QUARTERLY REPORT ON THE ELECTRICITY GENERATOR EMISSIONS LIMITS PROGRAM (310 CMR 7.74): FOURTH QUARTER 2023

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TABLE OF CONTENTS

A. Introduction and Summary

The Massachusetts Department of Environmental Protection ("MassDEP") implemented its program to limit CO_2 emissions from electricity generators in January 2018. This report provides background on key aspects of the program, a summary of market activity through the compliance deadline for 2023, an overview of emissions and allowance holdings patterns, and discussion of the results of our market power screens.

- *CO_2 Emissions versus the Annual Caps*: Emissions have fallen since the program's annual caps were established, resulting in a large number of banked allowances after each annual compliance deadline.
  - ✓ In 2021, the cap was 8.28 million allowances compared to 5.92 million metric tons of emissions. The cap is not scheduled to fall below this level until 2032.
  - ✓ In 2022, the cap was 8.06 million allowances compared to 6.44 million metric tons of emissions. The cap is not scheduled to fall below this level until 2030.
  - ✓ In 2023, the cap was 7.84 million allowances compared to 5.45 million metric tons of emissions. The cap is not scheduled to fall below this level until 2034.
- *Load, Generation, and Emissions Trends*: Emissions from covered generation have fallen compared to 2018. Also, 2023 emissions were lower than in 2021 and 2022.
  - ✓ Generation from covered units fell by 12 percent in 2023 from the previous year.
- *CO_2 Allowance Prices and Trading Activity*: Trading activity was limited in 2023 and early 2024 as regulated entities relied on banked allowances and auctions to satisfy most or all of their projected compliance obligations for 2023.
  - ✓ The vast majority of allowance purchases were made through auctions rather than the secondary market. The six auctions for 2023 vintage allowances cleared:
    - 391,784 allowances for $4.00/metric ton in Auction 2022-3 in June 2022,
    - 391,784 allowances for $7.51/metric ton in Auction 2022-4 in September 2022,
    - 1,175,351 allowances for $14.20/metric ton in Auction 2023-1 in December 2022,
    - 1,175,351 allowances for $12.05/metric ton in Auction 2023-2 in March 2023,
    - 1,536,084 allowances for $9.40/metric ton in Auction 2023-3 in June 2023, and
    - 1,536,083 allowances for $3.00/metric ton in Auction 2023-4 in September 2023.
  - ✓ The six offerings of 2024 vintage allowances cleared:
    - 380,590 allowances for $6.03/metric ton in Auction 2023-1 in December 2022,

- 380,590 allowances for $5.85/metric ton in Auction 2023-2 in March 2023,
- 380,590 allowances for $6.53/metric ton in Auction 2023-3 in June 2023, and
- 380,590 allowances for $3.00/metric ton in Auction 2023-4 in September 2023.
- 761,180 allowances for $2.25/metric ton in Auction 2024-1 in December 2023.
- 761,180 allowances for $2.25/metric ton in Auction 2024-2 in March 2024.

✓ The spread between 2023 vintage and 2024 vintage clearing prices decreased in each auction from December 2022 to September 2023. A small price spread is expected when there is a substantial surplus of current vintage allowances that can be banked and used in subsequent years.

We evaluate information on the holdings and demand for allowances to identify firms that may have acquired a position that raises competitive concerns. In the current study period, we find no evidence of anti-competitive conduct in the secondary market for allowances, and we find that firms have generally sought to acquire or sell allowances consistent with their expected needs for 2023 and 2024.

B. BACKGROUND

Regulation 310 CMR 7.74 created a cap-and-trade program to reduce carbon dioxide emissions from electricity generating facilities located in Massachusetts beginning in 2018.[1] 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 hold 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.

Covered compliance entities and emissions are consistent with the Regional Greenhouse Gas Initiative (RGGI) regulation, implemented as 310 CMR 7.70 in Massachusetts. Under 310 CMR 7.74, compliance periods are annual. The Massachusetts Carbon Allowance Registry ("Registry") is used to track the ownership of allowances. Once an allowance is allocated or purchased in the auction, it can be resold in the secondary market. Participation in the market for allowances is limited to regulated electricity generating facilities.

The secondary market is important for several reasons. First, it gives firms the ability to obtain allowances at any time, while the auctions are relatively infrequent. Second, it provides firms a way to protect themselves against unexpected swings in future prices. Third, it provides price signals that assist firms in deciding how much electricity to produce and in making investment decisions that are affected by the costs of compliance.

The market for Massachusetts allowances has several key elements, which are discussed in this section: the emissions cap, allocations, auctions, banking, program participation, and compliance.

Annual Emissions Cap

The program's annual emissions cap was set at 9,149,979 metric tons for 2018, which was the first year of program implementation. The annual cap fell to 8,731,175 metric tons in 2019, 8,507,299 metric tons in 2020, and it declines by 223,876 metric tons in each subsequent year,

[1] https://www.mass.gov/guides/electricity-generator-emissions-limits-310-cmr-774

eventually reaching 1,791,019 metric tons in 2050.[2] The 2023 cap was 7,835,671, and the 2024 cap is 7,611,795.

Allowance Allocations

One hundred percent of the 2018 vintage allowances were allocated to individual generators, including new facilities. Starting with the 2019 compliance year, the MassDEP began to transition from allocating allowances directly to using auctions as the primary mechanism for distributing allowances.[3] For the 2019 and 2020 compliance years, the MassDEP distributed a number of allowances equal to 75 and 50 percent of the cap through direct allocation. As of the 2021 compliance year, all allowances are distributed by auction, subject to the banking adjustment described below.

Banking of Allowances

In August 2018, the MassDEP adopted changes to the provisions for banked allowances (i.e., allowances held by covered entities after the compliance deadline for a given year). Under the new provisions, if the number of banked allowances after a particular year exceeds 223,875, the number of allowances distributed in the subsequent year will be adjusted downward by the difference between the number of banked allowances and 223,875. As the cap declines by 223,876 metric tons each year, this approach ensures that each year's emissions are less than the previous year's cap.

For instance, after 2022 compliance obligations were satisfied, 1,853,109 allowances were held in facility accounts on April 1st, 2023. Thus, the number of allowances to be distributed for the 2023 compliance year was adjusted down by 1,629,234 (which equals the 1,853,109 allowances held after 2022 minus the limit of 223,875 allowances). Consequently, the adjusted emissions

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2 310 CMR 7.74(5)(a)

3 In this report, the term "allowance" refers to allowances that can be used to comply with 310 CMR 7.74 only. These allowances cannot be used to comply with requirements of the Regional Greenhouse Gas Initiative, which is implemented in Massachusetts pursuant to a different regulation, 310 CMR 7.70.

cap for the 2023 compliance year was 8,059,546 metric tons (including 1,853,109 banked allowances and 6,206,437 vintage 2023 allowances sold in auctions 2022-3 through 2023-4).

The same calculation was used to determine the adjusted emissions cap for 2024 and the number of 2024 allowances to be sold in Auctions 2024-3 and 2024-4. In April 2024, the amount of 2023 allowances held after compliance was 2,434,631, so the number of allowances to be auctioned for the 2024 compliance year was adjusted down by 2,210,756. Because a total of 3,044,720 vintage 2024 allowances were auctioned through 2024-2, the number of 2024 allowances remaining to be distributed is 2,356,319.

Auctions

Twenty percent of the 2024 vintage allowances were auctioned in Auctions 2023-1 to 2023-4. The MassDEP plans to distribute the rest of allowances for the 2024 compliance year in four quarterly auctions:

- On December 13, 2023: 10 percent of the 2024 unadjusted emissions limit was offered (761,180 allowances).
- On March 13, 2024: 10 percent of the 2024 unadjusted emissions limit was offered (761,180 allowances).
- In June 2024: 50 percent of the allowances remaining after the 2023 banking adjustment was performed (1,178,160 allowances).
- In September 2024: All remaining 2024 allowances will be offered for sale (1,178,159 allowances).

In addition to 2024 vintage allowances, 5 percent of the 2025 annual cap (which equals 369,396 allowances for the 2025 vintage) will be offered in each of the four auctions listed above.

Participants in the Program

Participation in the program, including auctions, is restricted to the owners and operators of covered facilities. The term “Regulated Entity” is used in the Registry to refer to the highest level of facility ownership, and in the case of shared ownership groups together several

facilities.[4] A list of facilities and associated regulated entities is available to the public at https://macar.apx.com/ (select "Reports").

Compliance

On March 1st of each year, every generating facility's Registry account is required to hold sufficient allowances to satisfy obligations from the prior calendar year. Facilities that do not hold sufficient allowances may qualify for "emergency deferred compliance." Under emergency deferred compliance, the compliance obligations from emissions that occurred during a MLCCP#2 designated period can be deferred to the following year.[5] However, those emissions are required to be offset on a two for one basis in that following year.[6] For example, if a facility deferred 1,000 allowances for 2019 compliance, they are required to hold a number of allowances for 2020 compliance equal to their 2020 emissions plus 2,000 additional allowances for their deferred compliance from the previous year. This provision is intended to provide generators with additional flexibility when they may be needed for system reliability, while still discouraging generators from exceeding the cap in a given year. Thus, it is unlikely that facilities will use this option under normal circumstances.

By April 1st, the Department will deduct allowances from each generating facility's registry account; first to address any deferred obligations, then to meet the facility's obligations from the previous calendar year. For 2023, allowance deductions were carried out successfully and all facilities met their obligations without the use of emergency deferred compliance. The Registry tracks current holdings, allowance transfers, and allocations, as well as ownership and representation of each facility or regulated entity.

4 For example, Medway Station and Mystic receive allocations separately, but they are both owned by Exelon, so for tracking and market monitoring purposes their demand is aggregated.

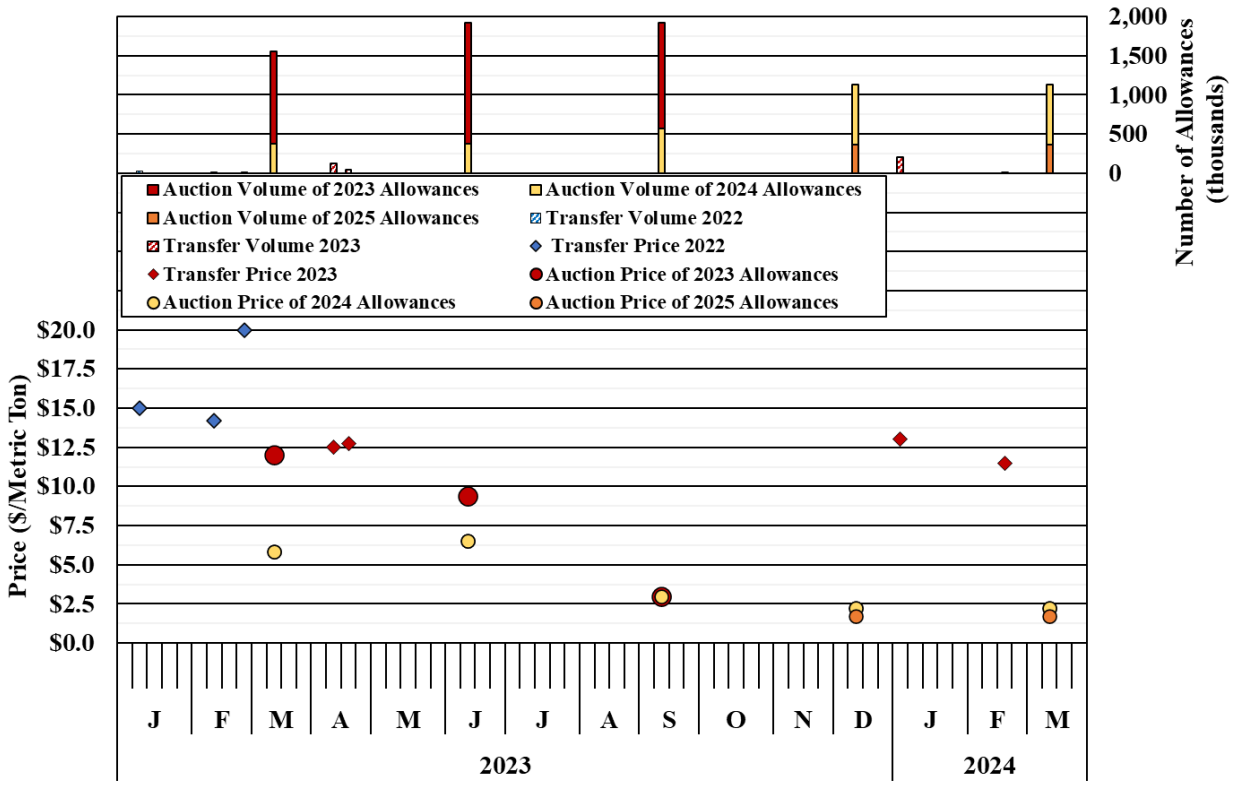
5 These are periods when ISO New England has triggered "Master Local Control Center Procedure No.2"

6 310 CMR 7.74(6)(d)

C. Summary of Prices and Traded Volumes

This section evaluates the available information regarding the purchase of allowances in the auctions and transfers in the secondary market for allowances. Figure 1 displays the weekly volumes of allowance transfers and weighted average prices as well as auction results.

Figure 1: Allowance Prices and Volumes[7] [8]



There were six priced transfers between unaffiliated regulated entities in 2023 and four in the first quarter of 2024. All of the transfers were for allowances usable for 2023 compliance. Most

7 Figure 1 shows transfers reported to the registry through April 3, 2024, but since there is no prompt reporting requirement, other transactions may have occurred that have not yet been reported. Trades are reported by transaction date if one is provided that differs from the date it is reported to the Registry.

8 "2022 Allowances" indicates allowances usable for 2022 compliance, which includes previous vintages.

of the transfers were for small volumes with just two of the transfers accounting for more than 80 percent of the total volume. In 2023, the average price was $12.98 for 191,480 allowances.

Figure 1 shows that prices have fluctuated considerably over the period and that there has been a small number of allowance trades in the secondary market. Prices of 2023 vintage allowances fell significantly from March to September 2023. In early 2024, several transactions were recorded at prices much higher than auction clearing prices since June 2023. However, the volume of these transfers was relatively low, and the pricing may have been set well before they were recorded. There has been a wide dispersion of bid prices in the auctions, reflecting considerable variation among regulated entities in their expectations regarding the value of allowances. This variation in expectations highlights (a) that relatively little information from trading in the secondary market has been available regarding the value of allowances and (b) that some generators earn high margins on the sale of electricity in some periods due to the wide distribution of hourly prices in the ISO New England market.

In the first three auctions in which allowances were sold for both 2023 and 2024 vintage allowances, there was a substantial price premium on the current vintage over the future vintage. However, since Auction 2023-4 in September 2023, the clearing prices have been the same for both vintages and they have been down significantly from auctions in late-2022 and early-2023.

D. EMISSIONS AND ALLOWANCE HOLDINGS

In this section we review patterns of emissions and allowance holdings to assess the fundamentals of supply and demand. Table 1 and Figure 2 evaluate emissions and electricity supply over the last three years, while Figures 3 compares allowance holdings to emissions by regulated entity.

Table 1 summarizes electricity supply and emissions through 2023 compared to 2021 and 2022. Data is provided for regulated facilities by type: combined cycle units running on liquified natural gas ("LNG"), all other combined cycle units ("CC"), gas/oil-fired steam turbines ("ST"), and combustion turbine peaking units ("CT"). The table shows the supply of electricity from other non-regulated sources, including: nuclear generation, other non-program units such as renewables and waste burners, and net generation from the commercial and industrial sectors ("C&I").

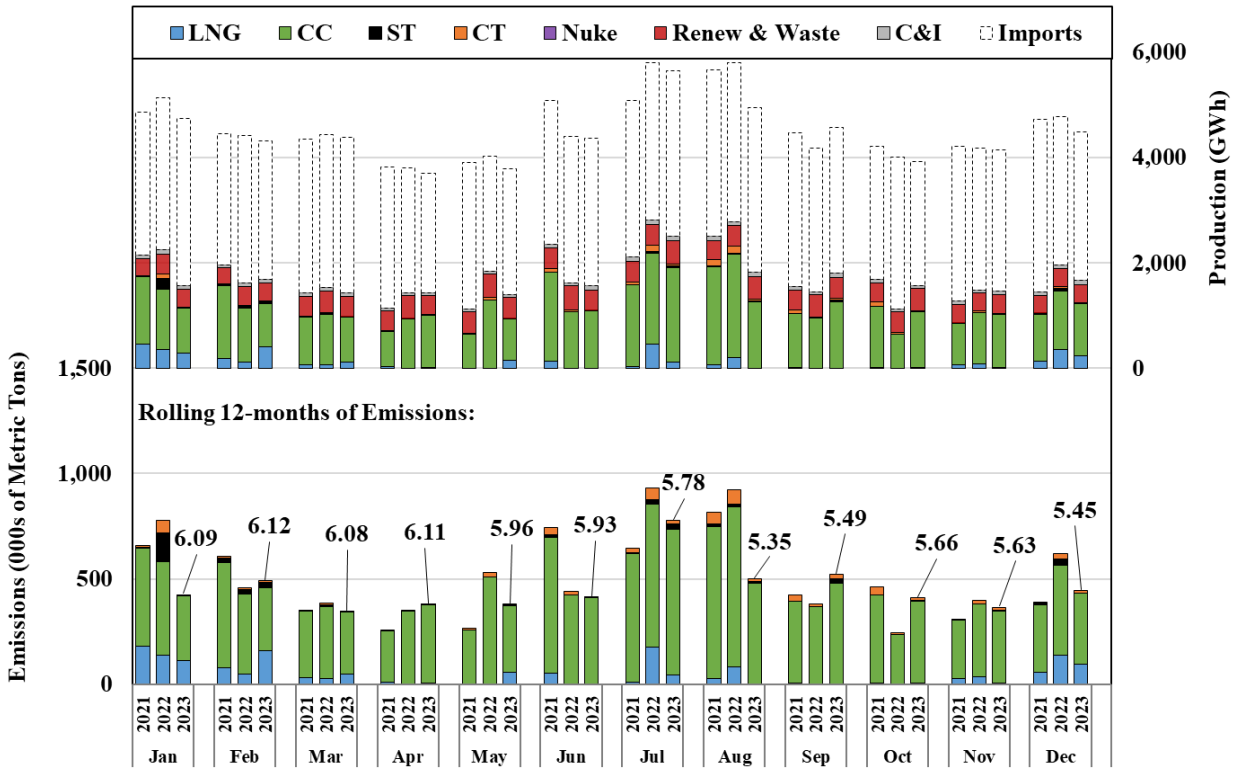
Table 1: Electricity Supply[9] and Emissions

Year	Generation By Type, January-December (TWh)							
	LNG	CC	ST	CT	Renew & Waste	C&I	Imports	Total
2021	1.2	13.8	0.08	0.44	4.4	0.78	34.1	54.9
2022	1.7	13.8	0.34	0.56	4.8	0.74	33.1	55.0
2023	1.3	12.8	0.14	0.22	4.6	0.88	33.1	53.0
	Carbon Dioxide Emissions, January-December (Million Metric Tons)							
2021	0.5	5.2	0.06	0.22	-	-	-	5.92
2022	0.6	5.2	0.24	0.31	-	-	-	6.44
2023	0.5	4.7	0.09	0.12	-	-	-	5.45

Figure 2 summarizes the same categories of information as Table 1 but on a monthly basis. The figure also reports emissions for entities subject to the cap under 310 CMR 7.74.

[9] Generation is based on EIA Form 923 data and Real-Time Load from the ISO-NE website. Form 923 data for 2023 is not final, so values for 2023 may change in future reports.

Figure 2: Monthly Electricity Supply and Emissions, 2021-2023

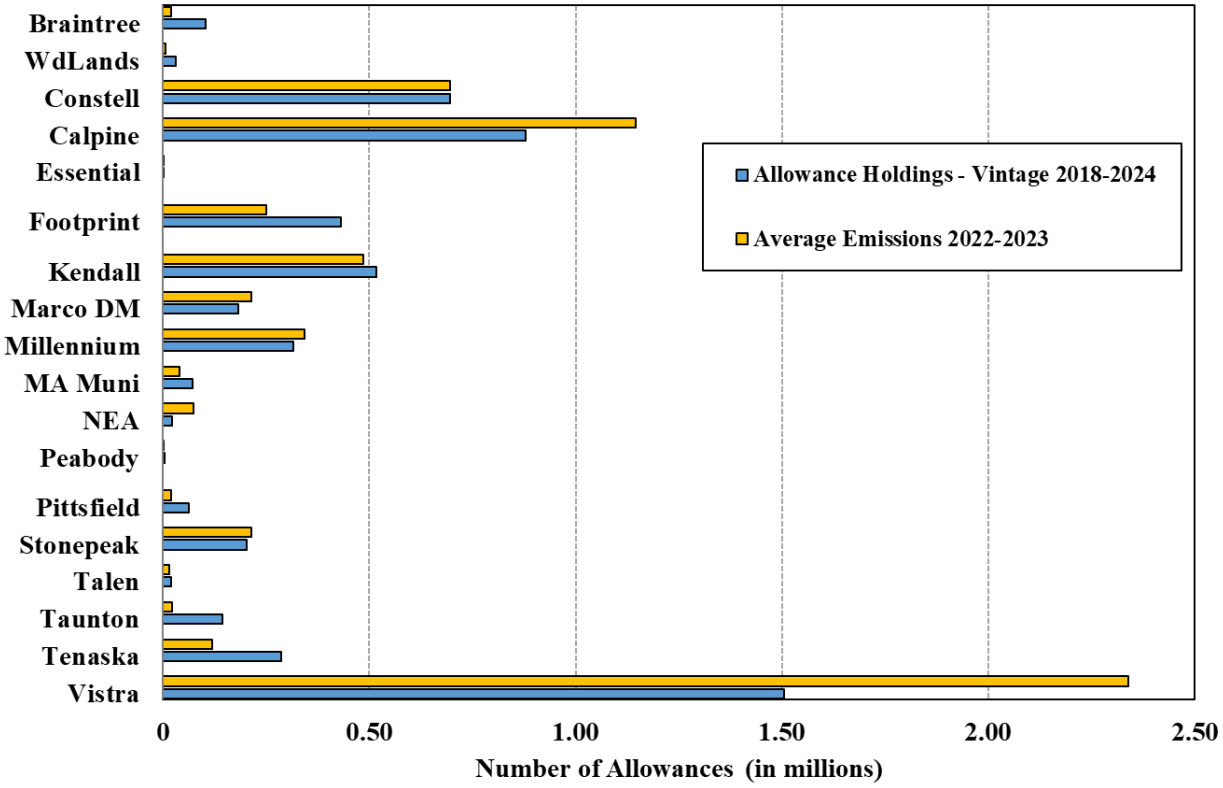


In 2023, emissions totaled 5.45 million metric tons, a decrease from 5.92 million metric tons in 2021 and 6.44 million metric tons in 2022. This decrease in emissions resulted primarily from a reduction in load levels by 3 percent (or 2.0 TWh). Emissions from combined cycle units (including LNG-burners) decreased by 0.6 million metric tons (1.4 TWh) from 2022 to 2023, while emissions from combustion turbines and steam turbines decreased by a combined 0.34 million metric tons (0.54 TWh).

Figure 3 shows, for each regulated entity, its average annual emissions over 2022 and 2023 compared to its estimated holdings of allowances that are usable for 2024 compliance, including allowances purchased in the December 2023 and March 2024 auctions.[10] This is composed of the sum of allowances banked from previous years and its Vintage 2024 allowance holdings.

10 Holdings and allocations are shown as of April 3, 2024.

Figure 3: Allowance Holdings for 2024 and Average Annual Emissions by Regulated Entity



The figure shows that some regulated entities already hold sufficient allowances to meet their compliance obligations if 2024 emissions are similar to the average annual emissions in 2022 and 2023. Other regulated entities whose emissions are trending above the number of allowances they hold for 2024 are projected to require an additional 1.2 million allowances. These entities will be able to satisfy their compliance obligations through some combination of:

- Allowance purchases in the remaining two auctions for 2024 vintage allowances (in which 2,356,319 allowances will be offered),
- Allowance purchases in the secondary market – However, secondary market activity has been relatively limited, so this accounted for a small share of allowance acquisitions before 2024.
- Reducing emissions –There is relatively little transmission congestion into Massachusetts from neighboring states, which could allow additional electricity imports if fossil-fuel generators in Massachusetts reduce generation further.

Thus, it appears that regulated entities will have options for satisfying their 2024 compliance obligations.

E. Discussion of Market Monitoring

As the Massachusetts Carbon Allowance Program Market Monitor, we monitor trading and holdings amongst regulated entities in order to identify anticompetitive conduct. This section discusses two types of anti-competitive conduct for which we monitor in the secondary market. In the current period we find no evidence of anti-competitive conduct.

In any commodity market, one potential concern is that a firm could hoard a substantial share of the supply of a commodity to influence prices or to prevent a competitor from obtaining production inputs. Hence, we screen information on the holdings of CO_2 allowances and the demand for allowances to identify firms that might acquire a position that raises competitive concerns.

Another potential concern is that a firm expecting to purchase CO_2 allowances in the auction might sell a large number of allowances below the competitive level. Such a firm might profit from buying a larger number of CO_2 allowances in the auction at a discount if the bidding in the auction were influenced by the depressed transfer price. For this to be a profitable strategy, the firm would need to be able to substantially depress the current 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. Firms that are looking for an opportunity to sell excess allowances or to purchase CO_2 allowances for their future compliance needs to limit the effectiveness of a strategy to depress prices below the competitive level.