
REGI Inc.



**ANNUAL REPORT ON THE MARKET
FOR REGI CO₂ ALLOWANCES: 2010**

Prepared for:

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

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**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.

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I. EXECUTIVE SUMMARY

The Regional Greenhouse Gas Initiative (“RGGI”) began full operation on January 1, 2009, becoming the first mandatory cap-and-trade program to limit CO₂ emissions in the United States. Currently, approximately 95 percent of the CO₂ emissions from the electric power generation sector in ten states in the northeast and mid-Atlantic regions are regulated under the program. RGGI distributes CO₂ emissions allowances to the market primarily through auctions, making it distinctive among existing cap-and-trade programs. 94 percent of the CO₂ allowances in circulation at the end of 2010 initially entered the market through one of the auctions. By the end of 2010, the RGGI participating states conducted ten successful auctions, selling a total of 319 million CO₂ allowances for \$777 million.

This report evaluates activity in the market for RGGI CO₂ allowances in 2010, focusing on the following areas: allowance prices, trading and acquisition of allowances in the auctions and the secondary market, participation in the market by individual firms, and market monitoring.

CO₂ Allowance Prices

The prices of CO₂ allowances for the current control period decreased during 2010 as futures prices fell 17 percent from an average of \$2.24 in January 2010 to \$1.87 in December 2010. Furthermore, the prices of CO₂ allowances for the current control period fell significantly from the previous year as the average futures price fell 34 percent from 2009 to 2010. The auction clearing prices of CO₂ allowances for the current control period exhibited a similar pattern, falling from \$2.07 in the March 2010 auction to the level of the reserve price of \$1.86 in the December 2010 auction, and from an average of \$2.77 in 2009 to an average of \$1.93 in 2010. Futures prices were far less volatile in 2010 than in the previous year, and expectations of future price volatility (as implied by the prices of option contracts) also declined over the period.

Trading Patterns and Acquisition of CO₂ Allowances

Compliance entities consistently acquired the majority of CO₂ allowances in each of the four auctions in 2010, purchasing 91 percent of the allowances for the current control period and 100 percent of the allowances for the future control period. Although non-compliance entities purchased significant quantities of CO₂ allowances in the auctions, they sold the majority of these in the secondary market. Consequently, by the first week of January 2011, 98 percent of the CO₂ allowances in circulation were held by compliance entities, up from 96 percent one year earlier. This is consistent with expectations given that compliance entities account for nearly all of the demand for CO₂ allowances.

Trading activity in the secondary market for RGGI CO₂ allowances fell in 2010 from the previous year. This is reflected in the average daily volume of trading of CCFE-listed contracts, which fell from 2.7 million in 2009 to 0.21 million in 2010.

Participation in the Market by Individual Firms

Large numbers of compliance entities participated in the offerings of current control period CO₂ allowances in the four auctions held in 2010. The number of compliance entities submitting bids averaged 35, which was down modestly from 36 in 2009. Participation by non-compliance entities fell significantly to an average of nine bidders in 2010, down from 17 bidders in 2009. Participation in the market by a large number of firms promotes competition and helps ensure that the prices in the auctions reflect the value of CO₂ allowances. In the offerings of future control period CO₂ allowances, participation was more limited with an average of seven compliance entities and no non-compliance entities submitting bids.

Participation in the futures market was down in 2010 as the CFTC reported that 22 or fewer firms held significant futures positions in 2009 vintage contracts during the year, down from an average of 28 firms in 2009. Moreover, most of the positions in 2009 vintage contracts were held by a relatively small number of firms. Four firms accounted for an average of 90 percent of

all long positions in 2009 vintage contracts, while four other firms accounted for an average of 86 percent of all short positions in 2009 vintage contracts.

The holdings of CO₂ allowances were widely distributed across firms after the second full year of market operation. The largest holding of CO₂ allowances by a single firm was by a compliance entity that held 15 percent of the allowances in circulation. The top ten compliance entities, which collectively account for approximately 68 percent of the demand for current control period CO₂ allowances, held 70 percent of the allowances, while non-compliance entities collectively accounted for just 2 percent of holdings. Hence, firms have generally purchased quantities consistent with their forecasted needs.

Market Monitoring

As the RGGI Market Monitor, we evaluate the conduct of market participants in the auctions and in the secondary market to identify potential anti-competitive conduct. In addition, 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. We also assess whether the auctions were administered properly by World Energy Solutions.

In our reviews of the four auctions in 2010, we found no material concerns regarding the auction process, barriers to participation in the auctions, or the competitiveness of the results. Large numbers of firms participated in the offerings of CO₂ allowances for the current control period. Although interest in the small number of CO₂ allowances auctioned for the future control period has been more limited, we find no evidence of anti-competitive conduct or barriers that would impede wider participation. Further, we found that the auctions were administered in accordance with the noticed rules and bids received.

We find no evidence of anti-competitive conduct in the secondary market for CO₂ allowances, and we find that firms have generally purchased quantities of allowances that are consistent with their expected needs.

II. BACKGROUND ON THE CO₂ ALLOWANCE MARKET

RGGI began full operation on January 1, 2009, becoming the first mandatory cap-and-trade program to limit CO₂ emissions in the United States. Cap-and-trade programs work by setting an aggregate emissions limit for a particular class of emitters, and requiring them to acquire a number of allowances sufficient to cover their emissions. Firms that own allowances can decide whether it is more profitable to use them to cover their emissions or to sell them to an emitter that can use them more efficiently. In this manner, cap-and-trade uses market forces to reduce overall emissions in the most cost-effective ways.

RGGI is a collaborative effort of ten states in the northeast and mid-Atlantic regions to reduce overall CO₂ emissions. Electricity generating plants with more than 25 MW of capacity (known as “CO₂ budget sources”) must acquire a number of CO₂ allowances sufficient to cover their CO₂ emissions by the end of each control period. Firms that own budget sources (known as “compliance entities”) can acquire CO₂ allowances through a variety of means, including by purchasing them in the quarterly RGGI auctions or in the secondary market for allowances.

The market for RGGI CO₂ allowances has several key elements, which are discussed in this section: compliance obligations, the CO₂ Allowance Tracking System, the primary market for allowances, and the secondary market for allowances.

Compliance Obligations

CO₂ budget sources are fossil fuel-fired electricity generating plants with more 25 MW or more of capacity. Shortly after the end of each control period, compliance entities, which are firms that own CO₂ budget sources, must submit a sufficient number of CO₂ allowances to cover their CO₂ emissions during the control period. The current control period is from 2009 through 2011, and the second control period is from 2012 through 2014.

CO₂ Allowance Tracking System (“COATS”)

COATS is the registry for RGGI CO₂ allowances. Each RGGI CO₂ allowance has a unique serial number and can be used to satisfy one short ton of compliance obligations. When firms trade CO₂ allowances in the secondary market, the seller must record the transfer of ownership in COATS before the buyer is recognized as the owner.

Primary Market for RGGI CO₂ Allowances

The participating states have taken the approach of using auctions rather than free allocations as the primary means for distributing CO₂ allowances to the market. Accordingly, the primary market for RGGI CO₂ allowances consists mainly of the quarterly auctions. Thus far, 94 percent of the CO₂ allowances in circulation initially entered the market through one of the auctions.

Quarterly auctions have occurred regularly since September 2008. 2009 vintage CO₂ allowances were sold in two “pre-compliance” auctions, which were held in September and December 2008 before the current control period began. Since the March 2009 auction, the majority of CO₂ allowances have been sold for the current control period. A small number of CO₂ allowances have also been sold for the future control period.

Additional CO₂ allowances can also be awarded for approved CO₂ emissions offset projects (project-based greenhouse gas emissions reductions or carbon sequestration that occurs outside the capped electricity generation sector). In 2009, there was a one time award by certain participating states of early reduction allowances (ERAs). ERAs were awarded for qualifying CO₂ emissions reductions achieved at CO₂ budget sources during 2006 through 2008, prior to the start of the first control period. Approximately 20 million CO₂ allowances have been allocated by individual states, through either fixed-price sales or free allocations. Regardless of how CO₂ allowances initially enter the market, they can be traded to other firms in the secondary market.

Secondary Market for RGGI CO₂ Allowances

The secondary market is important for several reasons. First, it gives firms an ability to obtain CO₂ 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.

The secondary market for RGGI CO₂ allowances comprises the trading of physical allowances and financial derivatives, such as futures and options contracts. A physical CO₂ allowance trade occurs when the parties to the transaction register the transfer of ownership in 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 CO₂ allowances (i.e., the transfer is registered in COATS), but this may occur months or years after the parties enter into a financial transaction.

Standard futures and options contracts for RGGI CO₂ 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 CO₂ 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 CO₂ 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 CO₂ allowance that is to be transferred. One standard futures contract equals 1,000 RGGI CO₂ allowances.¹

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 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

- Call Options – Call options give the purchaser the option to buy a fixed number of CO₂ 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 CO₂ 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 CO₂ allowances.
- Put Options – Put options are similar to call options but they give the purchaser the option to *sell* a certain number of CO₂ 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.² Compliance entities may prefer to buy RGGI CO₂ allowances bundled with other goods

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.

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.

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 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.

III. CO₂ ALLOWANCE PRICES

The market for RGGI CO₂ allowances consists primarily of purchases in the quarterly auctions, as well as trading of allowances and allowance futures, forwards, and options contracts in the secondary market. The clearing prices from the quarterly auctions provide information about the market value of CO₂ allowances to the public four times per year, while the prices of trades on the CCFE and transaction prices recorded in COATS provide price information on a more frequent basis.

This section of the report summarizes prices in the market for RGGI CO₂ allowances in 2010. The first figure shows clearing prices in the RGGI auctions and transaction prices in the secondary market, while the second figure illustrates how the vintage year and the delivery month of a futures contract for RGGI CO₂ allowances affects its price. The third figure analyzes the trading of options contracts on the CCFE to determine what they imply about expectations of allowance prices in the future.

Summary of CO₂ Allowance Prices in 2010

The prices of current control period CO₂ allowances decreased during 2010 as futures prices fell 17 percent from an average of \$2.24 in January 2010 to \$1.87 in December 2010. Furthermore, the prices of current control period CO₂ allowances fell significantly from the previous year as the average futures price decreased 34 percent from 2009 to 2010. The auction clearing prices of CO₂ allowances for the current control period exhibited a similar pattern, falling from \$2.07 in the March 2010 auction to the level of the reserve price of \$1.86 in the December 2010 auction, and from an average of \$2.77 in 2009 to an average of \$1.93 in 2010.³ Futures prices were far

³ The average futures prices reported in this section are volume-weighted averages of the daily closing prices of the benchmark contracts on the CCFE unless otherwise stated, and the auction clearing prices are weighted on the award quantities.

less volatile in 2010 than in the previous year, and expectations of future price volatility (as implied by option prices) also declined over the period.

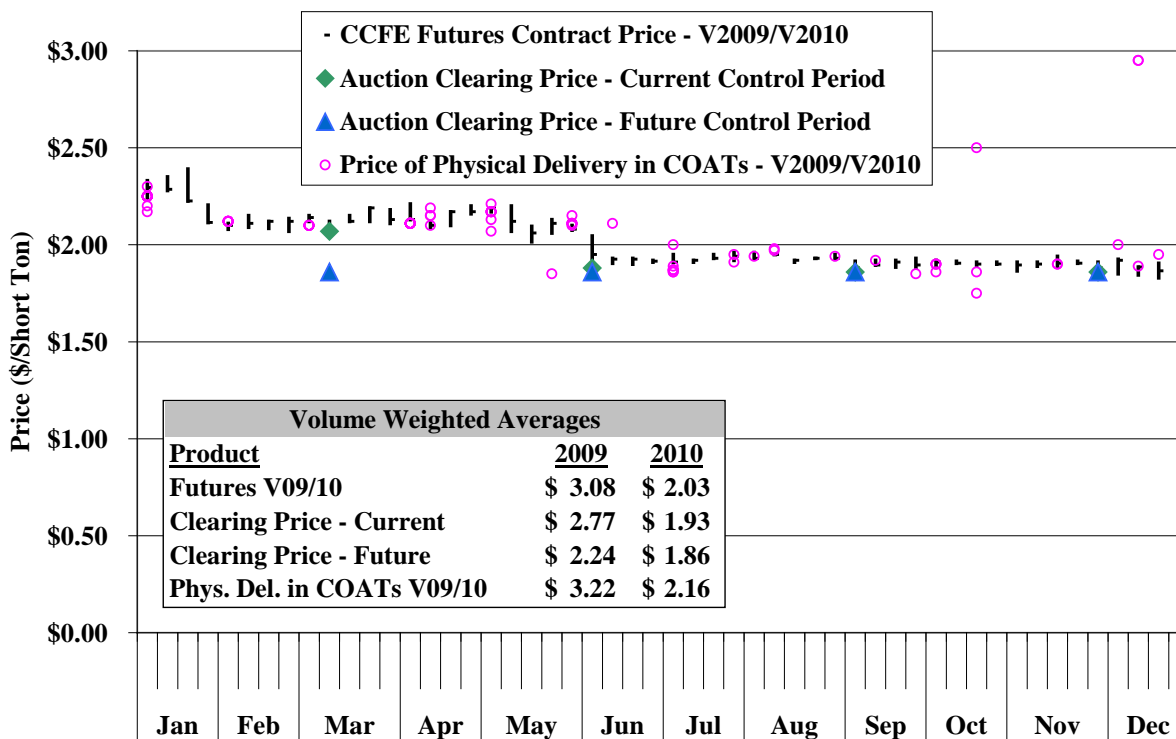
Prices in the Auctions and the Secondary Market

Figure 1 summarizes prices in the auctions and the secondary market on a weekly basis from January to December 2010. CCFE futures contract prices are summarized for each week by a black vertical line from the minimum transaction price to the maximum transaction price in the week and by a black horizontal tick mark at the closing price at the end of the week. CCFE futures prices are shown for the benchmark contracts, which were the contracts for 2009 vintage and 2010 vintage CO₂ allowances for December 2010 delivery. The volume-weighted average price of physical deliveries in COATS of 2009 vintage and 2010 vintage CO₂ allowances is shown by a pink circle for each day when a transaction took place at a price that was recorded by the transacting parties.⁴ The figure also shows the auction clearing prices of current control period and future control period CO₂ allowances in the four quarterly auctions held during 2010.

Figure 1 shows that CO₂ allowance prices decreased significantly during the first two quarters of 2010 and then remained relatively flat throughout the third and fourth quarters. Average futures prices for the current control period decreased 34 percent from \$3.08 in 2009 to \$2.03 in 2010. Average futures prices for current control period CO₂ allowances dropped from \$2.16 in the first quarter of 2010 to \$2.07 in the second quarter, \$1.92 in the third quarter, and \$1.89 in the fourth quarter. Although futures prices stabilized and have traded in a narrow range since the June 2010 auction, the average price of a CCFE futures contract has now decreased in each quarter since 2008.

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: CO₂ Allowance Prices in the Auctions and Secondary Market
2010**



CCFE futures prices have become less volatile as the market has matured. The historic volatility of futures prices fell from 26 percent in 2009 to 16 percent in 2010, and reached a low of 10 percent in the third quarter of 2010.⁵ As in 2009, futures prices were generally most volatile around the times of the four quarterly auctions.

The auction clearing prices in the offerings of current control period CO₂ allowances were consistent with futures prices around the times of the auctions in 2010. The auction clearing prices in the offerings of current control period CO₂ allowances decreased from \$2.07 in March 2010 to \$1.88 in June and to the level of the reserve price of \$1.86 in September and December.

⁵ 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 from a shorter period of time.

⁶ The auction clearing prices in the offerings of future control period CO₂ allowances were equal to the reserve price of \$1.86 in each of the four auctions in 2010.

The prices of physical deliveries reported in COATS have been generally consistent with the prices reported by the CCFE. In fact, many of the transaction prices reported in COATS are associated with physical deliveries that result from the expiration of the previous month's futures contract. Several business days after a futures contract reaches expiration, CO₂ allowances are exchanged for funds according to the closing price on the last day of the expiration month.^{7, 8} Accordingly, many of the transaction prices recorded in COATS are consistent with the prices of futures contracts in the previous week.

The prices of physical deliveries in COATS were substantially higher than CCFE futures prices in several cases, although the volumes transacted were relatively small—less than 50 thousand CO₂ allowances. 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,⁹ 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

⁶ Bids submitted in the auction must be priced at or above the auction reserve price, which was \$1.86 in each of the first ten RGGI auctions. In September and December 2010, some of the available CO₂ allowances were not sold and therefore the auction cleared at the reserve price.

⁷ Physical deliveries in COATS generally occur on the third business day following the expiration day of the futures contract. For instance, contracts for December 2010 delivery resulted in transfers in COATS on January 5, 2011.

⁸ 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 CO₂ allowances at \$2.50/allowance, the purchasing firm (firm with a long position) must put \$2,500 in an account (or whatever share of the entire liability the exchange requires). If the futures price declines to \$2/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 \$2,000 in the account.

⁹ 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.

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.

CO₂ Allowance Futures Contract Prices by Delivery Month and by Vintage Year

RGGI futures contracts are defined by a vintage year and a delivery month, and each contract trades as a distinct product at a distinct price. The previous figure illustrates how the control period affects the price of a CO₂ allowance, while the following figure shows that futures prices can also vary according to the delivery month and the vintage year within a control period.

- The delivery month of the contract determines when the actual exchange occurs of funds for CO₂ allowances, so a firm that buys a futures contract for delivery in 13 months rather than in one month is able to delay payment for one year. Since the purchasing firm can earn interest on funds it holds prior to making payment, it may be willing to pay more for a contract with a future delivery date. A firm's willingness to pay a premium for a future delivery date depends on interest rates.¹⁰ Hence, in a very liquid market for CO₂ allowances, the prices of futures contracts with different delivery months should be consistent with expected interest rates over the period.
- The vintage year of the contract specifies the vintage year of the CO₂ allowances that must be provided at the time of delivery. CO₂ allowances of different vintages within a particular control period are interchangeable for RGGI compliance purposes. However, CO₂ allowances of different vintages are not interchangeable for the purposes of satisfying the terms of the futures contracts, so it is possible for price differentials to arise between futures contracts for different vintage years.

When the prices of futures contracts with different delivery months are not consistent with interest rates, it may provide an opportunity for arbitrage. For example, suppose a futures contract for delivery next year is trading at a price significantly higher than a contract for delivery this year, and suppose the spread between the two contracts exceeds what would be expected based on interest rates. A firm could profit by borrowing money at close to the rate of interest on treasury bills to buy the futures contract for delivery this year while selling the futures

¹⁰ Firms that purchase futures contracts must deposit funds to satisfy margin requirements until the delivery of the contract. Firms can satisfy margin requirements by depositing cash, U.S. Treasuries, or other readily marketable securities. Hence, firms have the opportunity to earn interest on the funds they use to satisfy margin requirements.

contract for delivery next year. In this manner, the market tends to bring the prices of different futures contracts into a consistent relationship based on interest rates.

When the prices of futures contracts with different vintages in a particular control period are not consistent with one another, it may provide an opportunity for firms to take advantage of the price differential. For example, suppose 2009 vintage futures contracts are trading at prices higher than 2010 vintage futures contracts. A compliance entity holding 2009 vintage CO₂ allowances could reduce the cost of satisfying its compliance obligations by selling 2009 vintage futures contracts while purchasing 2010 vintage futures contracts. This sort of market behavior tends to bring consistency between the prices of futures contracts of different vintages within a particular control period.

Figure 2 summarizes the relative prices of four categories of RGGI futures contracts: the prompt month contract,¹¹ the next year contract,¹² and the benchmark contracts for 2009 vintage and 2010 vintage CO₂ allowances.¹³ The benchmark contracts for 2009 vintage and 2010 vintage CO₂ allowances accounted for the majority of trading volume on the CCFE in 2010. The daily closing prices of the prompt month contract, the next year contract, and the benchmark contract for 2009 vintage CO₂ allowances are shown as percentages of the daily closing price of the benchmark contract for 2010 vintage allowances.¹⁴ The figure shows weekly average percentages, excluding days when the volume of the contract was equal to zero.

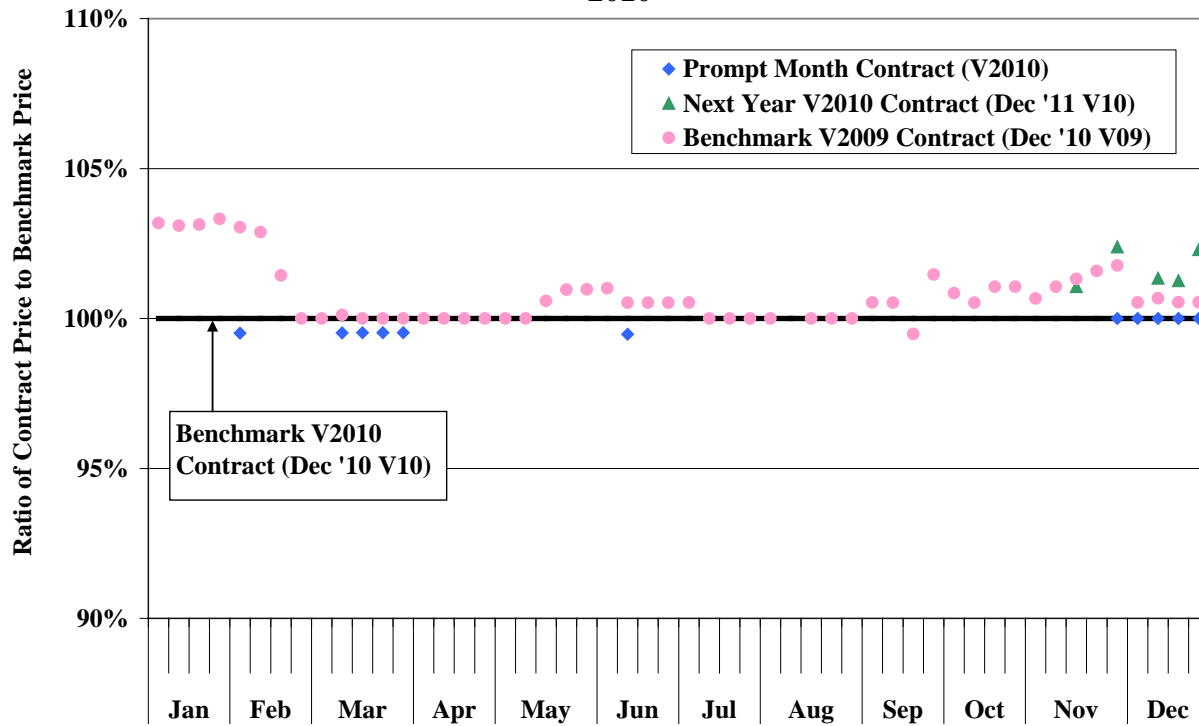
¹¹ The prompt month contract is the 2010 vintage contract with the nearest date of delivery. For example, in June 2010, the prompt month contract was the contract for June 2010 delivery. In February 2010, the prompt month contract was the contract for March 2010 delivery, since there were no exchange-traded futures contracts for February 2010 delivery.

¹² The next year contract is the 2010 vintage contract for December 2011 delivery.

¹³ The benchmark contracts are the contracts for December 2010 delivery.

¹⁴ The daily closing price is the Settlement Price as defined in Section 2604 of the CCFE Rulebook. The Settlement Price can be based on factors such as a volume-weighted average of trade prices before market close, the mid-point between the best bid and best offer before market close, and the time value between the delivery months of contracts.

**Figure 2: Futures Prices by Delivery Month and Vintage Year
2010**



The figure shows that 2009 vintage contracts traded at a small premium (of up to 3 percent) over the 2010 vintage contracts in January and early February. The premium fell to zero percent by the end of February and remained low for the remainder 2010. Normally, firms would be expected to place the same value on 2009 vintage and 2010 vintage CO₂ allowances since they are interchangeable for compliance purposes in the RGGI program. So the premium on 2009 vintage CO₂ allowances that was observed in the first half of the quarter may have reflected that some firms expected 2009 vintage allowances to be more valuable than 2010 vintage allowances if a federal program was created to limit greenhouse gas emissions.

The figure shows that the prompt month contract generally closed at or just below the price of the 2010 vintage benchmark contract, although many weeks are not shown since there was no trading volume. The relationship between the prompt month contract price and the 2010 vintage benchmark contract is as would be expected based on the yields of treasury bills, which were always less than 0.5 percent for durations of less than one year during 2010.

The next year contract closed 1 to 2 percent higher than the 2010 vintage benchmark contract during November and December, which are the only months when the trading volume was greater than zero. This premium is relatively high given that treasury yields were around 0.3 percent for a duration of one year.

Expected Volatility of CO₂ Allowance Prices

Cap-and-trade markets are designed to give firms efficient incentives to reduce and/or offset emissions. In the short-term, high-emitting generators will operate less frequently in favor of low-emitting generators. In the long-term, the market will affect the decisions of firms to develop offset projects, retire older inefficient generation, and perform maintenance that increases fuel efficiency and lowers carbon-intensity. Predictable CO₂ allowance prices reduce the risks associated with making long-term investments in reducing CO₂ emissions. Since CO₂ allowance prices can be volatile, the availability of futures and options contracts allows firms to protect themselves from the risks of such investments.

The trading of option contracts for RGGI CO₂ allowances provides insight about the market expectations of allowance prices in the future.¹⁵ Several standard methods are available for estimating the expected volatility of CO₂ allowance prices based on the prices and characteristics of option contracts that are traded. Such estimates are known as the *option-implied volatility*.¹⁶

The following scatter plot reports the option-implied (i.e., expected) volatility of RGGI CO₂ allowance futures contracts, which can be inferred from the trading of options contracts in 2009

¹⁵ The price of an option contract depends primarily on two factors: (i) the expected value of a CO₂ allowance relative to the strike price of the option, and (ii) the expected volatility of an allowance over the period until the expiration date. When call option prices and put option prices move in opposite directions, it signals a change in the expected price of allowances. Conversely, when call option prices and put option prices move in the same direction, it signals a change in the expected volatility of allowance prices.

¹⁶ The option-implied volatility of a CO₂ allowance refers to the expected standard deviation of the distribution of allowance prices one year in the future. For example, if the expected value of the price one year in the future is \$1 and the option-implied volatility is 25 percent, this implies that the probability that the price will be within 25 percent of \$1 (i.e., between \$0.75 and \$1.25) is 68.2 percent assuming that the price is distributed log-normally.

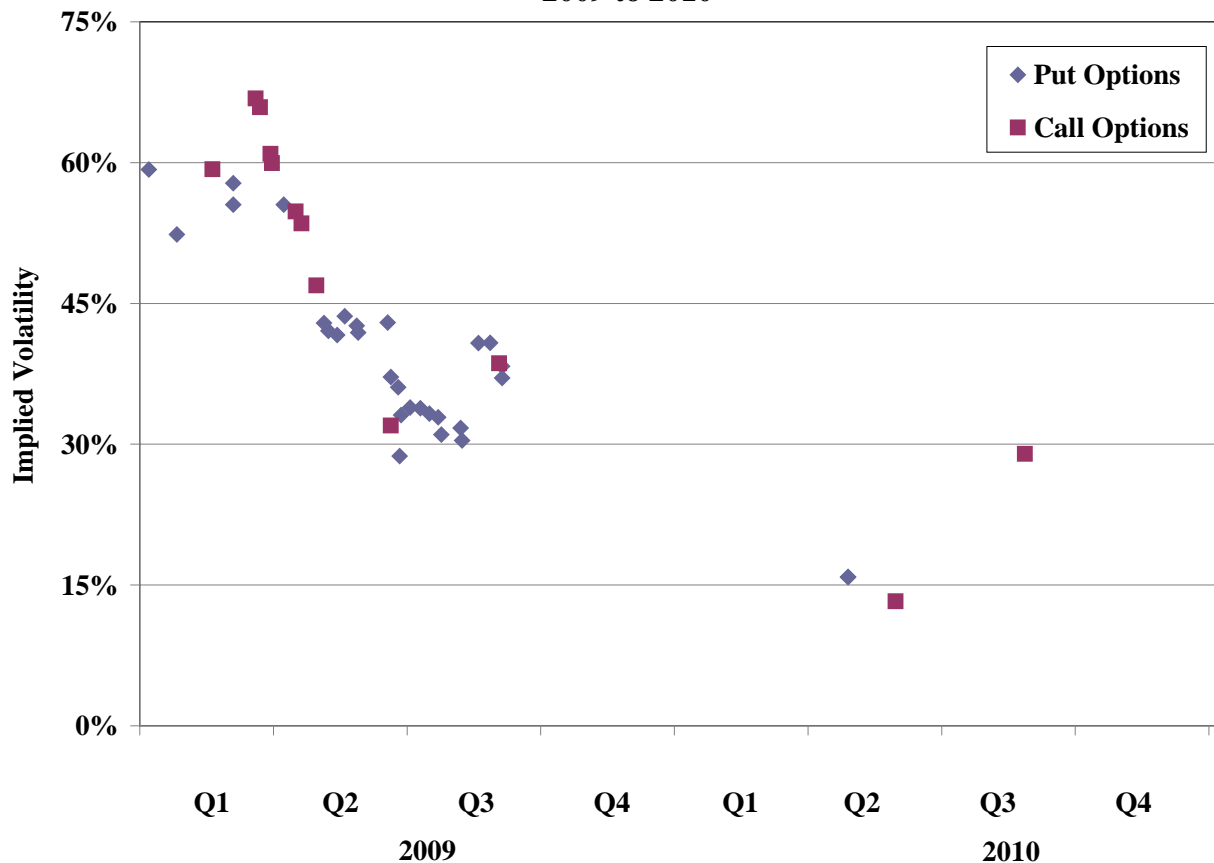
and 2010.¹⁷ The vertical axis shows the option-implied (expected) volatility of CO₂ allowance futures prices, and the horizontal axis shows the trade date. The figure excludes option contracts where the difference between the futures price and the strike price of the option exceeded 15 percent of the futures price.¹⁸ The figure also excludes contracts if fewer than two auctions occurred between the trade date and the expiration date. This is because historic prices suggest that CO₂ allowance prices become more volatile around the time of each quarterly auction, so excluding contracts with short times to maturity reduces variations in implied volatility that are driven by the timing of the trades within a particular quarter.

Figure 3 shows that option-implied volatilities ranged between 50 and 70 percent in the first quarter of 2009, fell considerably in the second quarter of 2009, and then generally ranged between 30 and 40 percent in the third quarter of 2009. Since the third quarter of 2009, only three options contracts have traded on the CCFE that fit the criteria for inclusion in the figure. The implied volatilities of the three trades in 2010 ranged from 14 to 29 percent, which were significantly lower than nearly all of the trades in the third quarter of 2009.

¹⁷ Black's model for valuing futures options is used to estimate the option-implied volatilities of RGGI allowance futures prices.

¹⁸ Option contracts with large differences between the strike price and futures price tend to produce higher estimates of option-implied volatilities than contracts where the strike price and futures price are similar. This phenomenon is known as the "volatility smile." By excluding option contracts with large (i.e., greater than 15 percent) differences, it helps isolate variations in the option-implied volatility that result from changes in the expected volatility of CO₂ allowance prices.

**Figure 3: Option-Implied Volatility of CO₂ Allowance Futures Prices
2009 to 2010**



The pattern of option-implied volatility is broadly consistent with the historic volatility over the period (see discussion of Figure 3). Both volatility metrics reflect that there was relative uncertainty regarding the value of RGGI CO₂ allowances in the first quarter of 2009, and that this uncertainty fell considerably during 2009 and 2010.

Furthermore, the low volume of options trading may itself reflect that firms perceive little risk from variations in future CO₂ allowance prices. Since the auction reserve price of \$1.86 is indexed to inflation, compliance entities are unlikely to be able to obtain CO₂ allowances at a lower price in the future. Prices in the futures market have remained above the auction reserve price, suggesting that firms perceive little risk that CO₂ allowances will fall below this level.

IV. TRADING AND ACQUISITION OF CO₂ ALLOWANCES

This section evaluates the trading and acquisition of CO₂ allowances in the primary and secondary allowance markets. Firms initially acquire CO₂ allowances in the primary market, mainly by purchasing them in the quarterly auctions.¹⁹ Firms then buy and sell CO₂ allowances in the secondary market. Secondary market activity can be observed from information about the trading of futures, forwards, and options contracts on public exchanges and in the OTC market, as well as from the transfers of ownership recorded in COATS. This section traces the movement of CO₂ allowances from their initial introduction to the market through the secondary market.

The figures in this section evaluate the activity of firms in the CO₂ allowance market in 2010, including: (i) the purchases by compliance entities and non-compliance entities in the quarterly auctions, (ii) the volume of trading of CO₂ allowances and allowance futures contracts, (iii) the general shift in ownership of allowances through the secondary market from non-compliance entities to compliance entities, and (iv) the holdings of CO₂ allowances in COATS.

Summary of Trading and Acquisition of CO₂ Allowances in 2010

Compliance entities consistently acquired the majority of CO₂ allowances in each of the four auctions in 2010, purchasing 91 percent of the allowances for the current control period and 100 percent of the allowances for the future control period. Although non-compliance entities purchased significant quantities of CO₂ allowances in the auctions, they sold the majority of these in the secondary market. Consequently, by the first week of January 2011, 98 percent of

¹⁹ However, some allowances are also allocated by individual states directly to individual entities (through free allocation or fixed-price sales) or awarded for greenhouse gas emissions reductions or carbon sequestration achieved through approved offset projects (project-based emissions reductions or sequestration occurring outside the capped electric generation sector). In 2009, there was a one-time award by certain states of early reduction allowances (ERAs). ERAs were awarded for qualifying CO₂ emissions reductions achieved at CO₂ budget sources during 2006 through 2008, prior to the start of the current control period.

the CO₂ allowances in circulation were held by compliance entities, up from 96 percent one year earlier. This is consistent with expectations given that compliance entities account for nearly all of the demand for CO₂ allowances.

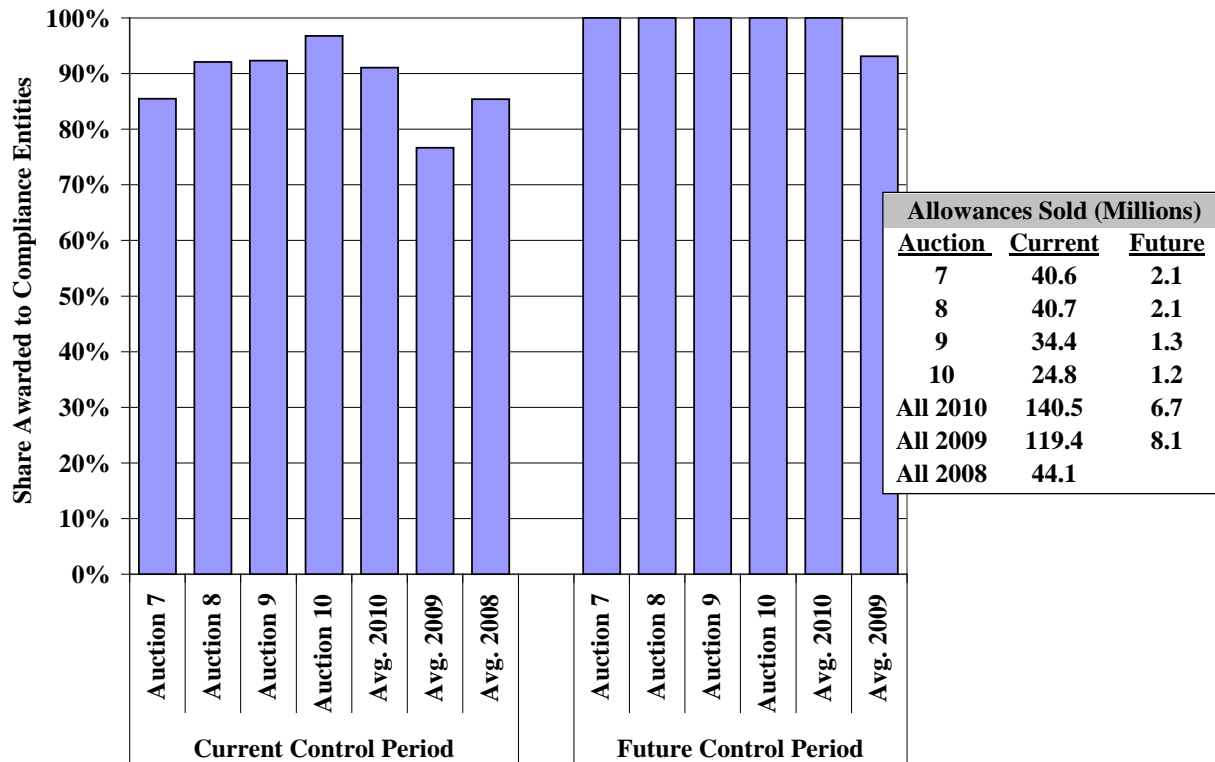
Trading activity in the secondary market for RGGI CO₂ allowances fell in 2010 from the previous year. This is reflected in the average daily volume of trading of CCFE-listed contracts, which fell from 2.7 million in 2009 to 0.21 million in 2010.

Distribution of Auction Awards

The following figure reports the quantity of CO₂ allowances awarded in each offering of the four auctions that were held in 2010 (i.e., Auctions 7 - 10). Each auction included two offerings: one for the current control period (2009 to 2011) and one for a future control period (2012 to 2014). The bars show the percentage of CO₂ allowances in each offering that were purchased by compliance entities, while the remaining share in each offering were purchased by non-compliance entities.²⁰ Several bars report the average percentage of CO₂ allowances that were purchased by compliance entities for each control period in each calendar year.

²⁰ Throughout this report, the compliance entity category includes corporate affiliates of compliance entities. In some cases, a firm that does not have stock ownership in a budget source is categorized as a compliance entity if it is believed that the firm has substantial control over the operation of a budget source and/or responsibility for acquiring RGGI allowances to satisfy the owner's compliance obligations.

**Figure 4: Distribution of Auction Awards
Auctions 7 – 10**



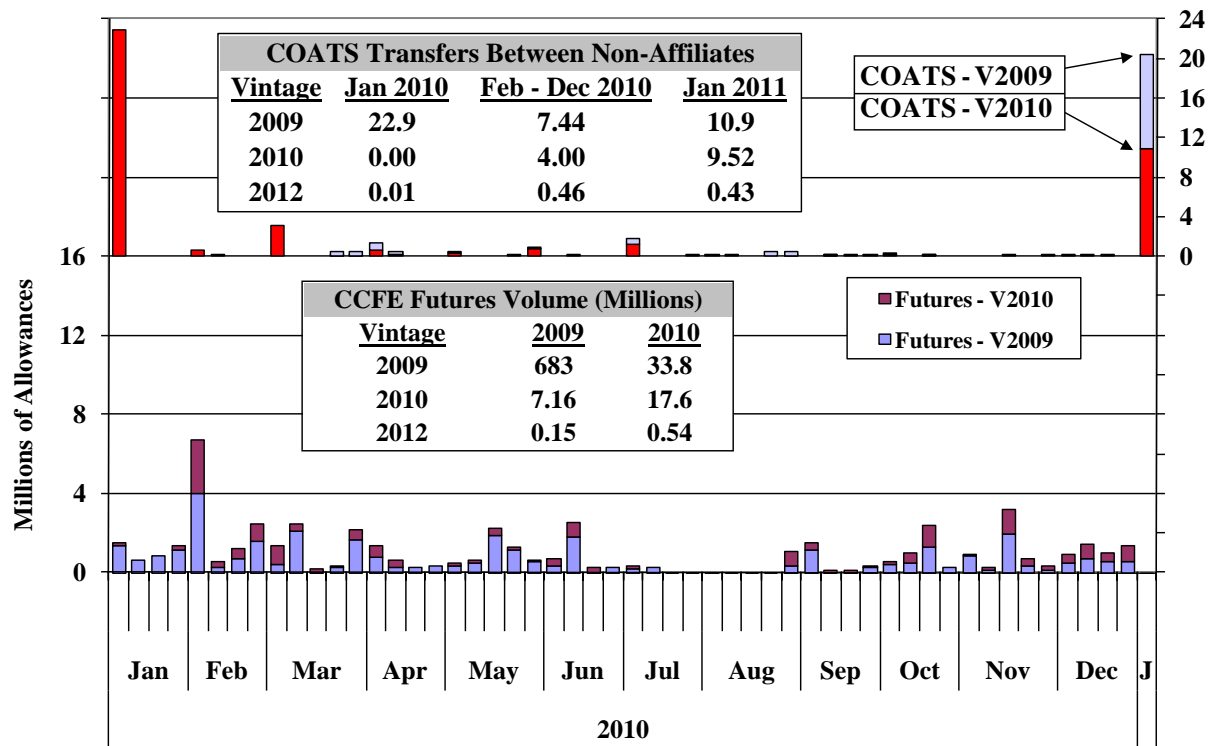
The figure shows that compliance entities have consistently purchased a substantial majority of the CO₂ allowances sold in the four 2010 auctions. Compliance entities purchased 91 percent or 128 million of the current control period CO₂ allowances sold in 2010, up from 77 percent in 2009. Compliance entities also purchased 100 percent of the 6.7 million future control period CO₂ allowances sold at auction in 2010, up from 93 percent in 2009. The high share of CO₂ allowances purchased by compliance entities is consistent with our expectations given that they constitute nearly all of the demand for allowances.

CO₂ Allowance Trading Volumes

The following figure summarizes the volume of trading of CCFE-listed futures contracts as well as transfers of CO₂ allowances between unaffiliated parties that were recorded in COATS on a weekly basis from January 4, 2010 to January 7, 2011. The first full week of January 2011 is shown in the figure because that is when CO₂ allowances were transferred between COATS

accounts as a result of the delivery of CCFE and OTC contracts with a December 2010 delivery month. The bottom portion of the figure shows the weekly volume of trading on the CCFE for 2009 vintage and 2010 vintage futures contracts against the left vertical axis. The top portion of the figure shows the weekly volume of 2009 vintage and 2010 vintage CO₂ allowance transfers between unaffiliated firms that are reported in COATS against the right vertical axis. The tables report the total volume over the period that is shown in the figure for each category. The table also reports the total volume for the 2012 vintage year. The volume of trading of futures contracts for other vintage years was negligible.

**Figure 5: Volume of Trading of CO₂ Allowances and Allowance Futures
January 4, 2010 to January 7, 2011**



The volume of trading in RGGI futures contracts varied significantly during 2010. The average daily volume of trading ranged from near zero in several weeks to a peak of 1.3 million in the first week of February. In 2010, the volume of futures trading totaled 52 million, which is far less than the number of CO₂ allowances that were auctioned. Hence, the volume of futures trading was relatively small during 2010, which is part of the reason why the majority CO₂

allowances that were acquired by firms came from the quarterly auctions rather than the secondary market.

The majority (65 percent) of trading volume was of contracts for 2009 vintage CO₂ allowances, down from 99 percent in 2009, due to the increased trading volumes of contracts for 2010 vintage allowances in 2010. 70 percent of the 2009 and 2010 vintage futures contracts traded were for the benchmark contracts (i.e., December 2010 delivery). Trading of contracts with delivery after 2010 became more prevalent in December 2010 when 39 percent of the trading volume was of contracts for December 2011 delivery. Trading of contracts for 2011 vintage and 2012 vintage CO₂ allowances was not significant during the period.

41 percent of the CO₂ allowances transferred between the COATS accounts of unaffiliated firms in the study period occurred in the first full week of January 2010 and 37 percent occurred during the first full week of January 2011. These transfers likely occurred as a result of the final maturity, expiration, and delivery of December 2010 contracts that were traded on the CCFE or the OTC market. Likewise, most of the COATS transfers taking place from February to December of 2010 occurred in the first week of a particular month, most likely as a result of the maturity, expiration, or delivery of the prompt month contracts.

The volume of CO₂ allowance transfers between the COATS accounts of unaffiliated firms was significantly lower than the volume of trading of futures contracts on the CCFE. This is to be expected since much of the futures trading volume never results in the transfer of CO₂ allowances in COATS. For example, a particular firm may buy futures contracts for 100,000 CO₂ allowances and sell futures contracts for 70,000 allowances in a particular month for a total trading volume of 170,000 allowances. If the contracts are for prompt month delivery, it would result in the transfer of just 30,000 CO₂ allowances as reported in COATS. Otherwise, if the contracts are for delivery after several months or years, sales of futures contracts would tend to reduce further the ratio of the number of CO₂ allowances transferred in COATS to the volume of futures trading.

Acquisition of CO₂ Allowances in the Secondary Market

This part of the section evaluates how the ownership of CO₂ allowances has changed as a result of trading in the secondary market.²¹ Changes in the ownership of CO₂ allowances are quantified using two measures:

- *Open Interest* – This is the net amount of futures contracts that have been purchased or sold by a particular firm, but that have not reached delivery. For example, if a firm sells 100 contracts to another firm, it will have an open interest, or short position, of 100 contracts. If the firm then buys 40 contracts, these will partly offset its short position, resulting in an open interest, or short position, of 60 contracts. The total open interest in the market can be determined by summing across all of the long positions of firms (or alternatively, by summing across all of the short positions).²²
- *Net Purchases/Sales of CO₂ Allowances* – This is the net change in the amount of CO₂ allowances in a firm's COATS account that have resulted from trading (rather than the auction or a state allocation). For example, if a firm purchases 100,000 CO₂ allowances from another firm, and then sells 30,000 allowances, the firm's net purchase of allowances would be 70,000. The total net change in CO₂ allowance holdings in the market can be determined by summing across all of the net purchases of individual firms (or alternatively, by summing across all of the net sales).²³

Figure 6 summarizes net changes in ownership as of the first week of each month from January 2010 to January 2011.²⁴ The figure does not include purchases and sales of CO₂ allowances for the second control period. The information on ownership is aggregated across firms by category. Futures open interest is shown for all firms in a single category, while net purchases and sales of CO₂ allowances are shown separately for compliance entities and non-compliance entities.

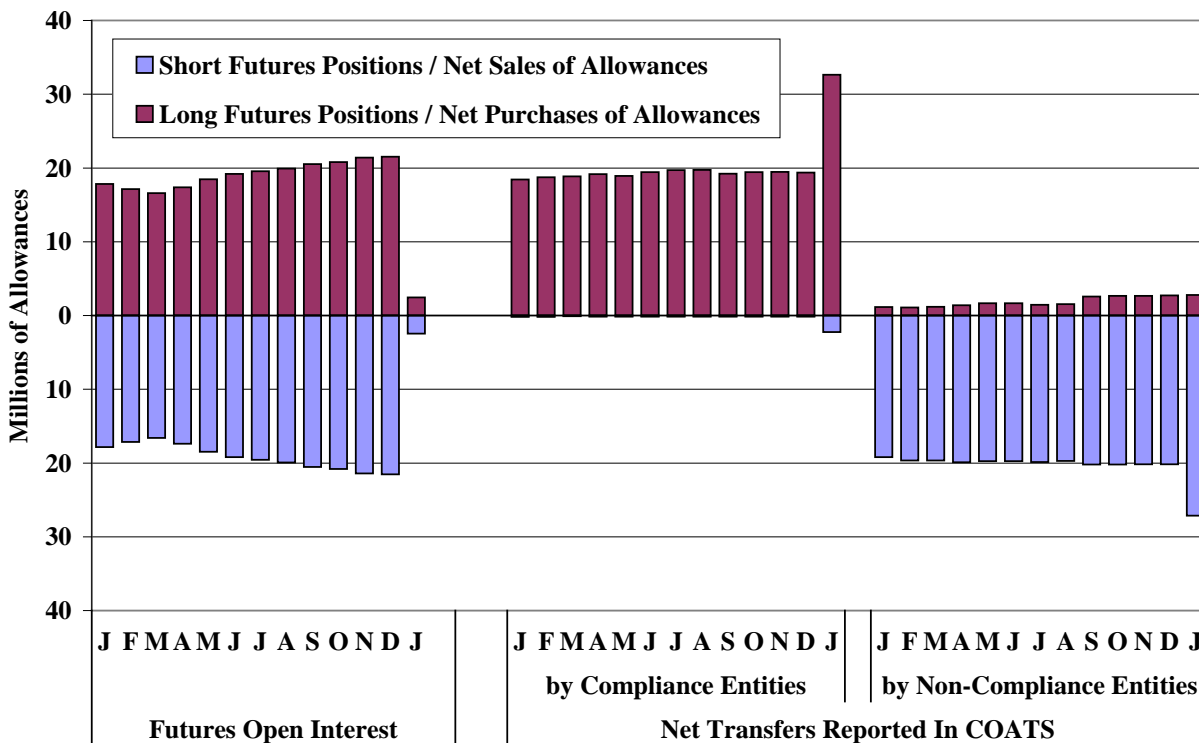
²¹ This excludes the majority of CO₂ allowances, which are held by firms that purchased them directly in the auction or received them through allocations by one of the Participating States.

²² Information on the open interest in CCFE futures contracts is available from the CCFE.

²³ Information on the ownership of actual CO₂ allowances comes from COATS.

²⁴ The futures open interest is based on futures positions at the end of the first business day of each month, while the net purchases and sales are based on registered holdings in COATS at the end of the third business day of each month, which is after delivery was made on contracts from the previous month.

**Figure 6: Futures Open Interest and Net Transfers of CO₂ Allowances
January 2010 to January 2011**



The figure shows that the total open interest of firms in futures contracts rose slowly during 2010 and then fell sharply in the first week of January 2011. The total open interest in futures contracts rose from 17.8 million CO₂ allowances in the first week of January 2010 to 21.5 million allowances in the first week of December 2010, and then it fell to 2.5 million allowances in January 2011 after the delivery of futures contracts for December 2010 delivery. Accordingly, the delivery of the futures contracts was responsible for a large share of the increase in net purchases and net sales shown in the first week of January 2011.

The figure shows that compliance entities generally used the secondary market to increase their holdings of CO₂ allowances, while non-compliance entities generally sold allowances in the secondary market that were originally acquired prior to 2010 or in one of the four quarterly auctions. In the first week of January 2010, compliance entities acquired a net 18 million CO₂ allowances through the secondary market as a result of the delivery of December 2009 contracts. In the first week of January 2011, compliance entities increased their net acquisition from 19 to

32 million CO₂ allowances through the secondary market. In contrast, non-compliance entities substantially reduced their holdings of CO₂ allowances in the first week of January 2010, and in the first week of January 2011.

The total net purchase of CO₂ allowances from January 2010 through the first week in January 2011 (35 million) is smaller than the gross volume of transactions between unaffiliated firms (55 million as shown in Figure 5). This is because some firms have both purchased and sold CO₂ allowances in the secondary market such that the net change in their position is smaller than the total volume of their transactions.

From January 2010 through the first week of January 2011, the overall change in CO₂ allowance holdings was substantial (35 million), although it was still much smaller than the 143 million current control period CO₂ allowances that were acquired in the auctions and state allocations in 2010. Hence, the auctions are still the principal means by which firms have acquired CO₂ allowances.

Registered CO₂ Allowance Holdings

The following figure combines information on the acquisition of CO₂ allowances from the auctions and state allocations with information on the purchase and sale of allowances in the secondary market and the initial holdings of allowances on January 1, 2010. Together, this information provides a summary of the holdings of CO₂ allowances in COATS accounts according to whether the allowances were acquired: (i) prior to 2010, (ii) through the primary market, or (iii) through the secondary market. The figure reports the following categories of CO₂ allowances:

- *Initial Holdings – Retained in COATS Account* – These CO₂ allowances are still held in the COATS account of the firm that held them at the end of 2009.
- *Awards and Allocations – Retained in COATS Account* – These CO₂ allowances are still held in the COATS account of the firm that purchased them in an auction or acquired them through a state allocation.

- *Net Sales in the Secondary Market* – These CO₂ allowances were held at the end of 2009, purchased in an auction in 2010, or acquired through a state allocation in 2010 and then subsequently sold in the secondary market.
- *Net Purchases in the Secondary Market* – These CO₂ allowances are held in the COATS account of a firm that purchased them in the secondary market after January 1, 2010.

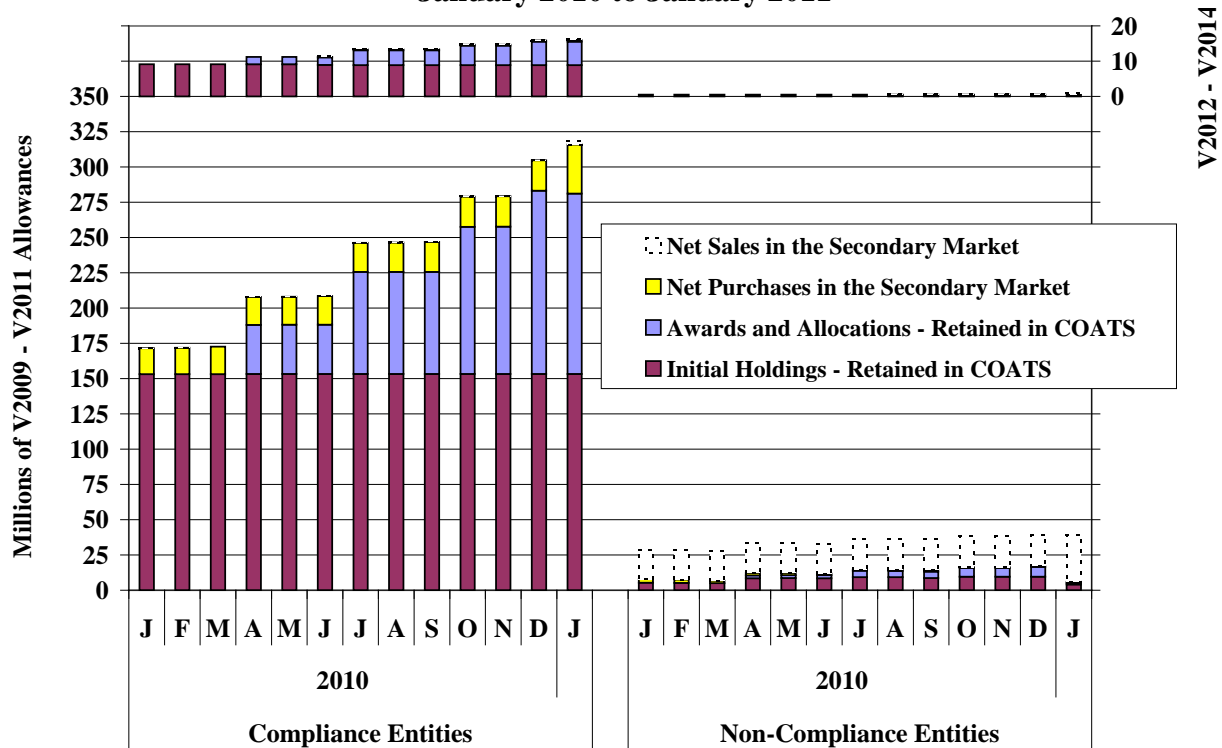
For each firm, its holdings of CO₂ allowances in COATS are equal to the sum of three categories: *Initial Holdings – Retained in COATS Account, Awards and Allocations – Retained in COATS Account*, and its *Net Purchases in Secondary Market*.²⁵

Figure 7 shows the four categories of CO₂ allowances as of the first week of each month from January 2010 to January 2011. The information is aggregated separately for compliance entities and non-compliance entities. The bottom portion of the figure shows CO₂ allowances with vintages in the current control period against the left vertical axis, while the top portion of the figure shows CO₂ allowances for the future control period against the right vertical axis.

²⁵ The following two examples illustrate how the categories of allowances are calculated:

- If a firm initially held 20,000 allowances at the beginning of the year, purchased 50,000 allowances in an auction, purchased 100,000 allowances in the secondary market, and then sold 70,000 allowances in the secondary market, the firm would contribute:
 - 20,000 allowances to *Initial Holdings – Retained in COATS Account*,
 - 50,000 allowances to *Awards and Allocation – Retained in COATS Account*, and
 - 30,000 allowances to *Net Purchases in Secondary Market*. The calculation does not consider the serial numbers of individual allowances. Hence, in the example, it would not matter whether the 70,000 allowances sold had originally been acquired in the auction or in the secondary market.
- Alternatively, if a firm initially held 20,000 allowances, purchased 50,000 allowances in an auction, purchased 100,000 allowances in the secondary market, and then sold 160,000 allowances in the secondary market, the firm would contribute:
 - 10,000 allowances to *Initial Holdings – Retained in COATS Account*,
 - Zero allowances to *Awards and Allocations – Retained in COATS Account*, and
 - 60,000 allowances to *Net Sales in the Secondary Market*.

**Figure 7: Sources of CO₂ Allowances Held in COATS Accounts
January 2010 to January 2011**



The figure shows that throughout the period, the majority of CO₂ allowances have been held by compliance entities that held them at the beginning of 2010 or that acquired their allowances through the auctions and/or state allocations. As of the first week of January 2011, 316 million CO₂ allowances from the current control period were held by compliance entities, and 49 percent of these were held by firms that held them at the beginning of 2010, 40 percent of these had been acquired through auctions and allocations in 2010, and 11 percent were purchased in the secondary market in 2010 or the first week of 2011. Since January 2010, compliance entities have been net sellers of just 2.2 million CO₂ allowances.

On the other hand, the figure shows that 85 percent of the 39 million CO₂ allowances that non-compliance entities held at the beginning of 2010 or acquired in the auctions and/or allocations were subsequently sold in the secondary market during 2010.

The figure shows that the holdings of future control period CO₂ allowances have not changed significantly as a result of trading in the secondary market. Of the 16 million future control

period CO₂ allowances that were held as of January 6, 2011, 54 percent were held by the same firm at the start of 2010, and 41 percent were acquired in one of the four auctions in 2010. Furthermore, virtually all of the second control period CO₂ allowances are held by compliance entities that acquired them in the auctions.

In summary, compliance entities have purchased the vast majority of their CO₂ allowances in the auctions, and they have generally increased their holdings through purchases in the secondary market. This is consistent with expectations for compliance entities in general.

V. PARTICIPATION IN THE CO₂ ALLOWANCE MARKET

This section evaluates participation by individual firms in the CO₂ allowance market.

Participation by a large number of firms tends to promote competition, which helps ensure that CO₂ allowance prices are determined efficiently. Over time, firms that need CO₂ allowances for compliance should be able to acquire them through the auctions and/or the secondary market, and the holdings of individual firms should be relatively consistent with their potential uses for allowances.

This section evaluates four aspects of the CO₂ allowance market that reveal the level of participation by individual firms: (i) the demand for allowances by individual firms, (ii) the breadth of participation in the quarterly auctions, (iii) the holdings of individual firms relative to their demand for allowances, and (iv) the breadth of participation in the trading of allowance futures contracts.

Summary of Participation in the CO₂ Allowance Market in 2010

Large numbers of compliance entities participated in the offerings of current control period CO₂ allowances in the four auctions held in 2010 as the number of compliance entities submitting bids averaged 35, down modestly from 36 in 2009. Participation by non-compliance entities fell significantly to an average of nine bidders in 2010, down from 17 bidders in 2009. In the offerings of future control period allowances, participation was more limited with an average of seven compliance entities and no non-compliance entities submitting bids.

Participation in the CCFE futures market was down in 2010 as the CFTC reported that 22 or fewer firms held significant futures positions in 2009 vintage contracts during the year, down from an average of 28 firms in 2009. Moreover, most of the positions in 2009 vintage contracts were held by a relatively small number of firms. Four firms accounted for an average of 90 percent of all long positions in 2009 vintage contracts, while four other firms accounted for an average of 86 percent of all short positions in 2009 vintage contracts.

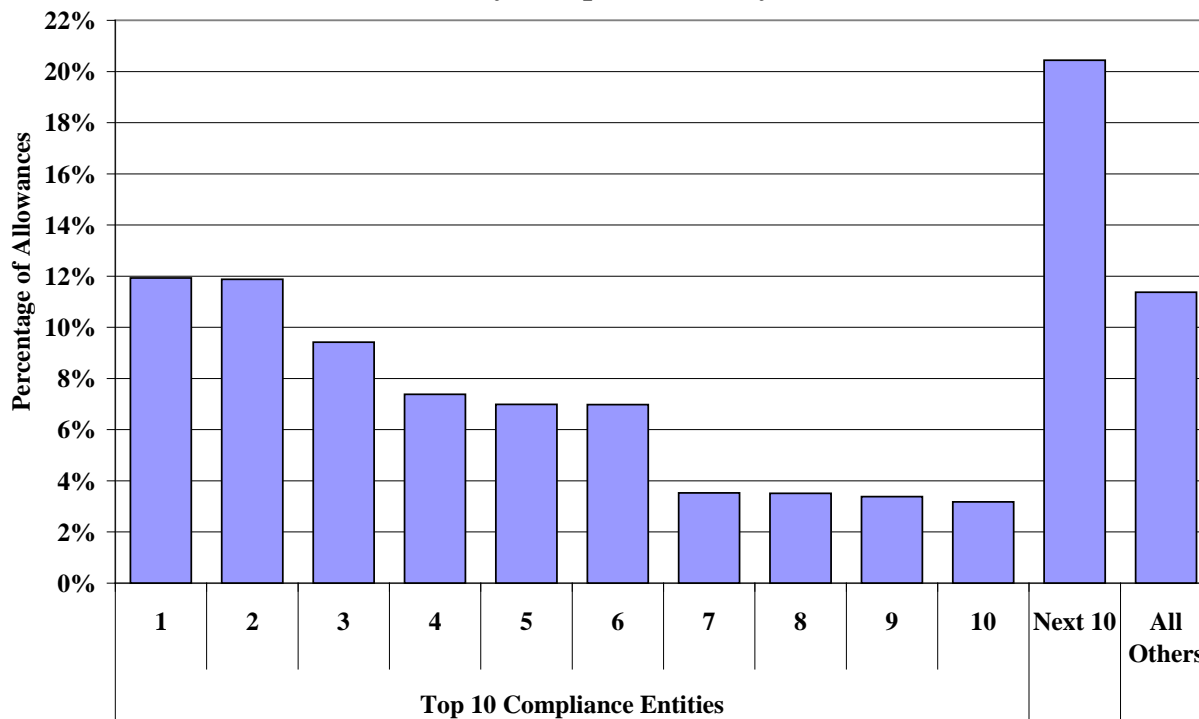
The holdings of CO₂ allowances were widely distributed across firms after the second full year of market operation. The largest holding of CO₂ allowances by a single firm was by a compliance entity that held 15 percent of the allowances in circulation. The top ten compliance entities, which collectively account for approximately 68 percent of the demand for current control period CO₂ allowances, held 70 percent of the allowances, while non-compliance entities collectively accounted for just 2 percent of holdings. Hence, firms have generally purchased quantities consistent with their forecasted needs.

Demand for CO₂ Allowances

The following figure summarizes the projected demand for current control period CO₂ allowances of individual compliance entities at the end of 2010. We project demand of each compliance entity for CO₂ allowances based on historical CO₂ emissions patterns and expected changes in future market conditions. The projected demand is shown for each of the top ten compliance entities (i.e. the ten firms with the highest projected demand), the second ten compliance entities as a group, and all other compliance entities as a group. The projected demand is reported in Figure 8 as a percentage of the total projected market demand.

The figure shows that the demand for CO₂ allowances is dispersed relatively widely across firms. The two largest compliance entities each account for 12 percent of the total projected demand for CO₂ allowances and the top five compliance entities account for 48 percent of the projected demand. The top ten compliance entities account for 68 percent of the total projected market demand for CO₂ allowances, while the next ten compliance entities account for 20 percent and all compliance entities that are not among the top 20 firms account for 11 percent.

**Figure 8: Estimated Demand for Current Control Period CO₂ Allowances
By Compliance Entity**



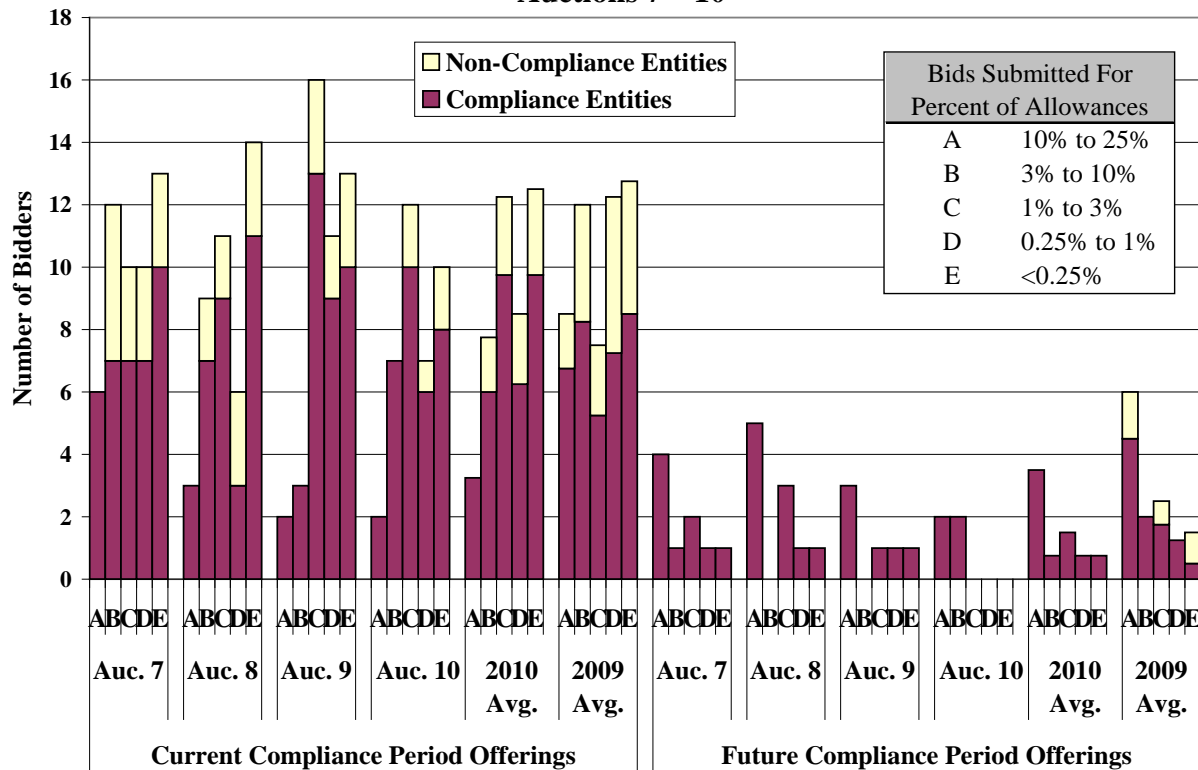
The concentration of projected demand has increased modestly since the end of 2009, which is reflected by the fact that the top five compliance entities now account for 48 percent of the projected demand, up from 44 percent at the end of 2009. This is primarily due to acquisitions and mergers that increased the sizes of certain generation portfolios, although reduced operation of oil-fired generation and increased use of gas-fired generation also affected the shares of projected demand of the largest five compliance entities.

Participation in RGGI Auctions

The following figure summarizes the breadth of participation in the four auctions during 2010. The figure reports the number of firms that submitted bids in each offering of each auction. The number of bidders is shown separately according to whether they were compliance entities or

non-compliance entities. The figure also shows these quantities averaged across the auctions in 2009 and in 2010.²⁶

**Figure 9: Number of Bidders According to the Quantity of Bids Submitted
Auctions 7 – 10**



Large numbers of compliance entities and non-compliance entities submitted bids in the current control period offerings of each of the 2010 auctions. The number of bidders ranged from a high of 51 in Auction 7 to a low of 38 in Auction 10. The number of bidders that were compliance entities ranged between 33 and 37, while the number of bidders that were non-compliance entities ranged between 5 and 14.

²⁶ For example, in the current control period offering of Auction 7 where 41 million CO₂ allowances were up for sale, a firm that submitted bids for 500,000 allowances would be counted in the “C: 1% to 3%” category, since $500,000 \div 41 \text{ million} = 1.2 \text{ percent}$.

Relatively large numbers of bidders participated in the current control period offerings in 2010, although the average number of bidders fell to 44 in 2010, down from 53 in 2009. The number of bidders submitting bids for at least 10 percent of the current control period CO₂ allowances dropped more significantly from an average of 6.8 in 2009 to 3.3 in 2010. In 2009, at least one non-compliance entity submitted bids for at least 10 percent of the current control period allowances in every auction, while in 2010 non-compliance entities never submitted bids for more than 10 percent of the allowances offered.

Substantially fewer firms submitted bids in the offerings of future control period CO₂ allowances, which cannot be used to satisfy compliance obligations until after the current control period, which will end after December 2011. The number of bidders decreased to 7.3 in 2010, down from 13.3 in 2009. Non-Compliance Entities have not participated in an offering of future control period CO₂ allowances since Auction 4.

Participation by a large number of firms promotes competition and helps ensure that the auction clearing price reflects the market value of CO₂ allowances. Although the number of firms participating in the current control period offerings declined in 2010, the number of firms is still relatively large. This is a positive indicator regarding the competitiveness of the auctions held in 2010. Although fewer firms participated in the future control period offerings, we have found no material evidence of anti-competitive conduct or significant barriers to participation in our reviews of the bids and the qualification process of each auction.

Acquisition of CO₂ Allowances by Individual Firms

In a well-functioning market, we expect each firm to purchase a number of CO₂ allowances that is generally consistent with its demand. Individual firms may purchase a larger or smaller share according to how the current price of CO₂ allowances compares to their expectations of allowance prices in the future. Firms that believe CO₂ allowances are currently undervalued can be expected to purchase a larger share, while firms that believe allowances are overvalued can be expected to purchase a smaller share. Thus, competition by many firms helps ensure that the

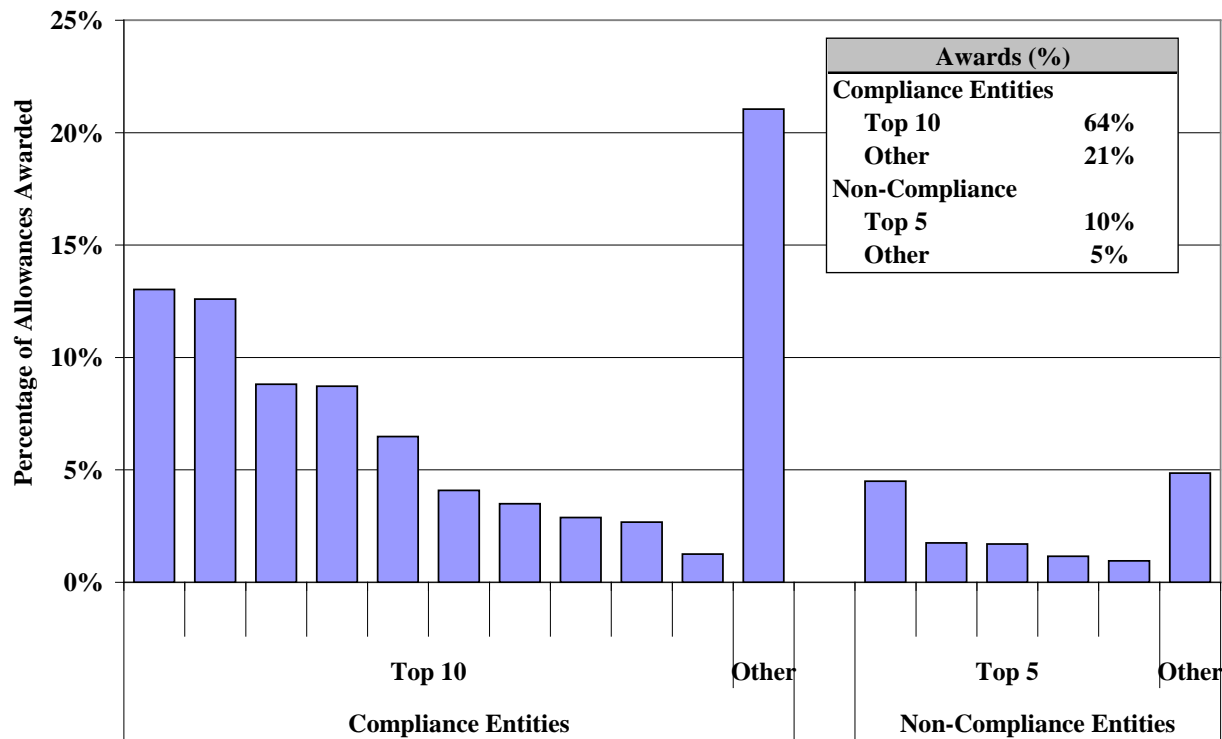
current price of CO₂ allowances in the auctions and in the secondary market reflects reasonable expectations.

The following two figures examine the distribution of CO₂ allowances across firms following the second full year of the RGGI market's operation. Figure 10 illustrates how broadly CO₂ allowances were distributed in the first ten auctions, while Figure 11 illustrates how the holdings of allowances in COATS accounts were distributed after the close of 2010. The figures show that CO₂ allowances have generally been acquired by firms in quantities that are consistent with their demand, which is a positive indicator regarding the competitiveness of the market.

Figure 10 reports the quantities of CO₂ allowances that were awarded to individual firms in the current and future control period offerings of the first ten auctions. The awards are shown for each of the top ten compliance entities (i.e. the ten firms with the highest projected demand), all other compliance entities as a group, each of the top five non-compliance entities based on awards (i.e., the five firms with the largest total awards), and all other non-compliance entities as a group. The top ten compliance entities are ranked in descending order based on total awards rather than demand.

The figure shows that the total awards from the first ten auctions were dispersed relatively widely across firms. The largest number of CO₂ allowances awarded to a single firm went to a compliance entity that purchased 13 percent of the allowances. The top ten compliance entities accounted for 64 percent of the total awards, while the top five non-compliance entities accounted for 10 percent.

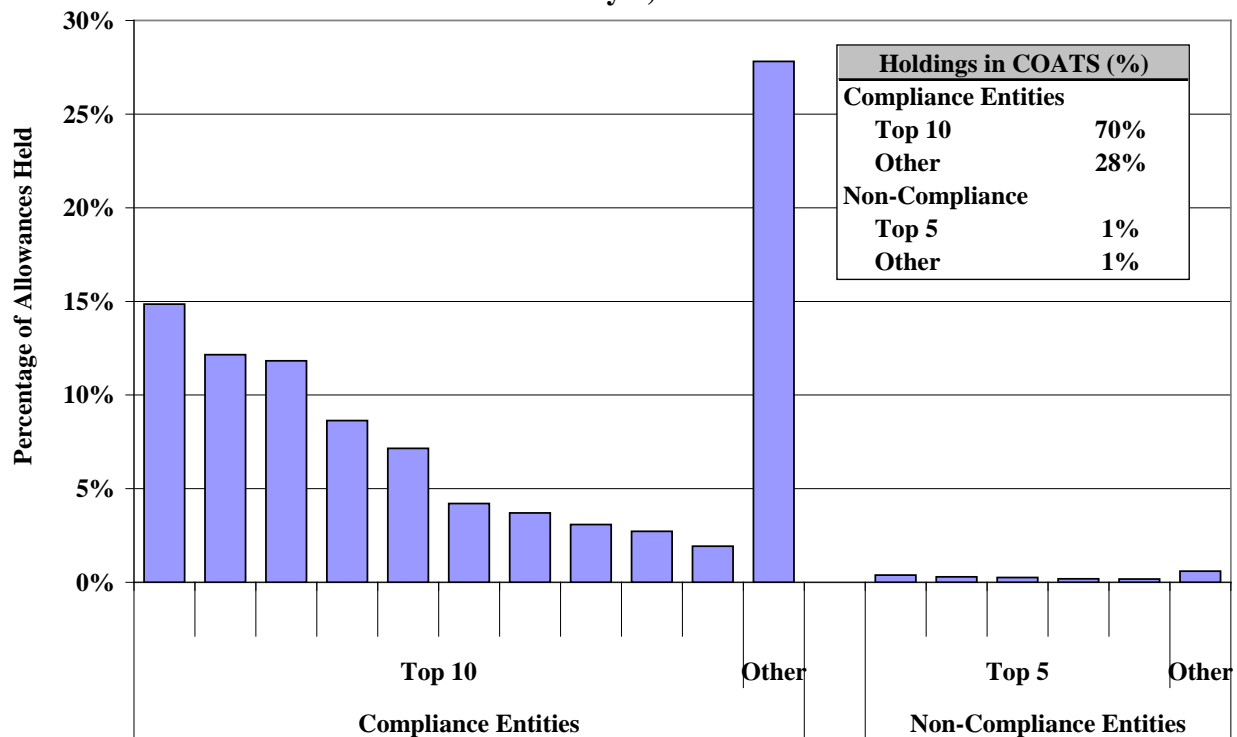
**Figure 10: Distribution of Auction Awards
Auctions 1 – 10**



Auction rules state that a single party or group of affiliated parties can purchase to 25 percent of the available CO₂ allowances in any given auction. In the current control period offerings, one or more bidders were awarded 25 percent of the CO₂ allowances offered for sale in five of the first ten auctions and at least 15 percent in the other five auctions. Since the bidders receiving the largest awards were not the same from auction to auction, the most that any single compliance entity purchased was 13 percent of all allowances for sale in the first ten auctions.

Figure 11 reports the quantities of CO₂ allowances that were held in the COATS accounts of individual firms in the first week of January 2011, following the delivery of contracts for December 2010 delivery. The holdings are shown for each of the top ten compliance entities, all other compliance entities as a group, each of the top five non-compliance entities based on holdings (i.e., the five firms with the largest holdings registered in COATS), and all other non-compliance entities as a group. The top ten compliances entities are ranked in descending order based on total holdings rather than demand.

**Figure 11: Distribution of CO₂ Allowance Holdings
January 6, 2011**



The figure shows that the total holdings of CO₂ allowances were widely distributed across firms after the second full year of market operation. The largest holdings of allowances were those of three compliance entities that held a combined 39 percent of the allowances. The top ten compliance entities accounted for 70 percent of the total holdings, while non-compliance entities collectively accounted for just 2 percent of the total.

Figure 10 and Figure 11 reflect a pattern of trading in the secondary market that is consistent with the results of Figure 7. Non-compliance entities generally purchased CO₂ allowances in the auctions and then subsequently sold most of them in the secondary market. On the other hand, compliance entities generally acquired most of their CO₂ allowances in the auctions and increased their holdings by purchasing more allowances in the secondary market. As a result, non-compliance entities account for a smaller share of the CO₂ allowances in Figure 11 than in Figure 10.

Participation in the CO₂ Allowance Futures Market

The last figure in this section evaluates participation in the market for CCFE futures contracts from January 2010 to January 2011. Information on the open interest in CCFE futures contracts for 2009 vintage and 2010 vintage allowances is taken from the CFTC's weekly COT report.²⁷ The COT reports do not yet include information on other vintage years.

The left side of Figure 12 summarizes the concentration of long and short positions in 2009 vintage futures contracts and 2010 vintage futures contracts against the left vertical axis. The net long positions are reported for three categories of firms: (i) the four firms with the largest long positions (see "Top 4 Firms"), (ii) the four firms with the largest long positions not including the Top 4 (see "Next 4 Firms"), and (iii) all other long positions.²⁸ The figure also reports the net short positions for three categories of firms: (i) the "Top 4 Firms", (ii) the "Next 4 Firms", and (iii) all other short positions. The right side of Figure 12 reports the number of Commercial and Non-Commercial firms with reportable long and short positions against the right vertical axis.

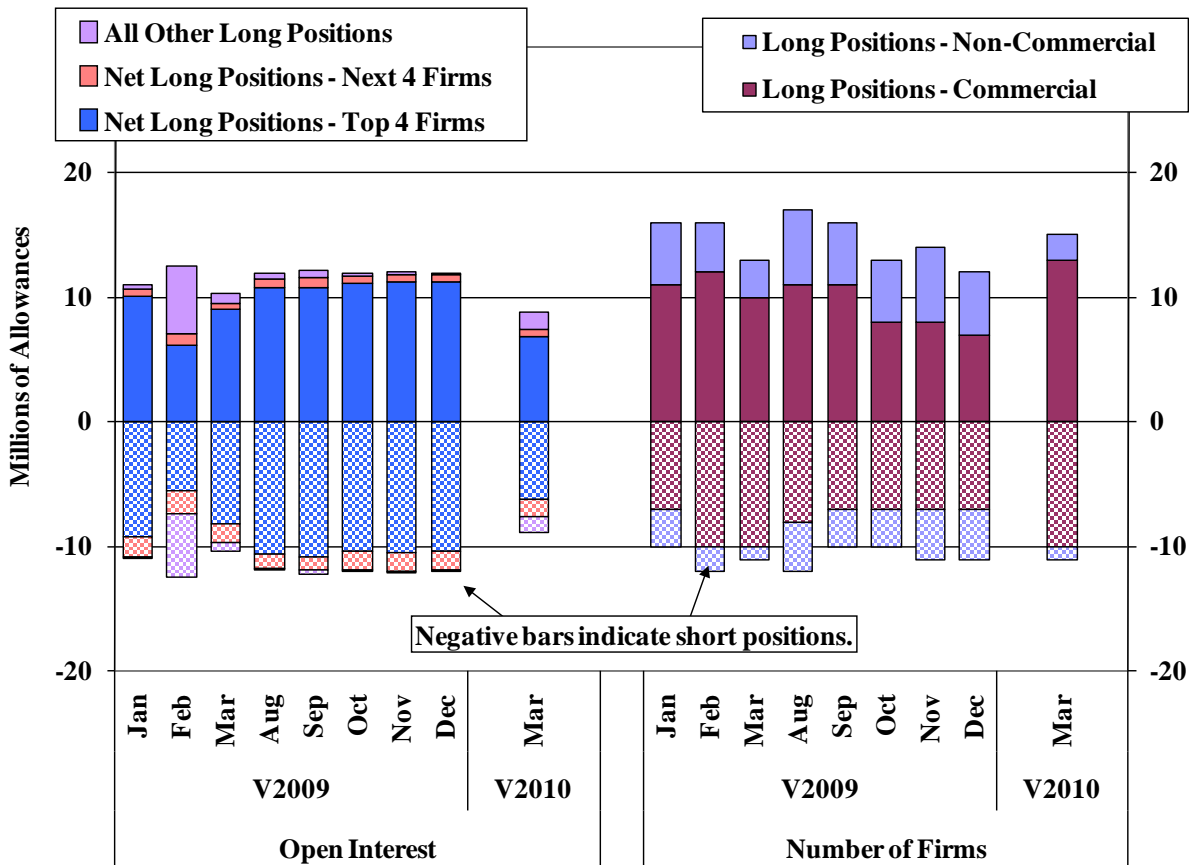
The figure reports information based on the open interest reported to the CFTC on the last Tuesday of each month when data is available. Position information is not shown in the figure for many of the months in 2010, since the CFTC did not report open interest for that vintage in these months.²⁹

²⁷ Each day, firms with an open interest of 25 contracts (1 contract is for 1,000 CO₂ allowances) 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 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.

²⁸ The net long position is defined as a firm's long position minus its short position (assuming its long position is larger than its short position). For example, if a firm has purchased 5,000 contracts for December 2009 delivery and sold 1,000 contracts for December 2010 delivery, it has a net long position of 4,000 contracts.

²⁹ The CFTC does not publish information from the COT reports for weeks when fewer than 20 firms have reportable positions.

**Figure 12: Participation in the Futures Market
2009 & 2010 Vintage Contracts, January 2010 to January 2011**



The number of firms taking short and long positions was relatively constant during 2010, reaching a high of 22 in several months and falling below the threshold for reporting of 20 for many weeks. Participation was lower in 2010 than in 2009 when the CFTC reported that an average of 28 firms held significant futures positions in 2009 vintage contracts.

A relatively small number of firms accounted for large shares of the positions in 2009 vintage and 2010 vintage futures contracts during periods when the CFTC reported such information. Four firms accounted for an average of 90 percent of all long positions in 2009 vintage contracts, while four other firms accounted for an average of 86 percent of all short positions in 2009 vintage contracts. Likewise, four firms accounted for 80 percent of all long positions in 2010 vintage contracts when such information was reported, while four other firms accounted for 72 percent of all short positions in 2010 vintage contracts.

Although the COT reports do not provide firm-level information on open interest, they provide an indication of the upper limits of the net long and net short positions in 2009 vintage contracts of individual firms. At its peak on November 16, 2010, the net long positions of four firms added up to the equivalent of 11 million 2009 vintage allowances, implying that the largest net long position of any single firm was smaller.

Combined with firm-specific information about allowance holdings from COATS, the information on open interest in the COT reports is useful for evaluating the concentration of ownership of RGGI allowances, which is discussed further in Section VI.

VI. DISCUSSION OF MARKET MONITORING

As the RGGI Market Monitor, we evaluate the conduct of market participants in the auctions and in the secondary market to identify potential anti-competitive conduct. In addition, the CFTC evaluates trading in the secondary market consistent with its role as the regulator of futures and option markets in the U.S. We also assess whether the auctions were administered properly by the auction administrator.

Participation in the auctions by a large number of firms promotes competition and helps ensure that the auction clearing price reflects the market value of allowances. Hence, the participation by a large number of firms in the current control period offerings that can be observed in Figure 9 is a positive indicator regarding the competitiveness of the first ten auctions. Although interest in the small number of allowances auctioned for the future control period has been more limited, we have found no material evidence of anti-competitive conduct or significant barriers to participation in our reviews of the bids and the qualification process for each product in each auction. Further, we found that the auctions were conducted in accordance with the noticed rules and bids received.

In our monitoring of the secondary market, we evaluate whether firms could potentially hoard a substantial share of the supply of allowances to influence prices or to prevent a competitor from obtaining allowances. Based on our review of the holdings of individual firms, we find no evidence that hoarding is a significant concern, and that the holdings of individual firms are generally consistent with their expected need for allowances. Moreover, the results of Figure 11 demonstrate that the allowances are widely distributed across the COATS accounts of individual firms.

Another potential concern is that a firm expecting to purchase CO₂ 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 CO₂ 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 CO₂ 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 CO₂ allowances for their future compliance needs help limit the effectiveness of a strategy to depress prices below the competitive level. Hence, it is encouraging that there are a large number of firms with compliance obligations that far exceed the largest possible long position in the futures market. Nevertheless, the CFTC has access to confidential transaction data, which allows it to monitor for evidence of manipulative conduct.