$5 strike option.

The expiration date of an option also greatly affects its value. The options with the earlier expiration date (e.g., June 2009) are substantially less valuable than the comparable options with a later expiration date (e.g., December 2009). For example, by June 1, 2009 the put option shown above with June 2009 expiration had dropped to \$0.01, because allowance futures were trading over \$3.50 and it seemed unlikely that the futures price would drop sufficiently for it to be profitable to exercise the option. In contrast, on June 1, 2009, the comparable put option with December 2009 expiration was available at \$0.19, reflecting more uncertainty about allowance prices over the subsequent 7 months.

Fluctuations in options prices 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, 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. For example, this occurred after the June auction when the futures price declined from June 18 to 24.

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. For example, put and call prices gradually declined during the month of April during which time the futures prices fluctuated far less than in previous periods.

Overall, Figure 2 shows a marked decline in options prices during the period, indicating much greater certainty about the value of RGGI allowances in the future. The price of a put option with December 2009 expiration and a \$3-strike decreased 86 percent, and in the same period, the price of a call option with December 2009 expiration and a \$4-strike decreased 59 percent. Call

options prices declined more than put options prices, which is consistent with the 10 percent decrease in the nearest month futures price from March 2 to July 10. Some of the decline in the options prices occurred because the time to expiration of the options with December 2009 expiration declined from 10 months at the beginning of the period shown to 6 months at the end of the period. The general decrease in options prices also indicates that the implied volatility of futures prices declined considerably during the period. Based on standard methods of option-pricing, the options prices in Figure 2 indicate that the annualized implied volatility of RGGI allowance prices declined from a standard deviation of 66 percent on March 2 to 35 percent on July 10.⁹

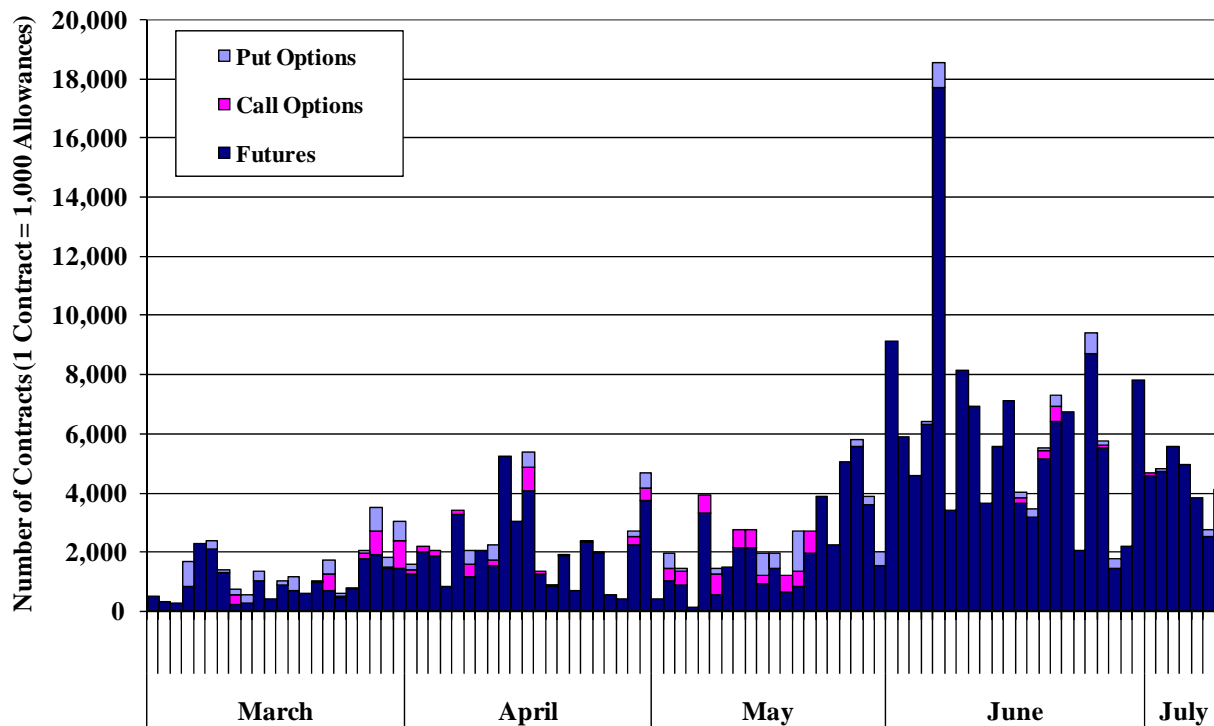
⁹ The annualized volatility, which may be inferred from the option prices, is the expected standard deviation of the RGGI allowance price one year in the future, measured as a percentage of the expected RGGI allowance price.

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 allowances between unaffiliated parties that are reflected in COATS. Open interest is the net amount of futures or options contracts that have been traded, but have not reached the time of delivery, expired, or been exercised. For example, if Firm A sells 100 contracts 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 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.

Figure 3 shows the volume of trading on the CCFE each day for futures and options.

**Figure 3: Volume of Trading of CCFE Futures and Options
March 2, 2009 to July 10, 2009**



Sources: Options volumes are available at “www.ccf.com/mktdata_ccfe/optionsSummary.jsf?symbol=rggi” and futures volumes are available at “www.ccf.com/mktdata_ccfe/futuresSummary.jsf?symbol=rggi”.

The volume of trading in futures contracts increased significantly during the period, from an average daily amount of nearly 1 million allowances in March to nearly 6 million allowances in June. The total volume of futures trading increased from 33 million allowances in the first quarter to 214 million allowances in the second quarter. The volume traded in the second quarter was much larger than both the number of allowances auctioned (33 million) and the estimated emissions from budget sources (less than 40 million) in the same period. The most liquid futures contract is the 2009 vintage contract for December 2009 delivery, accounting for 58 percent of the volume traded in the second quarter of 2009. During this period, the end of month contract (e.g., the April 2009 contract during April or the May 2009 contract during May) accounted for 27 percent of the volume, while other contracts accounted for the remaining 15 percent.

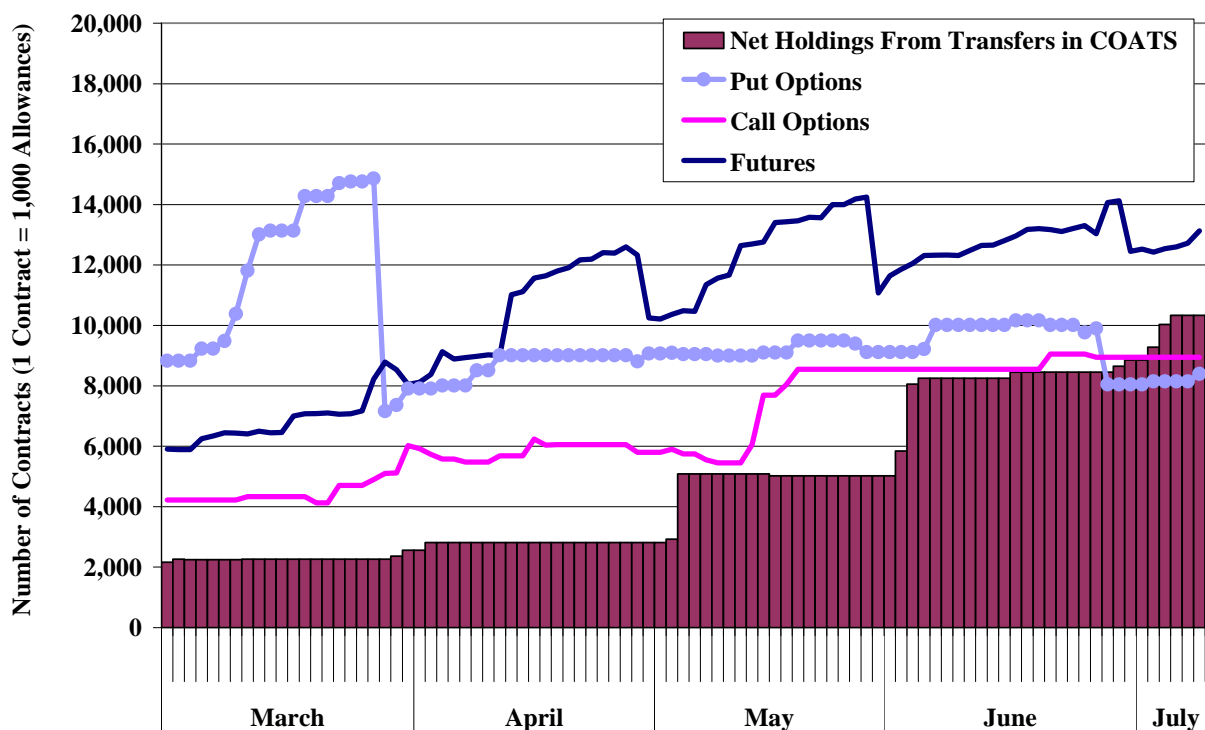
The volume of trading in options contracts decreased from an average daily amount of 363 contracts in March to only 186 contracts in June. Of the options traded during the second quarter of 2009, approximately half were call options expiring in December 2009 with strike prices ranging from \$3.50 to \$7.50. 51 percent were put options and 25 percent were put options with a strike price of \$3.00, but significant volumes of put options with strike prices of \$2.00 and \$3.25 were also traded.

Figure 4 shows the open interest on each day for the futures and options contracts shown in the previous figure. Figure 4 also shows the net change in allowance holdings of all firms in the COATS registry as a result of transactions between unaffiliated firms.¹⁰ The net change in holdings is smaller than the gross volume of transactions between unaffiliated firms, because the net change in holdings offsets sales against purchases for each firm. For example, if firm A transfers 100,000 allowances to Firm B but then Firm B transfers 20,000 allowances to Firm A, the figure would show a net change of 80,000 even though the volume of transfers would be 120,000. This is an important distinction because the total net change since RGGI allowances

¹⁰ 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 had them transferred from an affiliated firm.

have been circulating was 10.3 million as of July 10, while the gross volume of trading between unaffiliated firms was 15.2 million allowances.

**Figure 4: Open Interest in CCFE Futures and Options
March 2, 2009 to July 10, 2009**



Sources: Physical holdings of allowances are based on information in COATS, open interest in options is available at "www.ccf.com/mktdata_ccfe/optionsSummary.jsf?symbol=rggi", and open interest in futures is available at "www.ccf.com/mktdata_ccfe/futuresSummary.jsf?symbol=rggi".

The open interest shows that the positions of firms trading futures and options have been increasing over the period. In Figure 4, the first significant decline in the open interest in futures resulted from the delivery of futures contracts with a delivery month of April 2009. On May 5, the delivery of these futures contracts led to a substantial rise in the allowance holdings registered in COATS as a result of trading. Then the deliveries of the May futures contract (on June 2 & 3) and the June futures contract (on July 2 & 6) account for most of the remainder. Otherwise, few allowance trades have been registered in COATS.

Although the total open interest in futures contracts briefly declined following the delivery of the April, May, and June contracts, the total open interest increased from 8.1 million after delivery of the March contract to 12.5 million after delivery of the June contract. As of July 10, 82

percent of the open interest in RGGI futures contracts was for the benchmark contract (i.e., the 2009 vintage contract for December 2009 delivery).

The net amount of transfers registered in COATS between unaffiliated firms increased from 2.8 million after delivery of the March 2009 contract to 10.3 million after the delivery of the June 2009 contract. The rise in COATS activity resulted primarily from increased trading of futures contracts on the CCFE in the second quarter of 2009.

The sum of open interest in futures contracts and net transfers registered in COATS provides a sense of the overall amount of RGGI allowances that have been acquired through the secondary market. The sum of these two quantities rose from 10.9 million allowances after delivery of the March 2009 contract to 22.8 million allowances after delivery of the June 2009 contract. The increase in this sum is substantial, but still modest compared with the 33.1 million allowances acquired in the June 2009 auction. Hence, the auctions are still the principal means by which firms have acquired control of RGGI allowances (assuming that open interest in OTC contracts is modest).

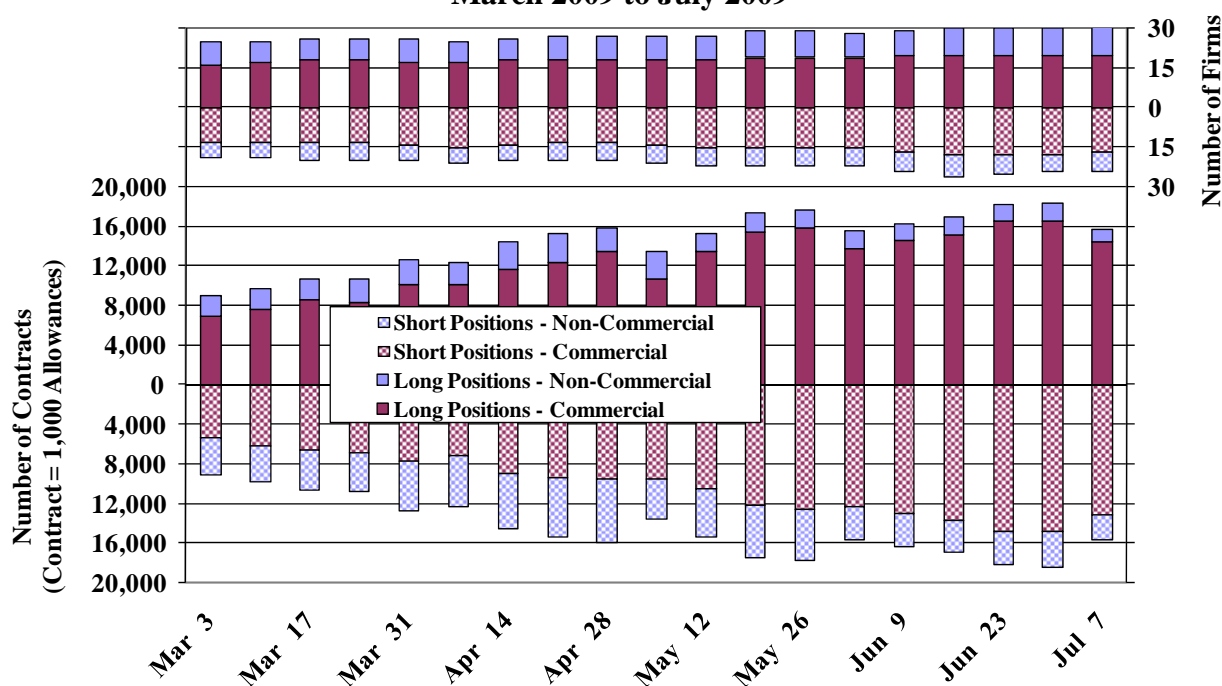
The open interest in options generally increased until late March when a large number of put option contracts reached expiration. Most of the put option contracts reaching expiration on March 27 had strike prices of \$3.00 or \$3.25. These outcomes suggest that some firms with long positions were seeking insurance against an unexpectedly low clearing price in the March 18 auction. The open interest in call options grew significantly during the period, particularly in late March and early May as firms purchased call options with strike prices as high as \$7.50.

Figure 5 provides additional information about the firms trading CCFE futures and options from the weekly Commitment of Traders (“COT”) reports, published by the Commodity Futures Trading Commission (“CFTC”). 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 generally designated as Non-Commercial. Each

Tuesday, the CFTC publishes a summary of the long and short positions of participants in the market.

Figure 5 summarizes the long and short positions of Commercial and Non-Commercial firms on a weekly basis. It shows the number of firms with long positions and the number of firms with short positions. It also shows the aggregate size of all long positions and the aggregate size of all short positions. Since each contract has a buyer and a seller, the total open interest in the market is equal to the total of all long positions and it is equal to the total of all short positions. The total open interest implied by the amount of long and short positions in Figure 5 is smaller than the sum of open interest in futures and options in Figure 4, because some firms buy or sell options contracts that offset or have a discounted impact on their long or short positions.

**Figure 5: Open Interest in the CCFE Futures and Options
March 2009 to July 2009**



Source: The CFTC's Commitment of Traders reports which are available at "www.cftc.gov/marketreports/commitmentsoftraders/index.htm"

Since the CFTC began publishing COT reports for the CCFE's RGGI contracts, a substantial number of firms have been active in taking short and long positions (24 and 31 as of July 7). Commercial firms (i.e., compliance entities) account for a large majority of long and short

positions. As of July 7, 92 percent of long positions and 84 percent of short positions were held by Commercial firms. The shares of positions held by Commercial firms have increased during the second quarter of 2009, from 82 percent of long positions and 58 percent of short positions on April 7. Non-Commercial firms have participated in the secondary market primarily by taking short positions, although the net amount of short positions declined from 5.2 million on April 7 to 2.5 million on July 7. It is likely that many firms with short positions on the CCFE also hold physical allowances that were purchased in one of the auctions.

The preceding figures show that activity in the secondary market continued to rise as the volume of trading of standard futures and options contracts rose again in the second quarter of 2009. As of July 7, the total open interest in exchange-traded futures and options contracts (on a combined basis) was approximately 15.7 million allowances and the net physical transfer of allowances from trading that has been registered in COATS was 10.3 million allowances. However, the total transfer of control of allowances from trading is still far lower than the 33.1 million allowances sold in the June 2009 auction. Hence, the auctions are still the principal means by which firms have acquired control of RGGI allowances.

E. DISCUSSION OF MARKET MONITORING

As the RGGI Market Monitor, we monitor trading in the secondary market in order to identify anticompetitive conduct. Additionally, the Commodity Futures Trading Commission (“CFTC”) evaluates trading in the secondary market consistent with its role as the regulator of futures and option markets in the U.S.

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 allowances. Hence, we screen information on the holdings of allowances and allowance-derivatives and the demand for allowances to identify firms that might acquire a position that raises competitive concerns. At this stage, hoarding is not a significant concern for the RGGI allowance market because the amount of allowances in circulation and the open interest in allowance derivatives is small relative to the total supply of allowances. The total supply of allowances that will ultimately be available in the first compliance period (from 2009 to 2011) is more than 560 million. Given that only 122 million allowances are circulating in the secondary market,¹¹ that the auction rules limit the amount of allowances that can be purchased by a single party, to 25 percent, and that the net transfers between parties in the secondary market have been modest thus far, it is not yet possible for the holdings of any participant to raise potential hoarding concerns.

Another potential competitive issue is that a firm expecting to purchase 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 allowances in the auction at a discount if the bidding in the auction were influenced by the depressed futures price. In a highly liquid market, this strategy would not be profitable because it would have a minimal effect on the futures price. Hence, it is encouraging that the volume of trading grew significantly

¹¹ 112 million allowances have been dispersed in the first four auctions, and 10 million allowances have been allocated by the states.

in the second quarter of 2009 and that the CFTC reports that a substantial number of firms have been taking short and long positions in RGGI futures and options contracts. However, we will continue to monitor for this concern.