QUARTERLY REPORT ON THE ELECTRICITY GENERATOR EMISSIONS LIMITS PROGRAM (310 CMR 7.74): FOURTH QUARTER 2020

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April 2021

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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 relevant aspects of the program, a summary of market activity through the compliance deadline for 2020, 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 dramatically since the program began, resulting in a large number of banked allowances after each annual compliance deadline.
  - ✓ In 2019, the cap was 8.73 million allowances compared to 5.83 million metric tons of emissions. The cap is not scheduled to fall below this level of emissions until 2032.
  - ✓ In 2020, the cap was 8.51 million allowances compared to 5.54 million metric tons of emissions. The cap is not scheduled to fall below this level until 2034.
- *Load, Generation, and Emissions Trends*: As emissions from covered generation have fallen since the program began, electric load has fallen more modestly and the Pilgrim nuclear plant has retired, so electricity imports have risen.
  - ✓ Generation from covered units fell from 15.5 TWh in 2019 to 13.3 TWh in 2020. Lower combined cycle generation accounted for nearly all of the decline in generation, while peaking generation from combustion turbines increased.
  - ✓ Electric load fell significantly during the initial phase of the COVID-19 pandemic (March to May of 2020) from previous years. During this time generation from covered sources was 54 percent lower than the same period in 2019. However, emissions and generation were higher during the summer of 2020 than in the same period in 2019 because above-normal temperatures more than offset the effects of the pandemic on load. Overall, load fell slightly from 2019 to 2020.
  - ✓ Electricity imports rose from 32.4 TWh in 2019 to 36.5 TWh in 2020. This more than offset the effects of the Pilgrim nuclear plant retirement, which reduced internal generation by 2.1 TWh from 2019 to 2020. Given the low levels of transmission congestion into Massachusetts from neighboring states, potential remains for higher levels of imports.
- *CO_2 Allowance Prices and Trading Activity*: Trading activity was extremely limited in 2020 and early 2021 as regulated entities were allocated sufficient allowances to satisfy most or all of their projected compliance obligations for 2020. Prices remained high given the large allowance surpluses, signaling that regulated entities expect the gap between the cap and emissions could tighten significantly in the future. Furthermore,

illiquid market conditions have encouraged regulated entities to hold excess allowances as a hedge against their compliance obligations in future years.

- ✓ Most of the allowances purchased since February 2020 were through the auctions rather than the secondary market.
  - In the September 22, 2020 auction, 502,503 allowances for the 2020 compliance year cleared at a price of $7.50 per metric ton.
  - In the December 16, 2020 auction, 1,656,685 allowances for the 2021 compliance year cleared at a price of $7.25 per metric ton.
  - In the March 11, 2021 auction, 1,656,685 allowances for the 2021 compliance year cleared at a price of $6.50 per metric ton.
- ✓ Secondary market prices have exhibited a significant premium over the auction clearing prices as some regulated firms sought additional allowances ahead of the compliance deadline on March 1, 2021.
  - Prices averaged $8.34 per metric ton across ten transfers for 2020 compliance year allowances since February 2020. These comprised approximately 450 thousand allowances.

- *Distribution of Allowances for 2020 Compliance*: The vast majority of allowances usable for 2020 compliance were distributed by direct allocation (49 percent) or banked from 2019 (36 percent), while a relatively small number (15 percent) of allowances were distributed through the auctions. Direct allocation will not be used for 2021 allowances, so most allowances usable for 2021 compliance will be distributed through the auctions.
  - ✓ In 2021, 100 percent of allowances will be distributed through auctions, although the total auction amount will be reduced by the bank of allowances from 2020.
  - ✓ The increased auction quantities and quarterly auction schedule for 2021 allowances will help to provide more frequent access to allowances. These changes should improve liquidity in the secondary market.

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 2020 and 2021.

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 an 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,

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

8,507,299 metric tons in 2020, and it will decline by 223,876 metric tons in each subsequent year, eventually reaching 1,791,019 metric tons in 2050.[2]

Allowance Allocations

One hundred percent of the 2018 vintage allowances were allocated to individual generators. 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. Beginning in the 2021 compliance year, all allowances will be distributed by auction, subject to the banking adjustment described below.

Of the allocations in the first three years of the program, some were initially set aside for new facilities. The number initially allocated to new facilities was 1.5 million in 2018, 1.125 million in 2019, and 750 thousand in 2020. New facilities emitted only 318,993 metric tons of CO_2 in 2018 and 260,941 metric tons in 2019, so the 1,181,007 allowances remaining after 2018 and the 864,059 allowances remaining after 2019 were apportioned among other facilities in proportion to their initial allocations.[4] Likewise, new facilities emitted 602,159 metric tons in 2020, so the remaining 147,842 allowances were apportioned among the other facilities.

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 these 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. Because the annual cap falls

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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.

4 310 CMR 7.74(5)(c)(2)

by 223,876 metric tons each year, this ensures that emissions cannot exceed the prior year's annual cap.

For instance, after 2019 compliance obligations were satisfied, 3,124,292 allowances were held in facility accounts on April 1st, 2020. Thus, the number of allowances to be distributed for the 2020 compliance year was adjusted down by 2,900,417 (which equals the 3,124,292 allowances held after 2019 minus the limit of 223,875 allowances). Consequently, the number of 2020 vintage allowances distributed was 5,606,882 metric tons, and the total number allowances available for the 2020 compliance year was 8.731,174 (one less than the 2019 annual cap).

The same calculation is used to determine the adjusted emissions cap for 2021 and the number of 2021 allowances to be sold in the auctions. In 2021, the post-compliance holdings amount was 3,191,261 so the number of allowances to be auctioned for the 2021 compliance year was adjusted down by 2,967,386. Because a total of 3,313,370 vintage 2021 allowances were auctioned in December 2020 and March 2021, the remaining 2021 allowances to be distributed total 2,002,667.

Auctions

The MassDEP's schedule to distribute allowances for the 2021 compliance year consists of four quarterly auctions:

- On December 16, 2020: 20 percent of the 2021 unadjusted emissions limit was offered (1,656,685 allowances).
- On March 11, 2021, an additional 20 percent of the total 2021 unadjusted emissions limit was offered (1,656,685 allowances).
- On June 9, 2021: 50 percent of the allowances remaining after the first two auctions and the adjustment for allowances banked after 2020 will be offered (1,001,334 allowances)..
- On September 15, 2021: All remaining 2021 allowances will be offered for sale (1,001,333 allowances).

Once these auctions are complete, the total number of allowances available for the 2021 compliance year will be 8,507,298, one less than the 2020 annual cap. This includes 5,316,037 allowances offered for sale in four auctions and 3,191,261 banked allowances.

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.[5] 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.[6] However, those emissions are required to be offset on a two for one basis in that following year.[7] 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 2020, allowance deductions were carried out successfully and all facilities met their obligations without the use of emergency deferred compliance. The Registry

5 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.

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

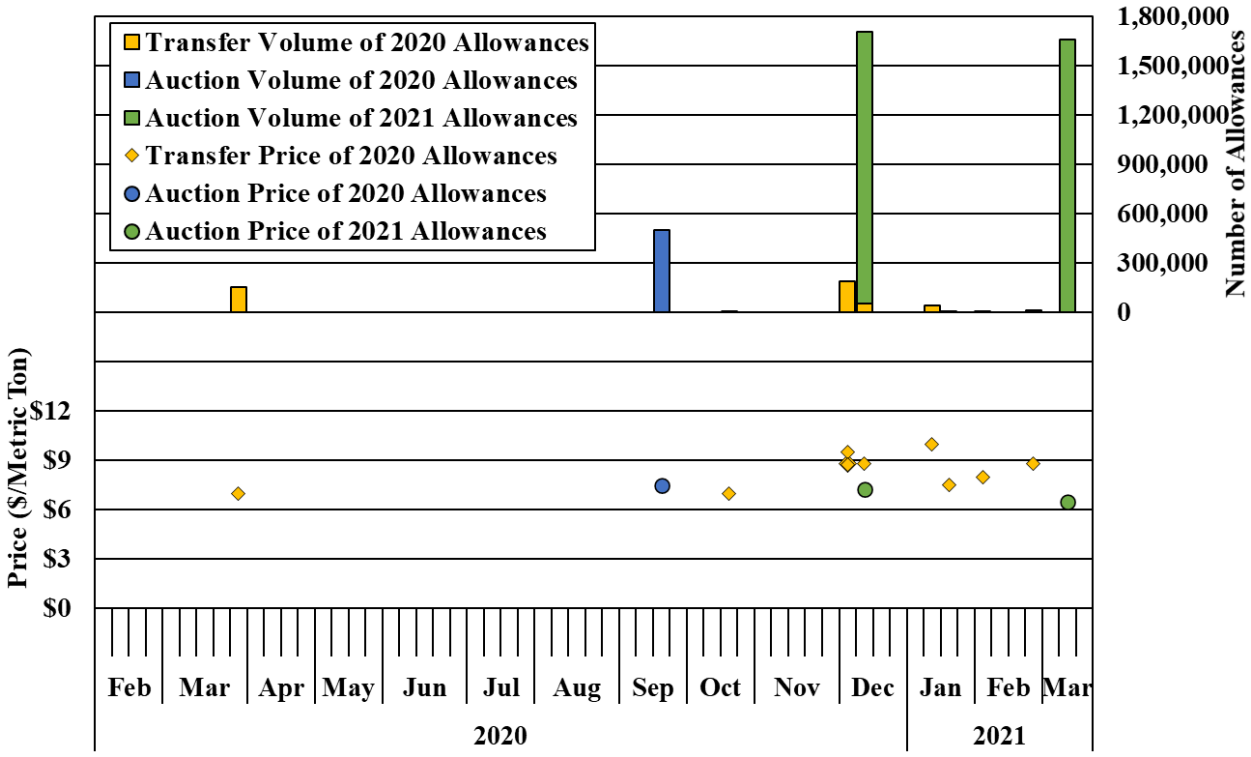
7 310 CMR 7.74(6)(d)

tracks current holdings, allowance transfers, and allocations, as well as ownership and representation of each facility or regulated entity.

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[8] [9]



There were six priced transfers between different regulated entities in 2020, and there have been four so far in 2021. All of the transfers were for allowances usable for 2020 compliance.

- The weighted average price of the 2020 transactions was $8.15, and the total sum of transfers was nearly 394 thousand allowances.

8 Figure 1 shows transfers reported to the registry through March 19, 2021, but since there is no prompt reporting requirement, other transactions may have occurred that have not yet been reported. There were no allowance transfers in January 2020.

9 "2020 Allowances" indicates allowances usable for 2020 compliance, which includes previous vintages.

- The weighted average price of the transactions in early 2021 is $9.72, and the total sum of transfers was nearly 55 thousand allowances. The relatively high average price is driven primarily by a single transaction priced at $10.

There have been two auctions since publication of the 2020 Q3 report, both for 2021 vintage allowances:

- 1,656,685 allowances for the 2021 compliance year were sold at $7.25 per metric ton on December 16, 2020.
- 1,656,685 allowances for the 2021 compliance year were sold at $6.50 per metric ton on March 11, 2021.

Although the prices in the secondary market have risen slightly since the first three quarters of 2020, auctions for 2021 allowances have cleared below the prevailing trends. Secondary market transactions not depicted in the figure (because they were reported after the compliance deadline for 2020) indicate that there was a substantial premium on allowances usable for 2020 compliance relative to 2021 allowances.[10] This likely explains much of the apparent discount on allowances sold in the auction.

Overall, prices have been relatively stable over the past year and remain high relative to levels that would be expected based on:

- The analyses that were performed to support the implementation of the regulation – These suggested that prices would be much closer to $0 per metric ton and demand for allowances would be relatively price-elastic.[11]
- The supply of allowances compared to emissions from 2018 to 2020 – Section D of this report shows that emissions were below the emissions cap by approximately 20 percent in 2018, 33 percent in 2019, and 35 percent in 2020.
- The supply of allowances compared to emissions after 2020 – The banking provisions encourage firms to hold allowances if they anticipate higher prices in the future.

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10 Nearly 290 thousand allowances for the 2021 compliance year were transferred at an average price of $7.57 per metric ton on April 1, the first day such transactions could be reported. Thus, it is likely that some of these occurred before the March 1 compliance deadline for 2020 allowances.

11 The most credible modeling results forecasted that BAU ("Business As Usual") emissions would not exceed the cap, suggesting that prices would be near $0/ton. To the extent that scenarios were run to evaluate price-elasticity (i.e., how prices might respond to unexpectedly high emissions), they suggested that prices might be expected to rise from $0 to $2 if emissions were reduced by 1 million below BAU emissions.

However, the annual emissions cap is not scheduled to fall to the level of 2020 emissions until 2034.

We find that the high prices observed are at least partly attributable to lack of liquidity rather than an indication of the supply-demand balance. Just six transactions were reported in 2020, with four reported in December. Given the low volume of transactions to-date, regulated entities may anticipate difficulty obtaining additional allowances in the future without paying a significant premium. Regulated entities with long-term contractual obligations to deliver electricity in 2021 and beyond can hedge exposure to fluctuations in natural gas prices and RGGI (CMR 7.70) allowance prices through liquid futures markets, but no comparable financial hedges exist for Massachusetts (CMR 7.74) program allowances. Consequently, some regulated entities may be setting aside 2020 allowances as a hedge for obligations in future years.

Future program review activities could consider the sale of future allowance vintages (e.g., sale of 2023 or 2024 vintage allowances during 2022 auctions). Such a change to the availability of future allowance vintages would provide firms more opportunity to engage in hedging, would enhance price discovery for future vintages, and may increase liquidity for current period allowances which would otherwise be held for future compliance obligations.

D. EMISSIONS AND ALLOWANCE HOLDINGS

Allowance prices are generally driven by the fundamentals of supply and demand, which we evaluate by reviewing patterns of emissions, allocations, and forecasted holdings of firms. Table 1 and Figure 2 evaluate emissions and electricity supply over the last three years, while Figures 3 and 4 compare allowance holdings to emissions by regulated entity.

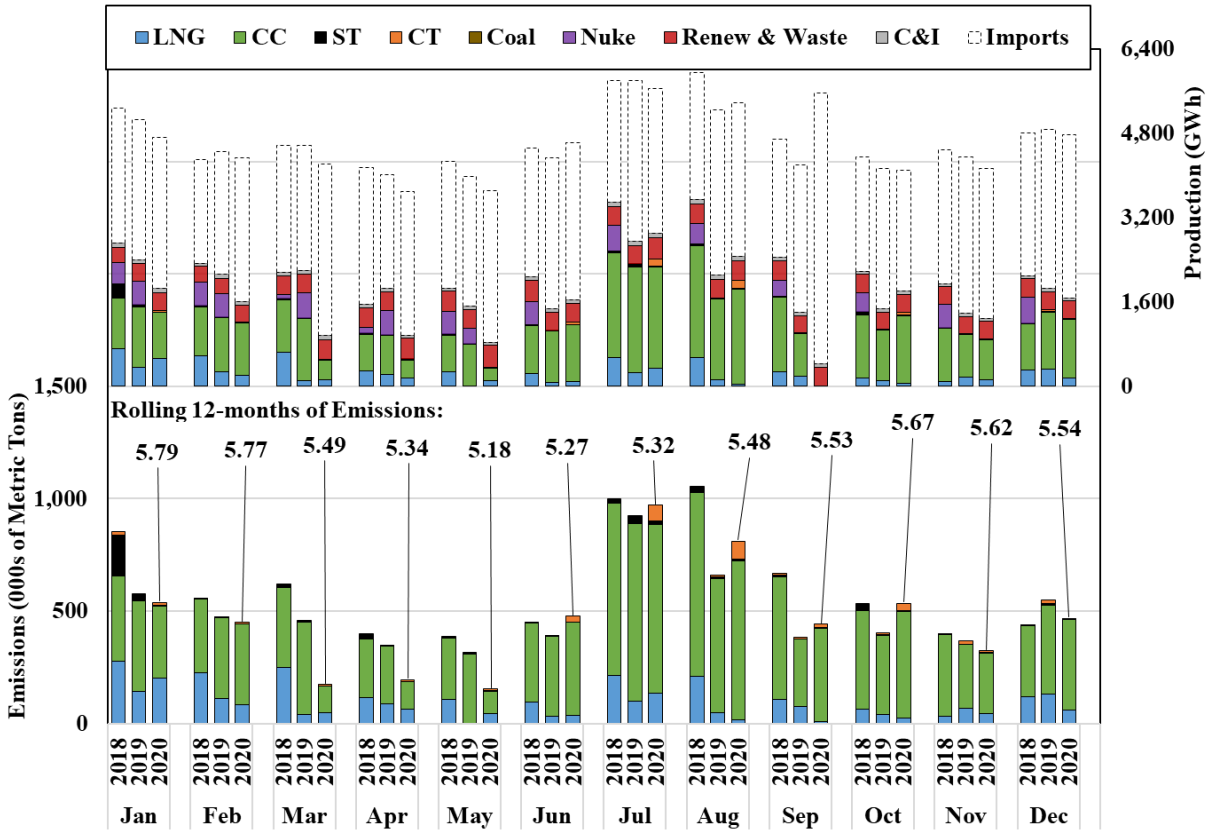
Table 1 summarizes electricity supply and emissions through 2020 compared to 2018 and 2019. Data is provided for regulated facilities by type: combined cycle units running on liquified natural gas ("LNG"), all other combined cycle units ("CC"), gas/oil-fired steam turbines ("ST"), and combustion turbine 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"). 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.

Table 1: Electricity Supply[12] and Emissions

Year	Generation By Type (TWh)								
	LNG	CC	ST	CT	Nuclear	Renew & Waste	C&I	Imports	Total
2018	4.7	13.8	0.40	0.08	4.4	4.3	0.79	28.8	57.2
2019	2.2	13.0	0.11	0.12	2.2	4.0	0.89	32.4	55.0
2020	1.9	10.8	0.07	0.52	0.0	4.4	0.79	36.5	54.9
	Carbon Dioxide Emissions (Million Metric Tons)								
2018	1.8	5.2	0.3	0.04	-	-	-	-	7.31
2019	0.9	4.8	0.1	0.02	-	-	-	-	5.78
2020	0.8	4.4	0.0	0.3	-	-	-	-	5.54

[12] Generation is based on EIA Form 923 data and Real-Time Load from the ISO-NE website. Form 923 data for 2020 is not final, so values for 2020 may change in future reports.

Figure 2: Monthly Electricity Supply and Emissions, 2018-2020



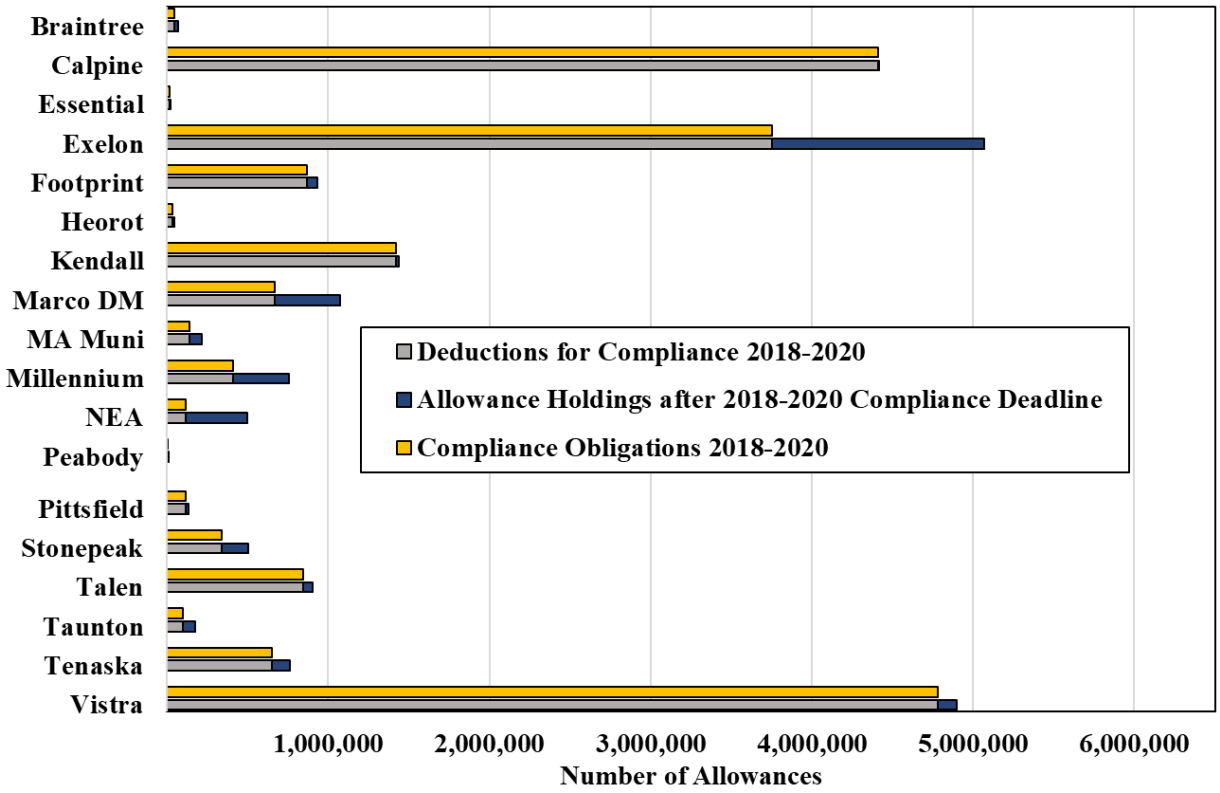
Emissions fell significantly from 2018 to 2019 and continued to decline in 2020, although by a smaller margin. The impact of COVID-19 significantly reduced load and emissions from March through May of 2020, but load and emissions recovered during the summer and fall before falling again during a relatively mild winter. Annual emissions fell to 5.5 million metric tons in 2020. This decline in emissions reflected:

- The impact of a reduction in energy generation and load levels following initial measures to reduce the spread of COVID-19. This contributed to very low generation from March through May. Combined cycle emissions during these months were 65 percent lower than in 2019 despite very low natural gas prices.
- Although the effects of the response to COVID-19 had a downward effect on electricity consumption during the summer of 2020, hotter-than-average temperatures led to increased electricity consumption, generation, and emissions.
- Emissions from LNG-supplied generation has been very low in 2019 and 2020 partly due to pipeline gas prices being low relative to prices of imported LNG.

- Emissions from combustion turbines increased by nearly 230 thousand metric tons from 2019. This increase is at least partially related to the entry of new peaking facilities.

For each regulated entity, Figure 3 summarizes compliance obligations from 2018 through 2020, allowance deductions for 2018 through 2020, and remaining holdings after the deductions for compliance (i.e., allowances banked after 2020).[13] The comparison of allowance holdings to compliance obligations provides insight about which firms likely to buy additional allowances versus ones that are more likely to sell allowances.

Figure 3: Allowance Holdings and Compliance Obligations by Regulated Entity, 2018-2020[14]

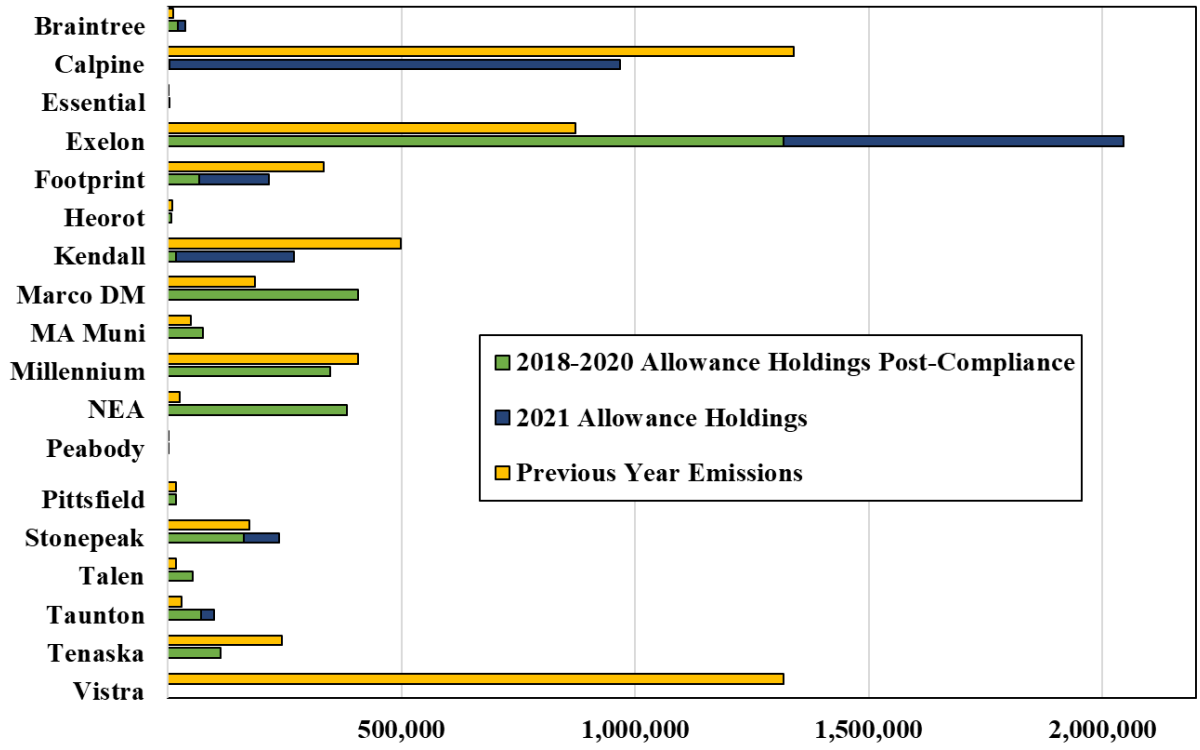


13 Holdings and deductions are shown as of March 23, 2021.

14 Holdings do not reflect 2021 allowances purchased in auctions to date.

Figure 4 shows, for each regulated entity, its reported emissions over 2020 compared to its estimated holdings to-date, which is comprised of the sum of allowances banked from previous years ("2018-2020 Allowance Holdings Post-Compliance") and its 2021 allowance holdings.

Figure 4: Allowance Holdings and Emissions by Regulated Entity [15]



The figure shows that many regulated entities already hold sufficient allowances to meet their compliance obligations if emissions are similar to 2020. However, several participants currently hold a number that is lower than its emissions from the previous year. Regulated entities whose emissions for 2021 are trending above their allowance holdings will be able to satisfy their obligations through some combination of:

- Reduced emissions relative to recent patterns of operation – Emissions fell more than 44 percent from 2017 to 2020. There is relatively little transmission congestion into

15 Holdings and allocations are shown as of March 23, 2021.

Massachusetts from neighboring states, which could allow additional electricity imports if fossil-fuel generators in Massachusetts reduce generation further.

- Allowance purchases in the secondary market – Based on Figure 4, many regulated entities already have sufficient allowances to satisfy their likely compliance obligations in 2021, suggesting that they may be willing to sell some. However, some regulated entities may prefer to bank a significant number of allowances for 2022.
- Allowance purchases in the remaining two auctions for 2021 vintage allowances.

Thus, it appears that regulated entities will have options for satisfying their 2021 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 help limit the effectiveness of a strategy to depress prices below the competitive level.