RGGI Inc.

ANNUAL REPORT ON THE MARKET FOR RGGI CO_2 ALLOWANCES: 2014

Prepared for:

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

Prepared By:

POTOMAC ECONOMICS

May 2015

This report was prepared by Potomac Economics (the contractor) in the course of performing work contracted for and sponsored by RGGI, Inc. on behalf of the RGGI Participating States (Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont). The opinions expressed in this report do not necessarily reflect those of RGGI, Inc. or any of the Participating States, and reference to any specific product, service, process, or method does not constitute an implied or expressed recommendation or endorsement of it. Further, RGGI, Inc., the Participating States, and the contractor make no warranties or representations, expressed or implied, as to the fitness for particular purpose or merchantability of any product, apparatus, or service, or the usefulness, completeness, or accuracy of any processes, methods, or other information contained, described, disclosed, or referred to in this report. RGGI, Inc., the Participating States, and the contractor make no representation that the use of any product, apparatus, process, method, or other information will not infringe privately owned rights and will assume no liability for any loss, injury, or damage resulting from, or occurring in connection with, the use of information contained, described, disclosed, or referred to in this report.

The Regional Greenhouse Gas Initiative (RGGI) is a cooperative effort of Northeast and Mid-Atlantic states to reduce emissions of carbon dioxide (CO_2) from the power sector.

RGGI, Inc. is a non-profit corporation created to provide technical and administrative services to the states participating in the Regional Greenhouse Gas Initiative.

Table of Contents

Table of Figures

I. EXECUTIVE SUMMARY

The Regional Greenhouse Gas Initiative ("RGGI") became the first mandatory cap-and-trade program to limit CO_2 emissions in the United States in 2009. Electric power generators located in the states participating in RGGI are required to obtain a number of CO_2 allowances equal to the number of tons of CO_2 they emit. RGGI distributes CO_2 emissions allowances to the market primarily through auctions, making it distinctive among existing cap-and-trade programs. Ninety-four percent of the CO_2 allowances that have entered into circulation initially entered the market through one of the auctions. Through the end of 2014, RGGI has conducted 26 successful auctions, selling a total of 729 million CO_2 allowances for $1.9 billion.

Following the 2012 Program Review, the participating states announced changes to the Model Rule, including a new CO_2 emissions cap.[1] The new CO_2 emissions cap was set at 91 million tons for 2014, and is being reduced by 2.5 percent per year until it reaches approximately 78 million tons for 2020. The Model Rule also included further interim adjustments to the cap to account for the surplus of allowances that accumulated from 2009 to 2013.[2]

This report evaluates activity in the market for RGGI CO_2 allowances in 2014, 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,[3] and market monitoring.

---

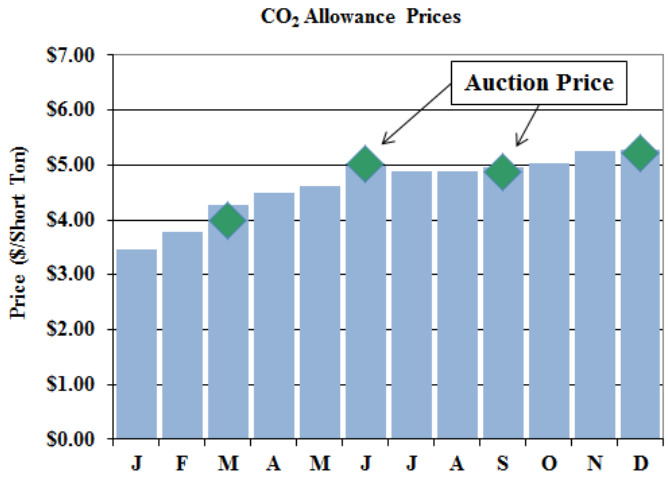
1 The new emissions cap and other updates to the Model Rule were announced on February 7, 2013. See http://www.rggi.org/docs/PressReleases/PR130207_ModelRule.pdf. Subsequently, each of the Participating States revised its CO_2 Budget Trading Program to be consistent with the updated Model Rule. See http://www.rggi.org/docs/PressReleases/PR011314_AuctionNotice23.pdf.

2 These program changes are described in more detail in Section II.A.

3 Throughout this report the term "firms" is used to refer to all participants in the CO_2 allowance market, including individuals.

CO_2 Allowance Prices

The average auction clearing price increased 62 percent from $2.92 in 2013 to $4.72 in 2014. Secondary market prices were generally consistent with auction clearing prices, increasing steadily throughout the first half of 2014, leveling-off in the middle of the year, and then rising slightly in the last two months (see figure). Prices in the secondary market increased approximately 59 percent to an average of $4.82 in 2014.[4]



The demand for allowances in the auctions rose considerably following the announcement of the updated model rule in February 2013. Likewise, the volatility of allowance prices in the secondary market also increased markedly, but after the initial increase, volatility has gradually fallen during 2013 and 2014.[5] The Cost Containment Reserve ("CCR") is a key factor that has helped limit price volatility: (a) directly by providing for the sale of five million additional allowances during 2014 and (b) indirectly since the potential for CCR allowances to be sold in future auctions limits upward speculative pressure on prices.

Trading of CO_2 Allowances

Firms initially acquire CO_2 allowances in the primary market, mainly by purchasing them in the quarterly auctions. Firms can also buy and sell CO_2 allowances in the secondary market. Secondary market activity consists mainly of trading of futures and options contracts on the public exchange and transfers of ownership recorded in COATS ("CO_2 Allowance Tracking System").

---

4 Allowance prices are summarized in more detail in Section III.A.

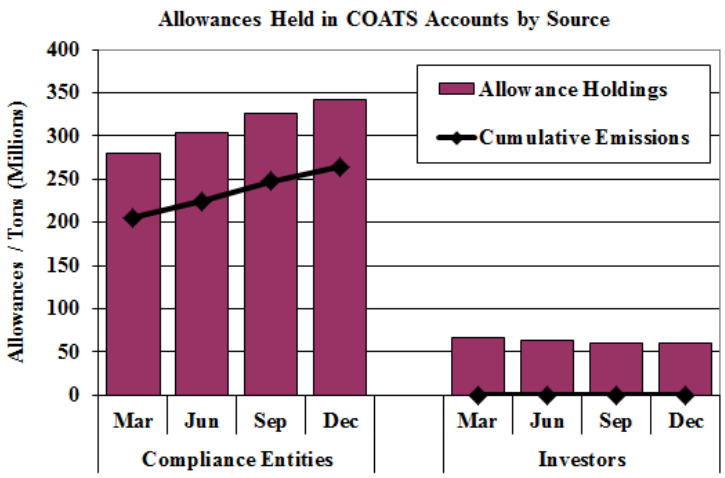
5 Allowance price volatility is evaluated in Section III.B.

Compliance entities gradually accumulated CO_2 allowances during 2014, while many investors were active in the secondary market.[6] Consequently, the volume of futures trading increased significantly, rising 38 percent from 76 million CO_2 allowances in 2013 to 104 million in 2014. Trading activity was highest in the fourth quarter, which accounted for 51 percent of the annual volume.[7]

Acquisition and Holdings of CO_2 Allowances

There continued to be a large private bank of surplus allowances in circulation throughout 2014, which accumulated during the period from 2009 to 2013. The number of CO_2 allowances in circulation increased from 319 million at the beginning of 2014 to 403 million at the end of the year. The cumulative compliance obligations for the second control period rose to 264 million at the end of 2014. Therefore, the surplus number of CO_2 allowances at the end of 2014 was 139 million. As a result of the interim downward adjustments to the cap, the current surplus of allowances will wind-down over the remainder of the decade.

The figure below summarizes the holdings of CO_2 allowances at the end of each quarter in 2014 by compliance entities and investors.[8] As the figure shows, compliance entities held substantially more CO_2 allowances than needed to satisfy compliance obligations. Compliance entities held 85 percent of allowances in circulation, 342 million allowances, at the end of 2014 compared to second control period emissions of 264 million. The surplus CO_2 allowances



[6] Entities without compliance obligations (or without affiliates that have compliance obligations) are described as "investors" throughout this report.

[7] Trading volumes and open interest are summarized in Sections IV.B and IV.C.

[8] Monthly totals are provided in Section IV.D.

held by compliance entities at the end of 2014 (78 million) accounted for 56 percent of the overall private bank of surplus allowances. Thus, investors held 44 percent of the private bank of surplus CO_2 allowances at the end of 2014. At the end of 2013, compliance entities held 81 percent of allowances in circulation.[9]

Although the auctions are still the primary means by which firms acquire CO_2 allowances, many individual firms relied primarily or exclusively on the secondary market in 2014. Seventy-six percent of the CO_2 allowances in circulation at the end of 2014 were held by firms that had held them since the beginning of the year, 11 percent were held by firms that acquired them through auctions or state allocations during 2014, and 13 percent were held by firms that purchased them in the secondary market during 2014.

Participation in the Market by Individual Firms

Participation by many firms promotes competition and helps ensure that CO_2 allowance prices are determined efficiently. Over time, firms that need CO_2 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.[10]

The demand for CO_2 allowances is dispersed relatively widely across firms, inviting participation in the auctions by a large number of firms. The three largest compliance entities account for a combined 39 percent of the total projected demand, a small decrease from 2013.

The number of auction participants in 2014 remained unchanged at an average of 45 bidders. The number of compliance entities submitting bids increased from an average of 36 in 2013 to 38 in 2014, while the number of investors submitting bids decreased from an average of 10 in 2013 to 7 in 2014.

---

[9] The classification of individual firms as compliance entities or investors is updated on an on-going basis. Thus, the holdings and other activity attributed to compliance entities and to investors may change from previous reports because a compliance entity has been recognized as an affiliate of a firm that was previously classified as an investor.

[10] Participation in the auctions and the secondary market by individual firms is evaluated in Section V.

The holdings of allowances were generally distributed across firms consistent with their compliance obligations, although the significant surplus of allowances in circulation led many individual firms to hold surpluses. The top ten compliance entities accounted for 55 percent of total holdings and smaller compliance entities accounted for 27 percent. The top four firms by surplus holdings (i.e., holdings in excess of compliance obligations) accounted for 14 percent and additional investors accounted for 4 percent. These levels are consistent with competitive expectations given that the current private bank of allowances far exceeds the compliance obligations of firms in the second control period.

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. We also assess whether the auctions were administered properly by World Energy Solutions, Inc.

In our reviews of the four auctions in 2014, 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 CO_2 allowances. 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 CO_2 allowances, and we find that firms have generally purchased quantities of allowances that are consistent with their expected needs.

II. BACKGROUND ON THE CO_2 ALLOWANCE MARKET

RGGI began full operation in 2009, becoming the first mandatory market-based program to limit CO_2 emissions in the United States. Market-based 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, the goal of market-based programs is to use market forces to reduce overall emissions in the most cost-effective ways.

RGGI is a collaborative effort of Northeast and Mid-Atlantic states to reduce overall CO_2 emissions.[11] Electricity generating plants with more than 25 MW of capacity ("CO_2 budget sources") must acquire a number of CO_2 allowances sufficient to cover their CO_2 emissions by the end of each control period. Firms that own budget sources ("compliance entities") can acquire CO_2 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 CO_2 allowances has several key elements, which are discussed in this section: compliance obligations, the CO_2 Allowance Tracking System ("COATS"), the primary market for allowances, and the secondary market for allowances.

A. Regional CO_2 Emissions Cap

Following a 2012 Program Review, each of the Participating States announced changes to the RGGI program, including a new RGGI CO_2 cap for the period from 2014 to 2020.[12] The new

[11] The full set of rules for the RGGI program (known as the "Model Rule") may be found at http://www.rggi.org/docs/ProgramReview/_FinalProgramReviewMaterials/Model_Rule_FINAL.pdf.

[12] The new emissions cap and other updates to the Model Rule were announced on February 7, 2013. See http://www.rggi.org/docs/PressReleases/PR130207_ModelRule.pdf. Subsequently, each of the Participating States revised its CO_2 Budget Trading Program to be consistent with the updated Model Rule. See http://www.rggi.org/docs/PressReleases/PR011314_AuctionNotice23.pdf. See also www.rggi.org/design/overview/cap

CO_2 cap was set at 91.0 million tons for 2014 and is being reduced by 2.5 percent per year until it reaches approximately 78.2 million tons for 2020.

Interim Adjustments to Account for Banked Allowances

Further adjustments were made to the cap to account for the surplus of allowances from allocation years 2009 to 2013.[13] Although many of the CO_2 allowances from allocation years 2009 to 2013 were not distributed, 690 million allowances were put in circulation compared to total compliance obligations of 550 million tons for the period from 2009 to 2013.[14] Unused CO_2 allowances can be "banked" by the holder, so the private bank of allowances exceeded the total expected compliance obligations by 140 million tons at the beginning of 2014. Consequently, two interim adjustments were used to adjust the RGGI CO_2 cap to account for the private bank of allowances that had accumulated by the first quarter of 2014.

First Control Period Interim Adjustment for Banked Allowances ("FCPIABA") – This is a reduction in the number of CO_2 allowances that is being sold over the seven-year period from 2014 to 2020. The amount of the reduction is equal to the private bank of first control period CO_2 allowances (i.e., allocation years 2009, 2010, and 2011) that were in circulation after compliance was completed for the first control period. The FCPIABA is approximately 8.2 million CO_2 allowances per year from 2014 to 2020.[15]

Second Control Period Interim Adjustment for Banked Allowances ("SCPIABA") – This is a reduction in the number of CO_2 allowances that is being sold over the six-year period from 2015 to 2020. The amount of the reduction is equal to the private bank of 2012 and 2013 allocation year allowances that are in excess of 2012 and 2013 emissions. The SCPIABA is approximately 13.7 million CO_2 allowances per year from 2015 to 2020.[16]

---

[13] The emissions cap was reduced from 188 million tons to 165 million tons in 2012 to account for the departure of New Jersey at the end of the first control period.

[14] This includes 53 million tons of compliance obligations for New Jersey from 2009 to 2011.

[15] See www.rggi.org/design/overview/cap.

[16] *ibid.*

Given the new CO_2 cap and the interim control period adjustments for banked allowances, the adjusted CO_2 cap will fall from approximately 82.8 million in 2014 to 56.3 million in 2020. Overall, the number of CO_2 allowances distributed for the adjusted CO_2 cap for the period from 2014 to 2020 will be approximately 449 million. These will be in addition to the 140 million surplus allowances that were already in circulation at the end of 2013 for a total supply of 589 million from 2014 to 2020.

Cost Containment Reserve

Beginning in 2014, RGGI implemented a new provision known as the Cost Containment Reserve ("CCR").[17] The CCR allows for the sale of a fixed number of allowances in addition to the cap when the clearing price in the quarterly auction reaches the CCR Trigger Price. The CCR is replenished at the start of each calendar year. In 2014, the CCR had a withdrawal limit of five million allowances, and the CCR Trigger Price was $4.00. From 2015 to 2020, the annual withdrawal limit will be ten million allowances, and the CCR Trigger Prices will rise to $6.00 in 2015, $8.00 in 2016, and $10.00 in 2017, and it will rise 2.5 percent in each year thereafter. In 2014, all five million allowances were sold from the CCR. These are in addition to the 589 million allowances already planned to be available for the period from 2014 to 2020.

B. Compliance Obligations

CO_2 budget sources are fossil fuel-fired electricity generating plants with greater than 25 MW of capacity. Shortly after the end of each control period, compliance entities must submit a sufficient number of CO_2 allowances to cover their CO_2 emissions during the control period. The first control period ran from January 1, 2009 to December 31, 2011, and the second control period ran from January 1, 2012 to December 31, 2014.

In 2015, RGGI will complete the compliance process for the second control period. By January 30, compliance entities were required to submit all CO_2 emissions data for CO_2 budget sources for the second control period to the Environmental Protection Agency's ("EPA's") Clean Air

[17] See http://www.rggi.org/docs/ProgramReview/_FinalProgramReviewMaterials/Model_Rule_Summary.pdf.

Markets Division ("CAMD") Business System. By March 2, the Compliance Account for each CO_2 budget source was required to hold a number of second control period CO_2 allowances (not including any CO_2 allowances surrendered previously) sufficient to satisfy its compliance obligation. Each CO_2 budget source was also required to submit a Compliance Certification Report certifying that it was in compliance with its state's CO_2 Budget Trading Program.[18, 19]

C. CO_2 Allowance Tracking System ("COATS")

COATS is the registry for RGGI CO_2 allowances. Each CO_2 allowance has a unique serial number and can be used to satisfy one short ton of compliance obligations. When firms trade CO_2 allowances in the secondary market, the seller must record the transfer of ownership in COATS before the buyer is recognized as the owner.[20]

D. Primary Market for RGGI CO_2 Allowances

The participating states have taken the approach of using auctions rather than free allocations as the primary means for distributing RGGI CO_2 allowances to the market. Accordingly, the primary market for CO_2 allowances consists mainly of the quarterly auctions.

Auctions – Through the end of 2014, 94 percent of the CO_2 allowances that have been put into circulation initially entered the market through one of the 26 auctions that have taken place on a quarterly basis since September 2008.

Offset Projects – Additional CO_2 allowances can also be awarded for approved CO_2 emissions offset projects (project-based greenhouse gas emissions reductions or carbon sequestration that

---

[18] The Compliance Process Checklist for the Second Control Period may be found at http://www.rggi.org/docs/Compliance/2015/RGGI_Compliance_2015_Checklist.pdf.

[19] RGGI administered the compliance process for the first control period in 2012. Compliance entities were required to: (a) submit all CO_2 emissions data by January 30, 2012, (b) acquire a sufficient number of allowances to satisfy their compliance obligations by March 2, 2012, and (c) submit a Compliance Certification Report for each Budget Source. The Compliance Summary for the First Control Period may be found at https://rggi-coats.org/eats/rggi/Docs/ArchivedSourceSubmittedComplianceReport.pdf.

[20] Public information related to the COATS registry may be found at http://www.rggi.org/market/tracking/public_reporting.

occurs outside the capped electricity generation sector), although no such allowances have been awarded thus far.

Early Reduction Allowances – In 2009, there was a one-time award by certain participating states of 2.4 million early reduction allowances (ERAs), which were awarded for qualifying CO_2 emissions reductions achieved at CO_2 budget sources during 2006 through 2008, prior to the start of the first control period.

Allocations & Sales by States – Approximately 29.7 million CO_2 allowances for the first control period were allocated by individual states through either fixed-price sales or free allocations. Approximately 7.7 million CO_2 allowances for the second control period have been allocated by individual states.

Regardless of how CO_2 allowances initially enter the market, they can be traded to other firms in the secondary market.

E. Secondary Market for RGGI CO_2 Allowances

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

The secondary market for RGGI CO_2 allowances comprises the trading of physical allowances and financial derivatives, such as futures, forwards, and options contracts. A physical CO_2 allowance trade occurs when the parties to the transaction register the transfer of ownership in COATS. Financial derivatives include any contracts whereby parties agree to exchange funds and/or allowances at some future date, depending in many cases on factors such as the price of allowances at some future date. Many financial derivatives eventually result in the transfer of physical CO_2 allowances (i.e., the transfer is registered in COATS), but this may occur months or years after the parties enter into a financial transaction. These include the following types of transactions:

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

- *Forwards* – These are like futures contracts, but a forward contract typically requires that all financial settlement occur at expiration.

- *Call Options* – Call options give the purchaser the option to buy a fixed number of CO_2 allowances of a certain vintage year at a particular strike price at any time prior to the expiration date. For example, suppose a firm holds a call option with $5 strike price and December 2014 expiration date. If the price of the corresponding forward contract rose to $5.75, the firm could exercise the option to buy CO_2 allowances at $5 and immediately sell them at $5.75. Alternatively, if the price of the forward contract stayed below $5, the firm would let the option expire without exercising it. One standard options contract can be exercised for 1,000 RGGI allowances.

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

Futures, forwards, and options contracts allow firms to manage risks associated with unforeseen swings in commodity prices. Futures and forwards 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 and forward contracts, they usually require less financial security, which could make them more attractive to some firms.

The terms of futures, forward, and option contracts vary in the degree to which they are standardized. "Exchange-traded" contracts typically have the most standardized provisions, while the term "over-the-counter" ("OTC") is applied to contracts with less standardized provisions. However, OTC contracts, once entered into, are often settled through a clearinghouse in order to protect the parties from the risk that the counterparty defaults.

The amount of *open interest* is the net amount of futures, forwards, 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. CO_2 ALLOWANCE PRICES

The market for RGGI CO_2 allowances consists primarily of purchases in the quarterly auctions and trading of allowances and allowance futures and options contracts in the secondary market. The clearing prices from quarterly auctions provide public information about the market value of CO_2 allowances four times per year, while the prices of futures and forwards trades on public exchanges and transaction prices recorded in COATS provide price information more frequently. This section of the report evaluates prices in the markets for RGGI CO_2 allowances in 2014.

Key observations regarding RGGI CO_2 allowance prices:

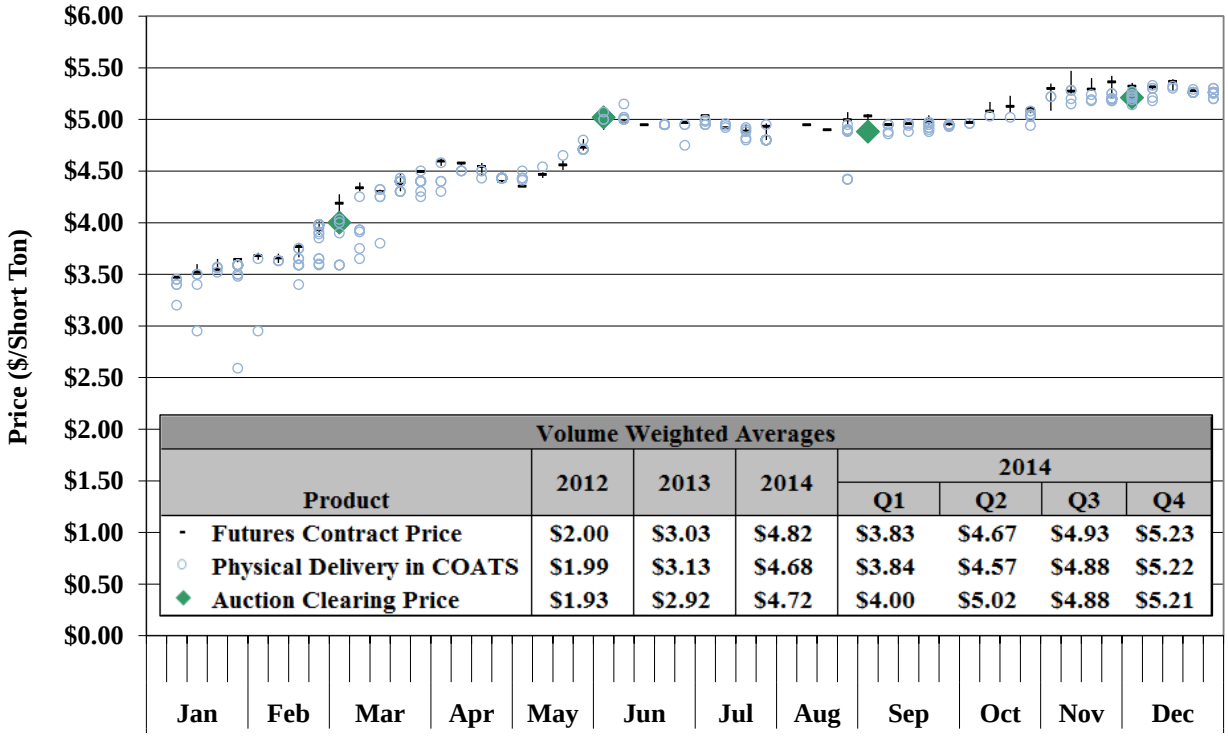
- *Auction Clearing Prices* – The volume-weighted average auction clearing price increased 62 percent from $2.92 in 2013 to $4.72 in 2014. Auction prices increased throughout the year and peaked in the fourth quarter, when Auction 26 cleared at $5.21 on December 3.
- *Price Trends in the Secondary Market* – Secondary market prices were generally consistent with auction clearing prices, increasing steadily throughout the first half of 2014, leveling in the middle of the year, then trending upward beginning in October. Prices increased from under $3.50 at the start of 2014 to approximately $5.25 from November through the end of the year. Volume-weighted average prices increased approximately 50 percent for the second year in a row, but were less volatile in 2014 than in recent years.
- *Price Volatility* – The volatility of futures prices increased after the announcement of planned changes in the annual CO_2 emissions cap in February 2013, but volatility steadily decreased during 2014, reflecting more certainty regarding allowance prices. The CCR has helped limit price volatility, both directly by allowing the sale of additional allowances in 2014 and indirectly since the potential for CCR allowances to be sold in future auctions limits speculative pressure on prices.

A. Prices in the Auctions and the Secondary Market

Figure 1 summarizes prices in the auctions and in the secondary market on a weekly basis from January to December 2014. 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 volume-weighted average price for each week. The volume-weighted average price of physical deliveries of CO_2 allowances recorded in COATS are shown by blue circles for each day when a transaction took place at a price that was recorded by

the transacting parties.[21] The figure also shows the auction clearing prices of CO_2 allowances in the four quarterly auctions held during 2014, which are represented by the green diamonds.

Figure 1: CO_2 Allowance Prices in the Auctions and Secondary Market 2014



Volume Weighted Averages							
Product	2012	2013	2014	2014 Q1	2014 Q2	2014 Q3	2014 Q4
Futures Contract Price	$2.00	$3.03	$4.82	$3.83	$4.67	$4.93	$5.23
Physical Delivery in COATS	$1.99	$3.13	$4.68	$3.84	$4.57	$4.88	$5.22
Auction Clearing Price	$1.93	$2.92	$4.72	$4.00	$5.02	$4.88	$5.21

Observations regarding prices in auctions and the secondary market:

- *General Price Levels* – The prices of CO_2 allowances increased throughout the first half of 2014, rising from just under $3.50 at the start of the year to approximately $5.00 by Auction 24 at the beginning of June. Prices remained close to $5.00 through the end of September, then trended upward in October before leveling out over the last two months of the year. Prices generally exceeded $5.25 from November through the end of the year. Volume-weighted average prices increased by approximately 50 percent for the second year in a row, but were less volatile in 2014 than in recent years. The fourth quarter of 2014 saw prices at their highest levels since the inception of the RGGI market.
- *Futures Contract Prices* – These were generally consistent with the prices of physical deliveries in COATS throughout the year. The volume-weighted average futures price for all vintages and control periods reached a quarterly high of $5.23 for the fourth quarter. For the calendar year 2014, the average futures price increased 59 percent to $4.82.

[21] Parties must report the transaction price if there is an underlying financial transaction related to the transfer.

- *Physical Deliveries in COATS* – The volume-weighted average transaction price for all vintages and control periods CO_2 allowances increased 49 percent from $3.13 in 2013 to $4.68 in 2014. The pricing of transactions generally moved consistent with the pricing of futures and auction clearing prices during the year. However, on some days, primarily in the first quarter, transactions generally involving small volumes were recorded at levels substantially below the prevailing price levels indicated by futures prices and most other COATS transactions. Most of these were likely from transactions that were executed significantly after the pricing terms were agreed to by the parties.
- *Auction Clearing Prices* – The volume-weighted average auction clearing price increased 62 percent from $2.92 in 2013 to $4.72 in 2014.[22] Similar to futures contract prices and CO_2 allowance transfers in COATS, auction prices increased throughout the year and peaked in the fourth quarter, when Auction 26 cleared at $5.21 on December 3.

B. Volatility of CO_2 Allowance Prices

Cap-and-trade markets are designed to give firms efficient incentives to reduce 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 CO_2 allowance prices decrease the risks associated with making long-term investments in reducing CO_2 emissions. Since CO_2 allowance prices can be volatile, the availability of futures and options contracts allows firms to protect themselves from the risks of such investments. This subsection evaluates two measures of price volatility in the market for RGGI CO_2 allowances.

One measure of the volatility of CO_2 allowance prices is known as *historic volatility*,[23] which is a measure of volatility based on day-to-day price variations over a recent period (e.g., several months or one year). This is a useful measure when factors influencing the volatility of prices in the recent period are likely to be the same as the factors influencing the volatility of prices in the future.

---

[22] Volume-weighted average auction prices include five million CCR allowances that were sold at $4.00 as part of Auction 23.

[23] 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.

Observations regarding historic volatility of CO_2 allowance prices:

- *Historic Volatility in 2014* – The historic volatility of futures prices dropped from 35 percent in 2013 to 14 percent in 2014. The volatility of futures prices decreased each quarter of the year in 2014, and ended the year with a fourth quarter average of 8 percent—the lowest level seen since 2012.
- *Historic Volatility Long-Term Trend* – Historic volatility was very low from 2010 to 2012 because there was a substantial surplus of CO_2 allowances and prices remained very close to the auction reserve price, which functions as a price floor since allowances are never sold for less than the auction reserve price. Volatility increased from 5 percent in 2012 to 35 percent in 2013 after the announcement of planned changes following the 2012 Program Review. As prices began to level-off in the second half of 2014, the volatility of allowance prices also decreased considerably.

Another measure of the volatility of CO_2 allowance prices is known as *option-implied volatility*,[24] which measures the volatility that is implied by the trading of option contracts for CO_2 allowances. If a firm perceives that CO_2 allowance prices are volatile, the firm may be willing to pay a high price for an option contract that protects it from unforeseen allowance price fluctuations. Likewise, if a firm perceives that CO_2 allowance prices are relatively stable, the firm will be willing to pay relatively little for the same option contract.[25]

The following scatter plot reports the option-implied (i.e., expected) volatility of RGGI CO_2 allowance futures contracts, which can be inferred from the trading of options contracts in 2014.[26] The vertical axis shows the option-implied (expected) volatility of CO_2 allowance futures prices, and the horizontal axis shows the trade date. The figure excludes contracts if fewer than two auctions occurred between the trade date and the expiration date. This is because

---

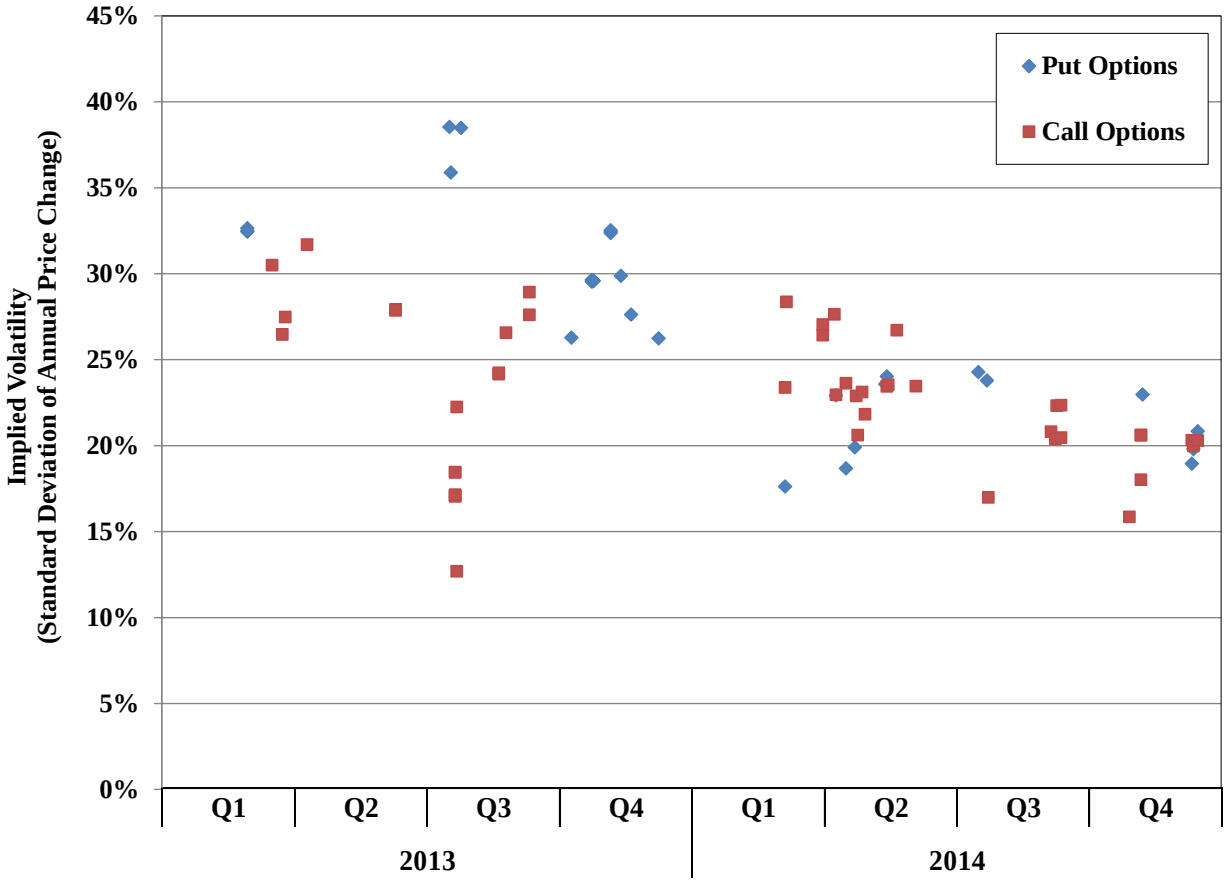
[24] The option-implied volatility of a CO_2 allowance refers to the expected standard deviation of the distribution of allowance prices one year in the future. For example, if the expected value of the price one year in the future is $1 and the option-implied volatility is 25 percent, this implies that 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.

[25] The price of an option contract depends primarily on two factors: (i) the expected value of a CO_2 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.

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

historical pricing patterns suggest that CO_2 allowance prices become more volatile around the time of each quarterly auction. Therefore, 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 2: Option-Implied Volatility of CO_2 Allowance Futures Prices 2014



Observations regarding the option-implied volatility of CO_2 allowance prices:

- *General Patterns of Volatility* – Option-implied volatility varied considerably during 2013 and 2014, but was broadly consistent with the pattern of historic price volatility. Both volatility metrics reflect that uncertainty regarding allowance prices was initially high after RGGI announced program changes in February 2013. As allowance prices have leveled out, there has been a gradual decline in uncertainty regarding the value of CO_2 allowances as a percentage of allowance prices. Notwithstanding, in absolute dollar terms, volatility has actually risen slightly since early 2013 because volatility (which is measured as a percent of allowance prices) has fallen slower than allowance prices have risen.

- *Cost Containment Reserve* – Since the program changes announced in February 2013, the CCR has been significant in reducing the volatility of allowance prices. The CCR reduces volatility by making additional supply available if allowance prices rise to the prescribed levels, but the CCR also has a significant effect on expectations. For example, since market participants know that if prices rise to $6.00 in the auctions during 2015, as many as ten million allowances will become available, it limits speculative pressure that might otherwise cause prices to rise significantly above $6.00.
- *Put Options* – The average option-implied volatility for put options trades decreased from 31 percent in 2013 to 21 percent in 2014. Option-implied volatility for the year ranged between 18 and 24 percent over 13 trades. Since put options generally protect the holder in the event of a price decrease, the decline in option-implied volatility suggests that market participants anticipated less risk of a decline in CO_2 allowance prices.
- *Call Options* – The option-implied volatility for call options trades trended downward slightly during 2013 and 2014. Option-implied volatility ranged between 16 and 28 percent in over 30 trades during 2014.

IV. TRADING AND ACQUISITION OF CO_2 ALLOWANCES

This section evaluates the trading and acquisition of CO_2 allowances in the primary and secondary allowance markets. Firms initially acquire CO_2 allowances in the primary market, mainly by purchasing them in the quarterly auctions. Firms then buy and sell CO_2 allowances in the secondary market. Secondary market activity can be observed from information about the trading of futures and options contracts on public exchanges and in the OTC market as well as from the transfers of ownership recorded in COATS. This section analyzes the movement of CO_2 allowances from their initial introduction to the market and in the secondary market.

The figures in this section evaluate the activity of firms in the CO_2 allowance market in 2014, including the acquisition of allowances in the quarterly auctions and trading in the secondary market. The analyses in this section distinguish between compliance entities and investors (i.e., firms with no compliance obligations). [27]

Key observations regarding trading and acquisition of CO_2 allowances:

- *Unsold CO_2 Allowances* – For the second year in a row, none of the allowances offered in auctions went unsold. This compares to 41 percent unsold in 2012 and 48 percent unsold in 2011. The drop in unsold allowances reflects that firms anticipate that allowance prices will remain above the auction reserve price in the future.
- *Surplus CO_2 Allowances in Circulation* – The number of CO_2 allowances in circulation increased from 319 million at the end of 2013 to 403 million at the end of 2014. Over the same period, cumulative compliance obligations for the second control period rose from 179 million to 264 million. Thus, the amount of surplus holdings (in excess of the amount needed for cumulative emissions) was 140 million at the beginning of 2014 and 139 million at the end of 2014. As a result of the interim adjustments for banked CO_2 allowances, the current surplus of allowances will wind-down over the remainder of the decade.
- *Acquisition by Compliance Entities* – The share of the CO_2 allowances in circulation that were held by compliance entities increased from 81 percent at the end of 2013 to 85

[27] The classification of firms as compliance entities or investors is updated on an on-going basis. Thus, the holdings and other activity attributed to compliance entities versus investors may change from previous reports because a compliance entity has been recognized as an affiliate of a firm that was previously classified as an investor.

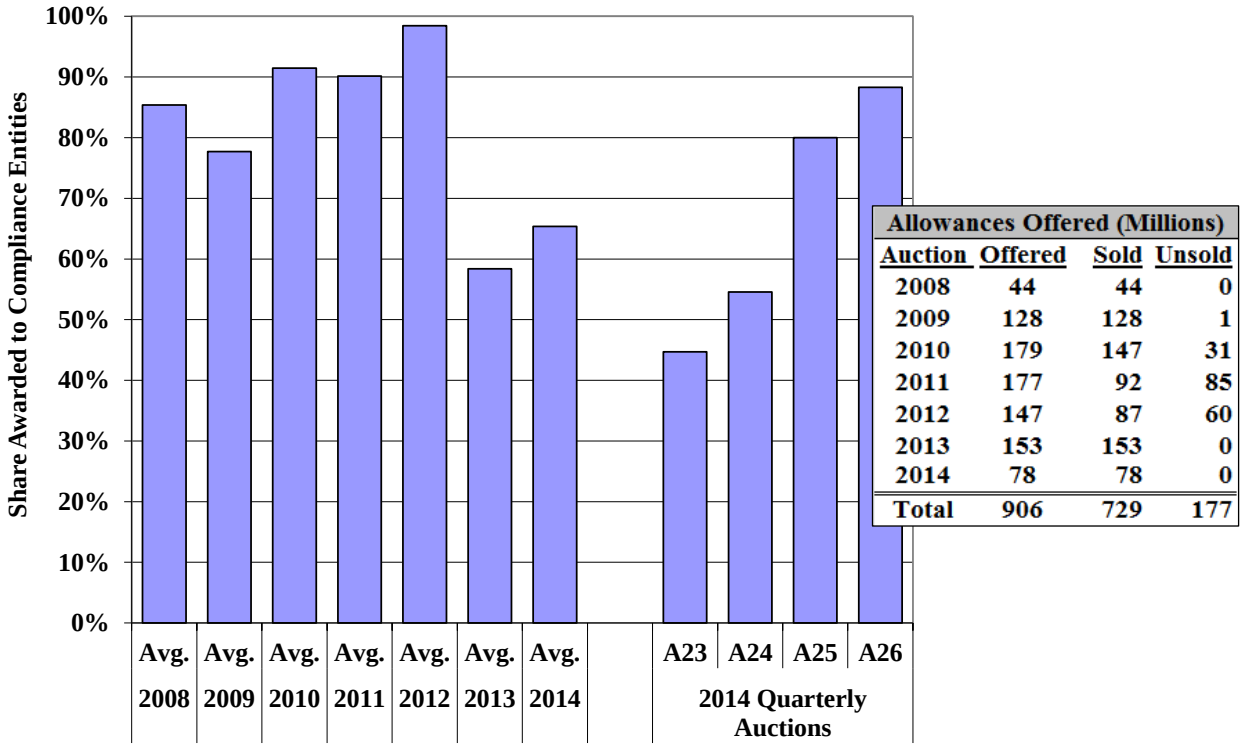
percent by the end of 2014. At the end of 2014, compliance entities held 78 million of the surplus CO_2 allowances in circulation (56 percent).

- *Participation by Investors* – Investors purchased 35 percent of the CO_2 allowances offered for sale at auction during 2014 and then sold a significant portion in the secondary market. Thus, the percentage of CO_2 allowances held by investors decreased from 19 percent at the beginning of 2014 to 15 percent at the end of 2014. Of the 139 million surplus CO_2 allowances in circulation at the end of 2014, investors held approximately 61 million (44 percent). A high level of participation by investors is expected given the large current surplus of CO_2 allowances, and investor participation is likely to reduce volatility even as the CO_2 emissions cap tightens over the remainder of the decade.
- *Trading Activity in the Secondary Market* – Compliance entities continued to accumulate allowances while investors remained active in the secondary markets. Consequently, the volume of futures trading increased significantly, rising 38 percent from 76 million CO_2 allowances in 2013 to 104 million in 2014. The volume of allowance transfers between unaffiliated firms in COATS also increased significantly, rising 90 percent from approximately 56 million CO_2 allowances in 2013 to 107 million in 2014. Fifty-one percent of the yearly volume of futures contracts and 40 percent of the yearly volume of allowance transfers in COATS occurred in the fourth quarter of 2014 as many futures contracts reached maturity and compliance entities prepared to satisfy their second control period compliance obligations.
- *Patterns of CO_2 Allowance Acquisition* – Approximately 76 percent of the CO_2 allowances in circulation at the end of 2014 were held by firms that had held them since the beginning of the year, 11 percent were held by firms that acquired them through auctions or state allocations during 2014, and 13 percent were held by firms that purchased them in the secondary market during 2014.

A. Distribution of Auction Awards

The following figure reports the quantity of CO_2 allowances that were offered and sold in each of the four auctions that were held in 2014 (i.e., Auctions 23 through 26) and in each year from 2008 to 2014. The bars show the percentage of CO_2 allowances (as a share of allowances sold) that was purchased by compliance entities in each year since 2008 and in each auction held in 2014, while the remaining share of allowances sold in each period was purchased by investors. The table in the figure shows the numbers of offered, sold, and unsold allowances in each calendar year since 2008.

Figure 3: Distribution of Auction Awards
Auctions 23 to 26 [28]



Allowances Offered (Millions)			
Auction	Offered	Sold	Unsold
2008	44	44	0
2009	128	128	1
2010	179	147	31
2011	177	92	85
2012	147	87	60
2013	153	153	0
2014	78	78	0
Total	906	729	177

Observations regarding distribution of auction awards:

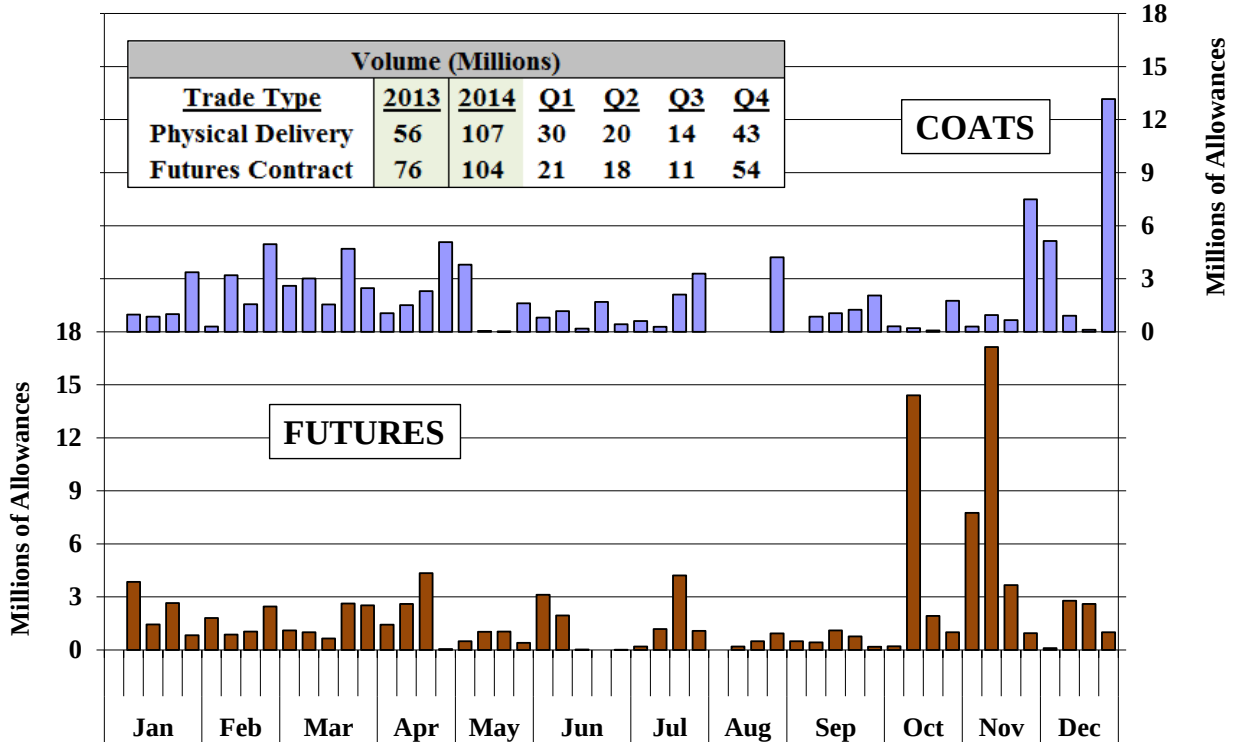
- *Distribution of Auction Awards* – The share of CO_2 allowances purchased in the auctions by compliance entities ranged from 78 percent to 98 percent through 2012 and then decreased to 58 percent in 2013 and 65 percent in 2014. The increased share of CO_2 allowances purchased by investors since 2013 reflects that (a) the number of allowances in circulation far exceeds the obligations that compliance entities have incurred to date, but (b) the emissions cap will be tightened in a manner that reduces the number of surplus allowances in circulation over the remainder of the decade. Consequently, compliance entities do not have an incentive to hold a substantial portion of the allowances in circulation, while investors that expect allowance prices to rise in the future have an incentive to hold allowances at present.
- *Unsold CO_2 Allowances* – For the second year in a row, none of the allowances offered in auctions went unsold. This compares to 41 percent unsold in 2012 and 48 percent unsold in 2011. The drop in unsold allowances reflects that firms anticipate that allowance prices will remain above the auction reserve price in the future.

[28] All five million allowances in the 2014 CCR were sold in Auction 23. These allowances are included the figure.

B. CO_2 Allowance Trading Volumes

The following figure summarizes the volume of trading of futures and forward contracts on the Intercontinental Exchange ("ICE") as well as transfers of CO_2 allowances between unaffiliated parties that were recorded in COATS on a weekly basis in 2014. The bottom portion of the figure is plotted against the left vertical axis, and shows the weekly volume of futures trading of CO_2 allowance contracts. The top portion of the figure is plotted against the right vertical axis, and shows the weekly volume of CO_2 allowance transfers between unaffiliated firms that are reported in COATS. The table shows quarterly volumes in 2014 as well a year-over-year comparison of the total volume of futures trading and CO_2 allowance transfers in COATS.

Figure 4: Volume of Trading of CO_2 Allowances and Allowance Futures 2014



Observations regarding CO_2 allowance trading volumes:

- *Volume of Futures Trading* – The volume of futures trading totaled approximately 104 million CO_2 allowances in 2014, up from 76 million in 2013 and just 2.2 million in 2012. Fifty-one percent of the yearly volume occurred in the fourth quarter of 2014, when nearly 54 million CO_2 allowances were traded. Investors continued to play an active role in the allowance market.

- *CO_2 Allowance Transfers* – The volume of CO_2 allowance transfers between unaffiliated firms totaled approximately 107 million in 2014, up 90 percent from approximately 56 million in 2013.[29] Investors continue to play a significant role in the allowance market, while compliance entities hedged their risk.

C. Acquisition of CO_2 Allowances in the Secondary Market

This section evaluates how the ownership of CO_2 allowances has changed as a result of trading in the secondary market.[30] Changes in the ownership of CO_2 allowances are quantified in Figure 5 using two measures: the open interest in RGGI futures contracts and the net purchases and sales of CO_2 allowances by individual firms.[31, 32]

Figure 5 summarizes net changes in ownership through the secondary market in 2014. Futures open interest is based on futures positions at the end of the last business day of each month, while net purchases and sales are based on registered holdings in COATS at the end of the last business day of each month.

---

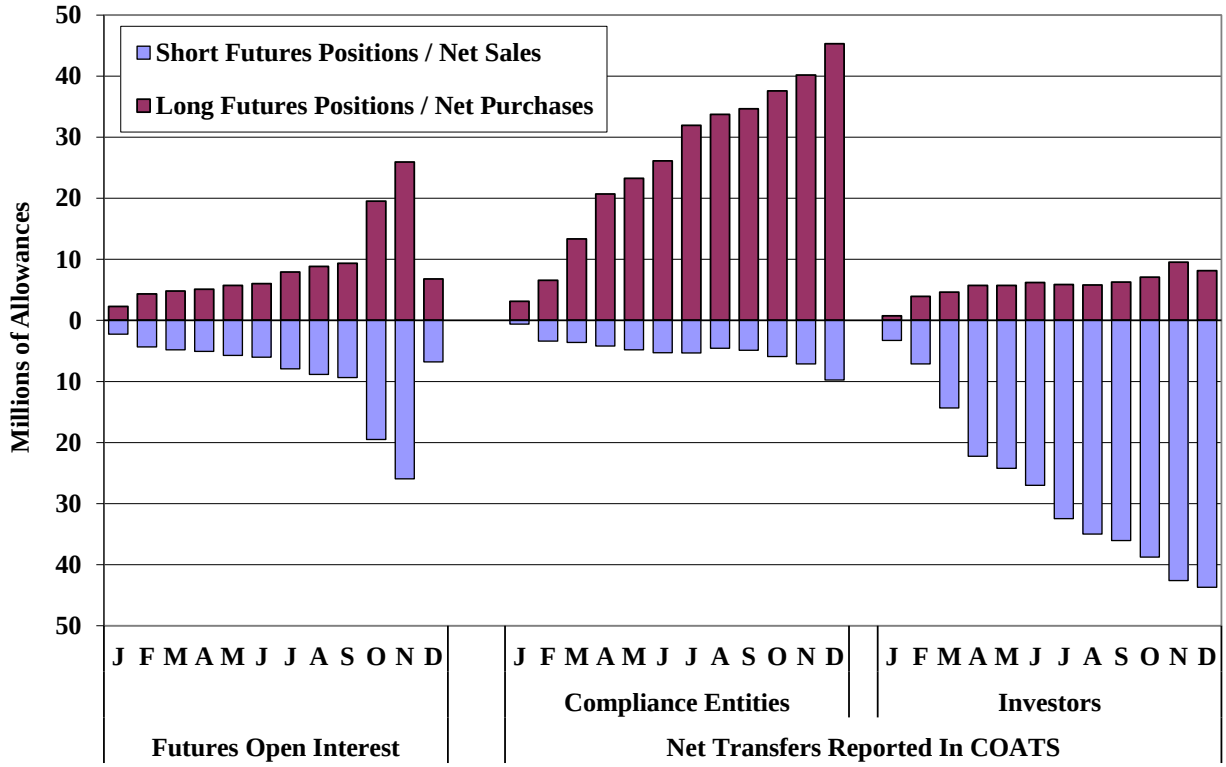
[29] The total volume of 2013 transfers in COATS is significantly higher than reported last year. The increase is due to lag time in the recording of transactions. Firms agreed to transfer nearly seven million allowances in 2013, but these were not recorded in COATS until 2014.

[30] This excludes CO_2 allowances that were held by firms that purchased them directly in the auction or received them through allocations by one of the Participating States.

[31] Open interest in futures contracts includes the net amount of futures contracts that have been purchased or sold on ICE 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). Information on the open interest in futures contracts is available on the ICE.

[32] Net purchases/sales of CO_2 allowances by a particular firm include the net change in the amount of CO_2 allowances in a firm's COATS account that has resulted from trading (rather than the auctions or allocations). For example, if a firm purchases 100,000 CO_2 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 CO_2 allowance holdings in the market can be determined by summing the net purchase or net sales of individual firms. Information on the ownership of actual CO_2 allowances comes from COATS.

Figure 5: Futures Open Interest and Net Transfers of CO_2 Allowances [33, 34]
2014



Observations regarding the acquisition of CO_2 allowances in the secondary market:

- *Open Interest in Futures* – Open interest rose steadily throughout 2014, before increasing dramatically beginning in mid-October. The net change in open interest of futures and forward contracts during 2014 reached a high of over 32 million CO_2 allowances on November 21, before decreasing to 26 million at the end of November and 6.8 million at the end of December. The significant decrease at the end of the year was expected due to the delivery of December 2014 contracts.
- *Net Transfers Reported by Compliance Entities* – Most transfer activity during 2014 was from compliance entities using the secondary market to acquire CO_2 allowances that they need to satisfy their compliance obligations. Most compliance entities gradually purchased allowances during 2014, increasing their holdings by 45 million CO_2 allowances. A small number of compliance entities were net sellers in 2014, reducing

[33] Futures open interest refers to the net change in futures open interest that occurred since January 1, 2014. The total futures open interest at the end of 2013 was just over 16 million CO2 allowances. Therefore, the total open interest in RGGI futures products is 16 million greater than the net change being reported in Figure 5.

[34] Net transfers of CO_2 allowances include transfers that occurred since January 1, 2014. Hence, transfers that occurred before January 1, 2014 are excluded.

their holdings by 9.7 million CO_2 allowances. These results indicate that the majority of compliance entities have used the secondary market to increase their holdings rather than to sell surplus allowances.

- *Net Transfers Reported by Investors* – In general, investors sold a large portion of their allowance holdings through the secondary market in 2014. Most investors sold allowances during 2014 for a total reduction in holdings of 44 million allowances. However, a small number of investors used the secondary market to increase their holdings by a total of 8.1 million CO_2 allowances.
- *Total Net Acquisition Reported in COATS* – The total net purchase of CO_2 allowances in 2014 (50.4 million) is less than half of the gross volume of transactions between unaffiliated firms (107 million as shown in Figure 4). This is because some firms have both purchased and sold CO_2 allowances in the secondary market such that the net change in their position is smaller than the total volume of their transactions. Although the total net purchase of CO_2 allowances was substantial, it was still smaller than the 78 million CO_2 allowances that were acquired in the auctions in 2014. Hence, the auctions were still the principal means by which firms acquired CO_2 allowances in 2014.

D. Patterns of CO_2 Allowance Holdings

The following figure combines information on the acquisition of CO_2 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, 2014. Together, this information provides a summary of the holdings of CO_2 allowances in COATS accounts according to whether the allowances were acquired: (i) prior to 2014, (ii) through the primary market, or (iii) through the secondary market. Figure 6 reports several categories of CO_2 allowances that are described below.

Net Sales in the Secondary Market includes CO_2 allowances that were held at the end of 2013, purchased in an auction in 2014, or acquired through an allocation in 2014 and then subsequently sold in the secondary market.

Net Purchases in the Secondary Market includes CO_2 allowances that were held in the COATS account of a firm that purchased them in the secondary market after January 1, 2014.

Awards and Allocations – Retained in COATS Account includes CO_2 allowances that were still held in the COATS account of the firm that purchased them in an auction or acquired them

through an allocation in 2014. If a firm was a net seller of CO_2 allowances at any point in 2014, then the CO_2 allowances were first deducted from this category.

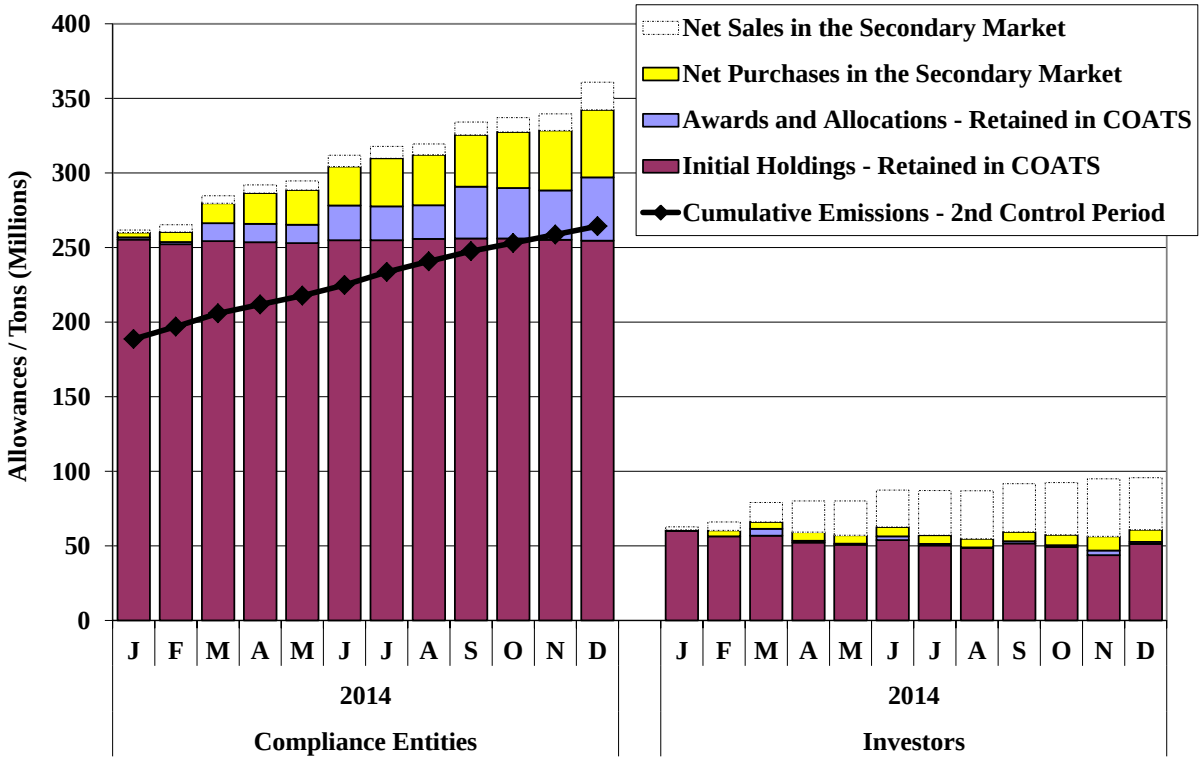
Initial Holdings – Retained in COATS Account includes CO_2 allowances that were held in the COATS account of the firm from the beginning of 2014. If a firm sold CO_2 allowances in 2014, those allowances were deducted from this category after any awards and allocations were exhausted.

For each firm, its holdings of CO_2 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*.[35] Figure 6 shows the four categories of CO_2 allowances at the end of each month in 2014. The figure also shows the cumulative CO_2 emissions for compliance entities in the second control period. The information is aggregated separately for compliance entities and for investors.

[35] If a firm initially held 15,000 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 130,000 allowances in the secondary market, the firm would contribute:

- 30,000 allowances to *Net Sales in Secondary Market*. The calculation does not consider the serial numbers of individual allowances. Hence, in the example, it would not matter whether the 130,000 allowances sold had originally been acquired in the auction or in the secondary market.
- 20,000 allowances to *Awards and Allocation – Retained in COATS Account.*
- 15,000 allowances to *Initial Holdings – Retained in COATS Account.*

Figure 6: Sources of CO_2 Allowances Held in COATS Accounts
2014



Observations regarding registered CO_2 allowance holdings:

- *Holdings by Compliance Entities* – Three hundred and nineteen million CO_2 allowances were in circulation at the beginning of January 2014. Of these, 257 million (81 percent) were held by compliance entities. Compliance entities purchased significant numbers of allowances in quarterly auctions and in the secondary market, which led to an increase in the share of allowances held by compliance entities to 85 percent by the end of 2014.
- *Cumulative CO_2 Emissions in the Second Control Period* – Cumulative second control period CO_2 emissions rose from 179 million at the beginning of 2014 to 264 million at the end of 2014. The amount of surplus holdings (above the amount needed for cumulative emissions) remained steady throughout the year, ranging from a low of 124 million to a high of 140 million, and settling at 139 million at the end of December 2014. Thus, there is currently a substantial surplus of allowances in circulation. As a result of the interim adjustments for banked CO_2 allowances the current surplus of allowances will be depleted over the remainder of the decade.
- *Holdings by Investors* – Due primarily to the sale of 35 million CO_2 allowances in the secondary market, the share of allowances held by investors decreased from 19 percent at the beginning of 2014 to 15 percent at the end of 2014. At the end of 2014, investors held 44 percent of the surplus allowances in circulation.

V. PARTICIPATION IN THE CO_2 ALLOWANCE MARKET

This section evaluates participation by individual firms in the CO_2 allowance market. Participation by many firms promotes competition and helps ensure that CO_2 allowance prices are determined efficiently. Over time, firms that need CO_2 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 the level of participation by individual firms in four ways: (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.

Key observations regarding participation in the CO_2 allowance market:

- *Demand for CO_2 Allowances* –The demand for CO_2 allowances is dispersed relatively widely across firms, resulting in participation in the auctions by large number of firms. The three largest compliance entities account for a combined 39 percent of the total projected demand and the top ten compliance entities account for 70 percent. These shares have decreased slightly from the estimates in 2013.
- *Participation in the Auctions* – The average number of bidders participating in 2014 auctions was 45, consistent with 2013 auctions. The number of compliance entities submitting bids increased slightly to an average of 38 in 2014. The number of investors submitting bids decreased from an average of 10 in 2013 to 7 in 2014.
- *Distribution of CO_2 Allowances Awarded* – The share of awards allocated to the top ten compliance entities increased from 38 percent in 2013 to 46 percent in 2014, while the share of awards allocated to the top five investors decreased from 40 percent in 2013 to 39 percent in 2014. Aggregating across all 2014 auctions, the largest number of CO_2 allowances awarded to a single firm went to an investor that purchased nearly 17 percent of the allowances.
- *Distribution of CO_2 Allowance Holdings* – The top ten compliance entities accounted for 55 percent of the total holdings and smaller compliance entities accounted for 27 percent of holdings. Four firms with significant surplus holdings accounted for 14 percent of current holdings and additional investors accounted for 4 percent. [36] From 2013, the

[36] In this report, the "surplus holdings" of a particular firm refers to the amount by which the holdings of the firm exceed its compliance obligations up to a given point in the control period.

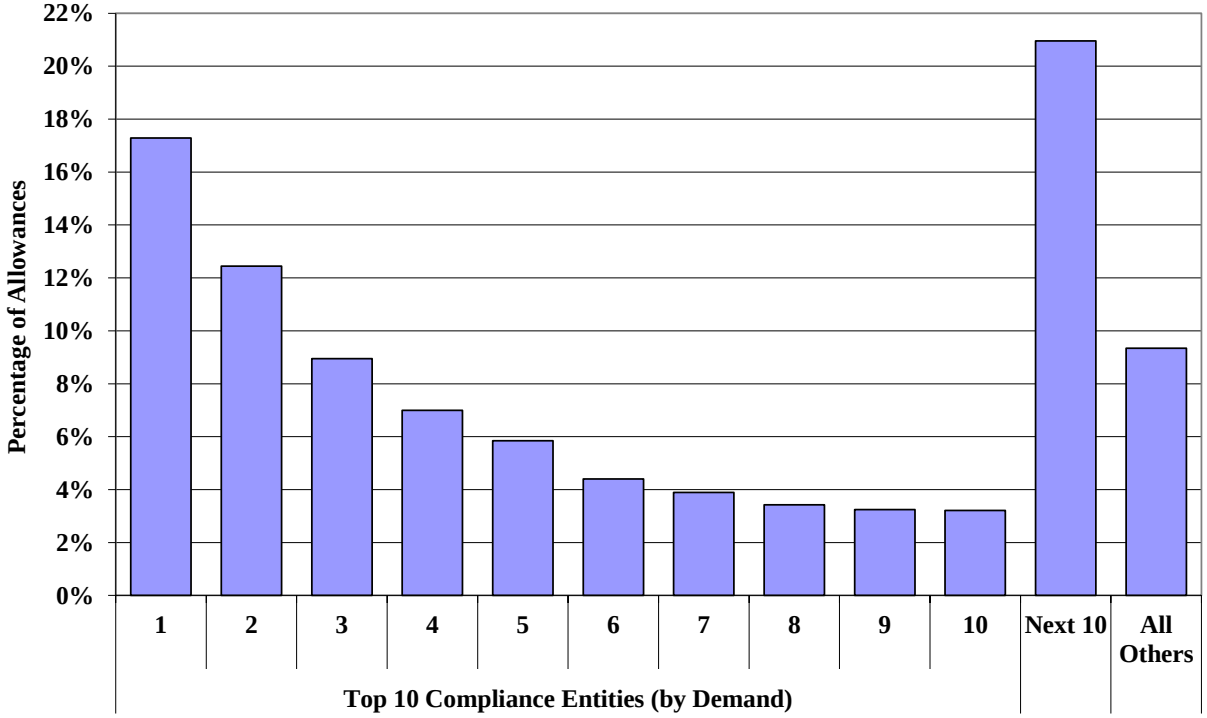
percentage of holdings for the top ten compliance entities decreased from 56 percent to 55 percent and smaller compliance entities percentage increased from 21 percent to 27 percent. The percentage of holding for investors and for compliance entities with significant surplus holdings decreased from 23 percent to 18 percent. These levels of holdings are distributed widely across firms and the current private bank of allowances far exceeds emissions to date.

- *Concentration of Futures Holdings* – Many firms have open interest in RGGI CO_2 allowance futures and options, although a small number of firms account for large shares of the net long and short positions in 2014 Vintage contracts. The net long positions of the top four firms accounted for an average of 42 percent of the total long positions for the weeks that were published, while the net short positions of the top four firms accounted for an average of 49 percent of the total short positions.

A. Demand for CO_2 Allowances

The following figure summarizes the projected demand for CO_2 allowances of individual compliance entities at the end of 2014. We project the demand of each compliance entity for CO_2 allowances based on historical CO_2 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 7 as a percentage of the total projected market demand.

Figure 7: Estimated Demand for CO_2 Allowances By Compliance Entity



Observations regarding demand for CO_2 allowances:

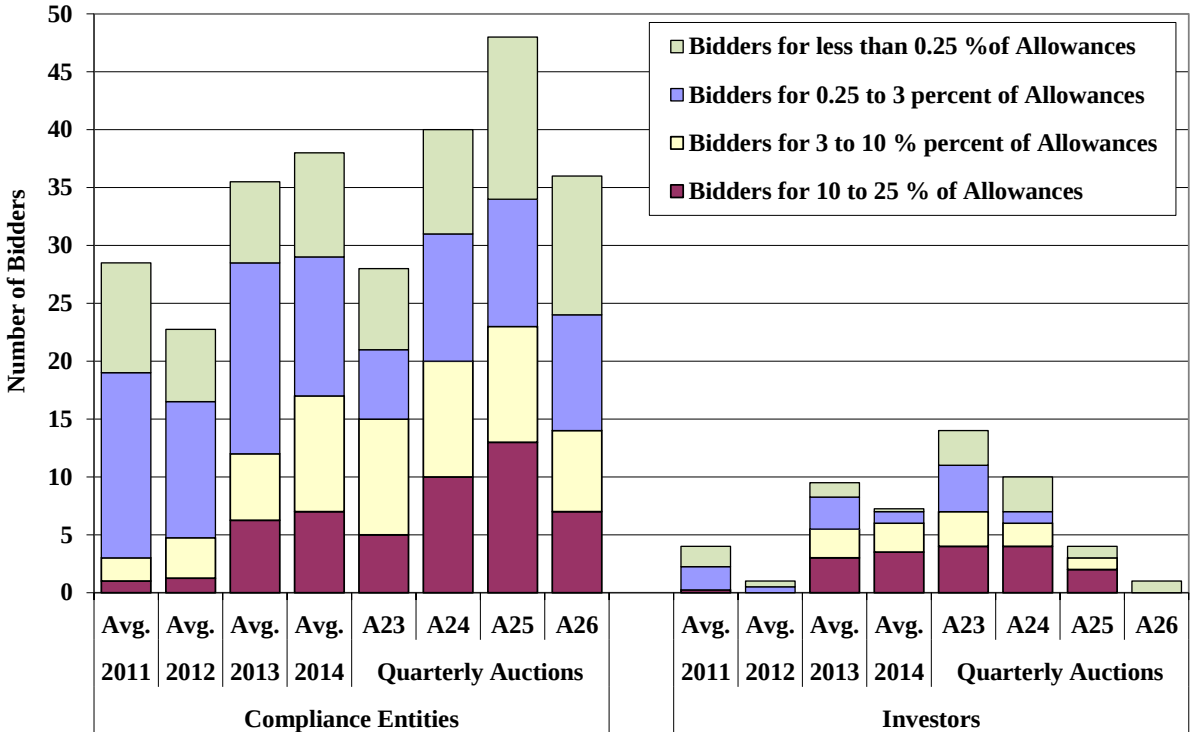
- *Demand for CO_2 Allowances* – The demand for CO_2 allowances is dispersed relatively widely across firms. The two largest compliance entities account for 30 percent of the total projected demand, while the top five compliance entities account for 52 percent. The top ten compliance entities account for 70 percent of the total projected market demand, while the next ten compliance entities account for 21 percent, and all compliance entities that are not among the top 20 firms account for 9 percent.
- *Concentration of Demand* – Except for the one percent increase in the estimated demand for CO_2 allowances by the top compliance entity concentration of demand decreased slightly. The the demand for allowances by the top three compliance entities as a group decreased from 42 to 39 percent, and the top five and ten compliance entities as a group each decreased by approximately 1.5 percent.

B. Participation in RGGI Auctions

The following figure summarizes the breadth of participation in the four auctions during 2014. The figure reports the number of firms that submitted bids in each auction. The number of

bidders is shown separately based on whether the bidder was a compliance entity or an investor. The figure shows these quantities averaged across the auctions in each year from 2010 to 2014.[37]

Figure 8: Number of Bidders According to the Quantity of Bids Submitted Auctions for Current Control Period Allowances



Observations regarding participation in the RGGI auctions:

- *Participation by Compliance Entities and Investors* – In the 2014 auctions, the number of bidders ranged from 43 to 50 and averaged 45 firms, equal to the average number of bidders in 2013 auctions. The number of compliance entities submitting bids increased from an average of 36 in 2013 to 38 in 2014, while the number of investors submitting bids decreased from an average of 10 in 2013 to 7 in 2014.
- *Participation by Large and Small Bidders* – The number of large bidders (i.e., firms submitting bids for more than three percent of the allowances in a current control period offering) increased from an average of 18 in 2013 to 23 in 2014. The number of small bidders (i.e., firms submitting bids for up to three percent of allowances offered for sale) decreased from 28 in 2013 to 22 in 2014.

[37] For example, in Auction 24, 18 million CO_2 allowances were offered. A firm that submitted bids for 200,000 allowances would be counted in the "C: 1% to 3%" category, since 200,000 ÷ 18 million = 1.1 percent.

- *Competition* – Participation by a large number of firms promotes competition and helps ensure that the auction clearing price reflects the market value of CO_2 allowances. The levels of participation in the 2014 auctions remain healthy, and we 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.

C. Acquisition of CO_2 Allowances by Individual Firms

In a well-functioning market, we expect each firm to purchase a number of CO_2 allowances that is generally consistent with its demand. Individual firms may purchase a larger or smaller share according to how the current price of CO_2 allowances compares to their expectations of allowance prices in the future. Firms that believe CO_2 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 CO_2 allowances in the auctions and in the secondary market reflects reasonable expectations.

The following two figures examine the distribution of CO_2 allowances across firms following the sixth full year of the RGGI market's operation. Figure 9 illustrates how broadly CO_2 allowances were distributed in the auctions, while Figure 10 illustrates how the holdings of allowances in COATS accounts were distributed after the close of 2014. The figures show that CO_2 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 9 reports the average quantities of CO_2 allowances that were awarded to firms in the auctions in 2013 and 2014. The awards are shown for each of the top ten compliance entities (i.e. the ten firms with the highest projected demand) and for each of the top five investors (i.e., the five firms with the largest total awards). Compliances entities are ranked in descending order based on total awards rather than demand. The table also shows the level of awards given to all other (not included in the top 10) compliance entities and investors as a group.

Figure 9: Distribution of Auction Awards
2013 - 2014

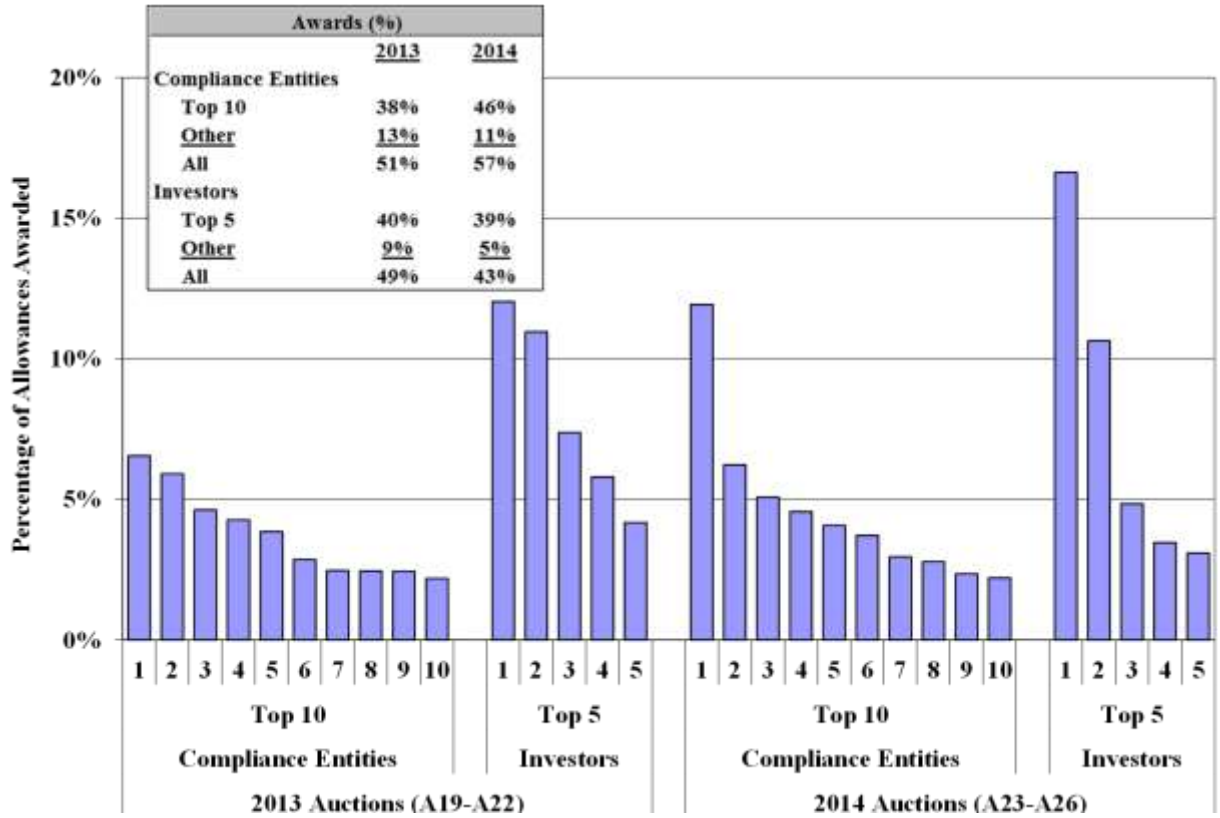
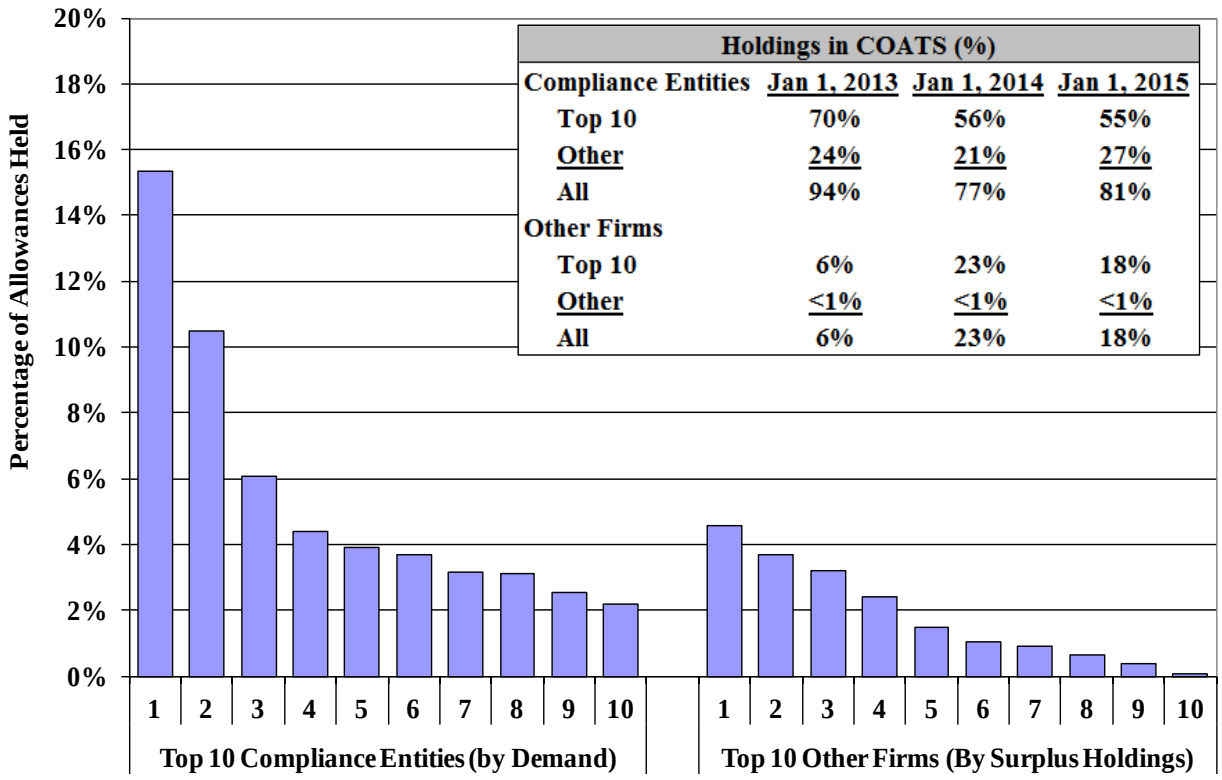


Figure 10 reports the quantities of CO_2 allowances that were held in the COATS accounts of individual firms at the beginning of January 2015, following the delivery of contracts for December 2014 delivery. The holdings are shown for each of the top ten compliance entities (i.e. the ten firms with the highest projected demand) and for ten other firms with the largest surplus holdings (not including the top ten compliance entities). Most of these firms are investors or compliance entities that hold allowances for both compliance and investment purposes. The top ten compliance entities are ranked in descending order based on total holdings rather than demand. The table also shows the level of holdings of other (not included in the top ten) compliance entities and firms with significant surplus holdings as a group.

Figure 10: Distribution of CO_2 Allowance Holdings
January 1, 2015



Observations regarding the distribution of CO_2 allowances:

- *Distribution of CO_2 Allowances Awarded* – The share of awards allocated to the top ten compliance entities increased from 38 percent in 2013 to 46 percent in 2014, while the share of awards allocated to the top five other firms decreased from 40 percent in 2013 to 39 percent in 2014. Aggregating across all 2014 auctions, the largest number of CO_2 allowances awarded to a single firm that purchased nearly 17 percent of the allowances but that was not among the top ten compliance entities.
- *Distribution of CO_2 Allowance Holdings* – The holdings of CO_2 allowances were distributed across firms at the close of 2014 at levels that were generally less than the demand of those firms. The top ten compliance entities accounted for 55 percent of the total holdings and smaller compliance entities accounted for 27 percent of holdings. Four firms without compliance obligations or with relatively small compliance obligations accounted for 14 percent of current holdings. These levels of holdings do not raise competitive concerns given that the current private bank of allowances far exceeds the compliance obligations of firms thus far in the second control period.

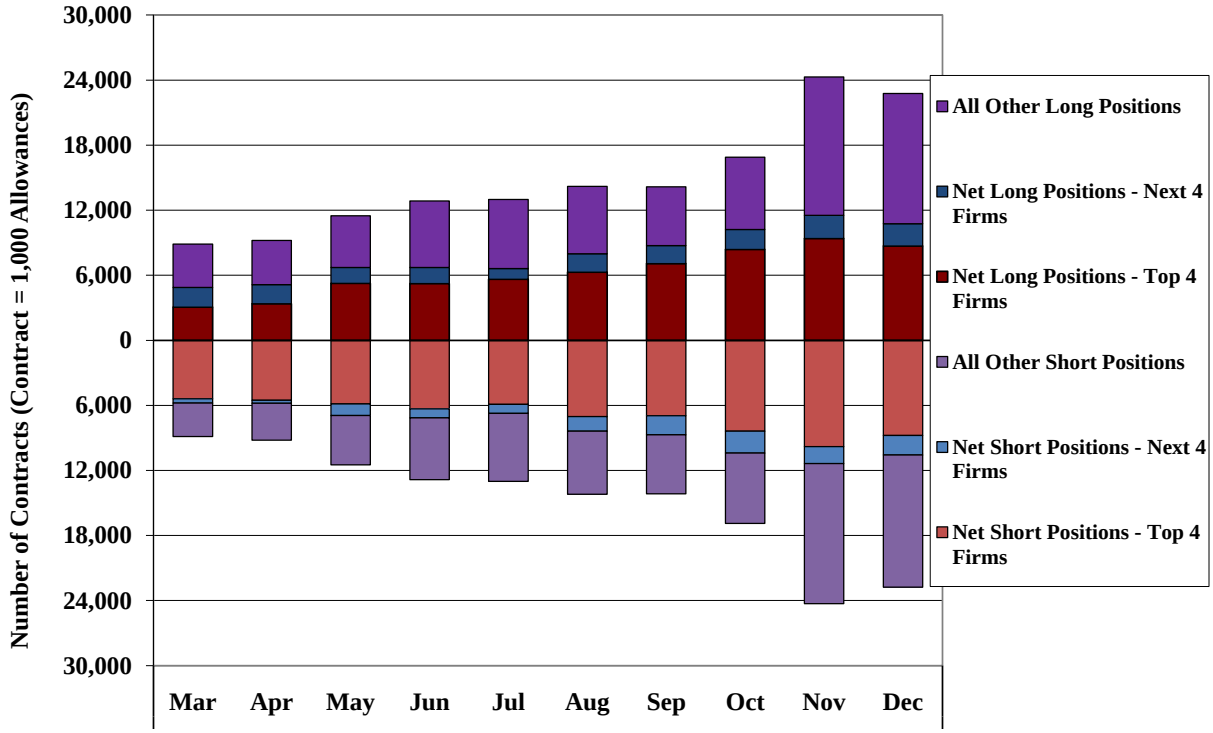
D. Participation in the CO_2 Allowance Futures Market

Additional information about the trading of futures, forwards, and options is available in the weekly Commitments of Traders ("COT") reports, which are published by the Commodity Futures Trading Commission ("CFTC") [38] for each week when greater than 20 firms have reportable positions in a particular product.

Figure 11 summarizes the concentration of open interest in Vintage 2014 ICE futures and options contracts. The figure reports the average monthly net long positions in three categories: (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. The figure also reports the average monthly net short positions in three categories: (i) the four firms with the largest short positions (see "Top 4 Firms"), (ii) the four firms with the largest short positions not including the Top 4 (see "Next 4 Firms"), and (iii) all other short positions.

[38] Each day, firms with an open interest of 25 contracts or more are required to report their positions to the CFTC. Each Tuesday, the CFTC publishes the COT report, which is a summary of the long and short positions of participants in the market.

Figure 11: Concentration of Open Interest in CCFE Futures and Options[39]
Vintage 2014



Observations regarding the concentration of open interest in futures and options contracts by individual firms:

- *Number of Participants* – The number of participants in the market for RGGI CO_2 allowance derivatives increased in 2014, and the COT report was published 34 weeks of the year, as compared to just four weeks in 2013 and none in 2012. For the weeks that were reported, up to 24 firms had significant positions in RGGI Vintage 2014 futures contracts. However, the CFTC did not publish the information for any other vintages in 2014 because fewer than 20 firms had reportable positions.
- *Concentration of Ownership* – Many firms have open interest in RGGI CO_2 allowance futures and options, although a small number of firms account for large shares of the net long and short positions in Vintage 2014 contracts. The net long positions of the top four firms accounted for an average of 42 percent of the total long positions for the weeks that were published, while the net short positions of the top four firms accounted for an average of 49 percent of the total short positions.

[39] Source: The CFTC's Commitment of Traders reports which are available at "www.cftc.gov/MarketReports/CommitmentsofTraders/HistoricalCompressed/index.htm".

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. 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 substantial number of firms as observed in Figure 8 is a positive indicator regarding the competitiveness of the first 26 auctions. 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. We also 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 over the current control period. Moreover, the results of Figure 10 demonstrate that the allowances are adequately distributed across the COATS accounts of individual compliance entities.

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

allowances for their future compliance needs help limit the effectiveness of a strategy to depress prices below the competitive level. Given current price levels relative to the auction reserve price, firms would have a strong incentive to make additional purchases if a firm deliberately attempted to depress the futures price.