QUARTERLY REPORT ON THE ELECTRICITY GENERATOR EMISSIONS LIMITS PROGRAM (310 CMR 7.74): FOURTH QUARTER 2019

Prepared for:

Massachusetts Department of Environmental Protection on behalf of the Commonwealth of Massachusetts

Prepared by:

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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 fourth quarter of 2019, an overview of emissions and allowance holdings patterns, and discussion of the results of our market power screens.

- *CO_2 Emissions versus the Allowance Caps*: Emissions have fallen dramatically since the program began, resulting in a large number of banked allowances (2.9 million) after the 2019 compliance deadline.
  - ✓ In 2018, the cap was 9.15 million allowances compared to 7.35 million metric tons of emissions. The cap will not fall below this level of emissions until 2026.
  - ✓ In 2019, the cap was 8.73 million allowances compared to 5.83 million metric tons of emissions. The cap will not fall below this level of emissions until 2032.
  - ✓ In 2020, the cap is 8.51 million allowances, so large allowance surpluses will continue throughout the decade unless emissions increase significantly.
- *Generation and Emissions Trends*: Emissions were down considerably in 2019 primarily because of increased electricity imports and reduced electric load levels.
  - ✓ Electricity generation from covered units fell from 19.0 TWh in 2018 to 15.4 in 2019. Most (69 percent) of this reduction resulted from lower LNG-supplied generation as LNG became less economic to import because of low pipeline gas prices.
  - ✓ Electricity imports rose by 3.6 TWh from 2018 to 2019. This more than offset the effects of the Pilgrim nuclear plant retirement, which reduced internal generation by 2.2 TWh from 2018 to 2019. Given the low levels of transmission congestion into Massachusetts from neighboring states, potential remains for additional imports.
  - ✓ Electricity load levels fell 2.2 TWh year-over-year, contributing to the reduction in emissions. Emission trends are discussed further in Section D.
- *CO_2 Allowance Prices and Trading Activity*: Trading activity was very limited as most regulated entities were allocated sufficient allowances to satisfy their compliance obligations. Prices remain high given the large allowance surpluses, signaling that regulated entities expect the gap between the cap and emissions to tighten significantly in the future.
  - ✓ Prices averaged $8.77/metric ton for 662k of allowance transfers during 2019.
  - ✓ Two auctions were conducted on December 17, 2019. The clearing prices were:
    - $8.50/metric ton for 168,611 allowances for the 2019 compliance year; and
    - $8.26/metric ton for 850,730 allowances for the 2020 compliance year.

- ✓ Given the large surplus of allowances relative to 2019 emissions, prices in 2019 were likely driven by expectations of tighter conditions in subsequent years.
- ✓ However, illiquid conditions in the secondary market for allowances have likely also contributed to higher prices. This is discussed further in Section C.

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.

B. BACKGROUND

Regulation 310 CMR 7.74 creates a cap-and-trade program to reduce carbon dioxide emissions from electricity generating facilities located in Massachusetts.[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. The first compliance period under 310 CMR 7.74 went from January 1st to December 31st, 2018. The Massachusetts Carbon Allowance Registry ("Registry") went online in July of 2018. 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.

Emissions Cap and Allowance Acquisition

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, and

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

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

One hundred percent of the 2018 vintage allowances were allocated to individual generators. Of these, 1.5 million were initially allocated to new facilities, but because new facilities emitted only 318,993 metric tons of CO_2 in 2018, the remaining 1,181,007 allowances were apportioned among existing facilities in proportion to their initial allocations.[3]

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.[4] For the 2019 compliance year, the MassDEP distributed a number of allowances equal to 75 percent of the cap through direct allocation. After accounting for banked 2018 allowances (as discussed below), the remaining allowances were distributed via auction.

The new facility allocation for 2019 was 1,125,000 allowances. However, new facilities only emitted 260,941 metric tons of CO_2 in 2019, so the remaining 864,059 allowances were distributed to existing facilities in February 2020 in proportion to their initial allocations.

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. For instance, compliance obligations totaled 7,348,480 in 2018, so 1,801,499 allowances were banked and, thus, became usable for compliance in 2019. Since the number of banked allowances exceeded 223,875 by

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2 310 CMR 7.74(5)(a)

3 310 CMR 7.74(5)(c)(2)

4 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.

1,577,624, the number of allowances to be auctioned by MassDEP for 2019 was reduced by 1,577,624 from the original quantity of 2,182,794. Since 436,559 allowances for 2019 compliance were auctioned in December 2018, the remaining 168,611 allowances were auctioned in December 2019.

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"). The following tables list regulated facilities at the beginning of 2019 as well as their 2019 and 2020 allocations and the auction set-asides.[6]

	2019 Allocation	2020 Allocation
Auction	2,182,794	4,253,650
New Facilities	1,125,000	750,000
ANP Bellingham	609,866	393,990
ANP Blackstone	558,240	360,638
Bellingham	165,743	107,074
Berkshire Power	309,842	200,166
Braintree Electric	17,316	11,187
Canal Station	72,257	46,680
Cleary Flood	35,768	23,107
Dartmouth Power	34,276	22,143
Dighton	234,231	151,320
Fore River Energy	1,016,315	656,566
Kendall Square	356,024	230,001
MASSPOWER	215,595	139,280
Medway Station	1,136	734
Milford Power, LLC	105,570	68,201
Millennium Power	472,922	305,520
Mystic	1,074,800	694,349
Pittsfield Generating	56,686	36,621
Stony Brook	48,806	31,530
Tanner Street	25,986	16,788
Waters River	1,125	727
West Springfield	10,877	7,027
(Total)	8,731,175	8,507,299

From 2018 to 2019, the number of allowances allocated to each Regulated Facility was reduced proportionally to account for: (a) the reduction in the emissions cap from 2018 to 2019 and (b) the reduction in the share of allowances to be distributed through allocation from 100 percent in 2018 to 75 percent in 2019. In 2020, the number of allowances allocated to each Regulated

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.

6 310 CMR 7.74(5)(b): Table B

Facility will be further reduced to account for: (a) the reduction in the emissions cap from 2019 to 2020 and (b) the reduction in the share of allowances to be distributed through allocation to 50 percent. Starting in 2021, allowances will no longer be distributed through allocation but instead will be distributed via auction.

The new Salem Harbor, West Medway, and Canal 3 facilities are also covered under the program. However, they receive allocations based on the rules for new facilities that were discussed earlier.

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.[7] However, those emissions are required to be offset on a two for one basis in that following year.[8] 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 2018, allowance deductions were carried out successfully and all facilities met their obligations without the use of emergency deferred compliance. The Registry

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

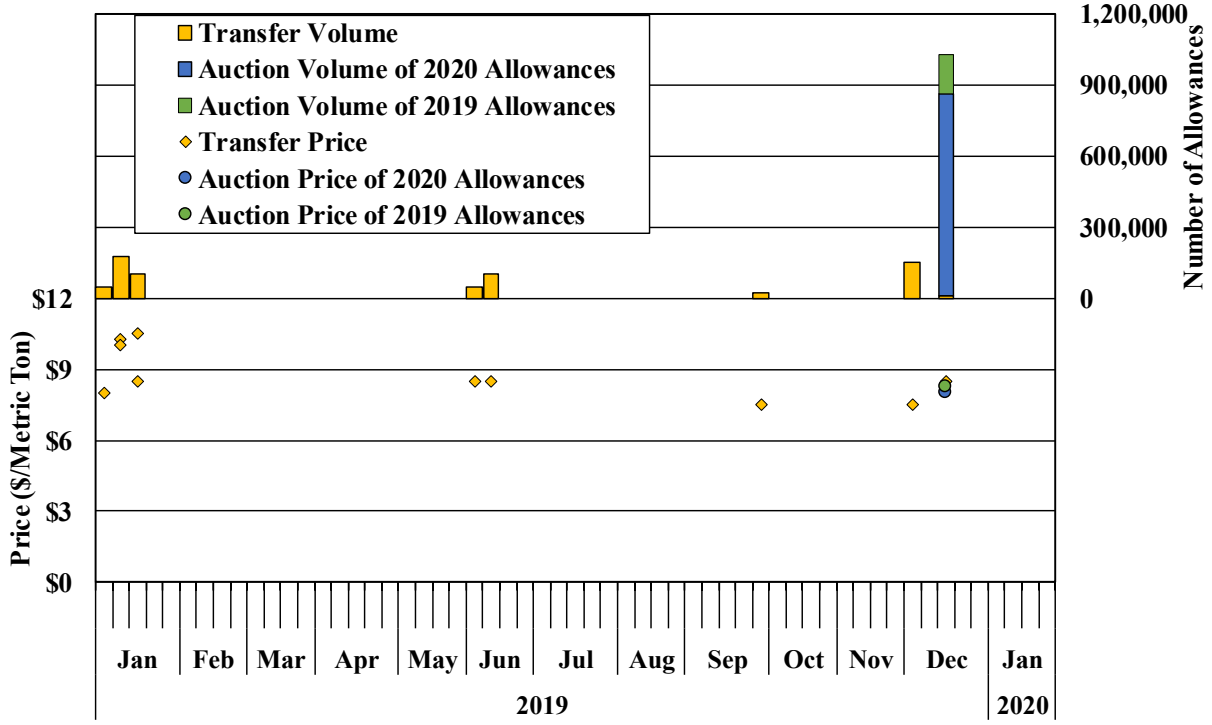
8 310 CMR 7.74(6)(d)

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[9]



The transfers shown above can be divided into two time periods:

- January 2019, 325k transfers had a weighted-average price of $9.60; and
- June through December 2019, 337k transfers had a weighted-average price of $7.98.

In the allowance auctions held on December 17, 2019:

- 168,611 allowances for the 2019 compliance year were sold at $8.50/metric ton; and
- 850,730 allowances for the 2020 compliance year were sold at $8.26/metric ton.

9 Figure 1 shows transfers reported to the registry by the end of February 2019, but since there is no prompt reporting requirement, other transactions may have occurred that have not yet been reported.

Although the prices have fallen modestly since the beginning of 2019, they 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 that the demand for allowances would be relatively price-elastic.[10]
- The supply and demand for allowances in 2018 and 2019 – Section D of this report shows that emissions were below the emissions cap for by approximately 20 percent in 2018 and 33 percent in 2019.
- The supply and demand for allowances after 2019 – The banking provisions encourage firms to hold allowances if they anticipate higher prices in the future. Thus, an anticipated increase in emissions after the Pilgrim nuclear plant retirement in June 2019 might account for the current high price levels. However, the retirement has been followed by an increase in imports to the state rather than increased CO_2 emissions from Massachusetts generators. See Section D for details.

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 for several reasons. First, just five transactions were reported after January 2019. Regulated entities know that if they begin to emit more than expected at some point during the year, it may be difficult to obtain additional allowances without paying a significant premium.

Second, some suppliers may have been reluctant to sell allowances until more information was available regarding the demand for 2019 vintage allowances from newly-constructed generators. Suppliers may have anticipated that the new Salem Harbor, West Medway units, and Canal 3 unit would emit near the new facility allocation of 1.125 million metric tons for 2019, however, these facilities emitted less than 261k metric tons in 2019. Production from the Salem Harbor plant has been reduced by tight pipeline gas limitations to the Boston area and the delayed development of the Weymouth compressor station.

[10] 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.

Third, there was no established venue (e.g., a public commodity exchange) where suppliers post standing offers, so some firms may have been willing to sell allowances for lower prices but were not aware of opportunities to sell. Thus, it is unclear whether the observed prices reflect the market expectations of most regulated entities.

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 in 2019 compared to 2017 and 2018. 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 thermal peaking units ("CT"). Data is also provided for coal-fired steam turbines ("Coal"), although these are not regulated facilities because they retired in 2017. 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.

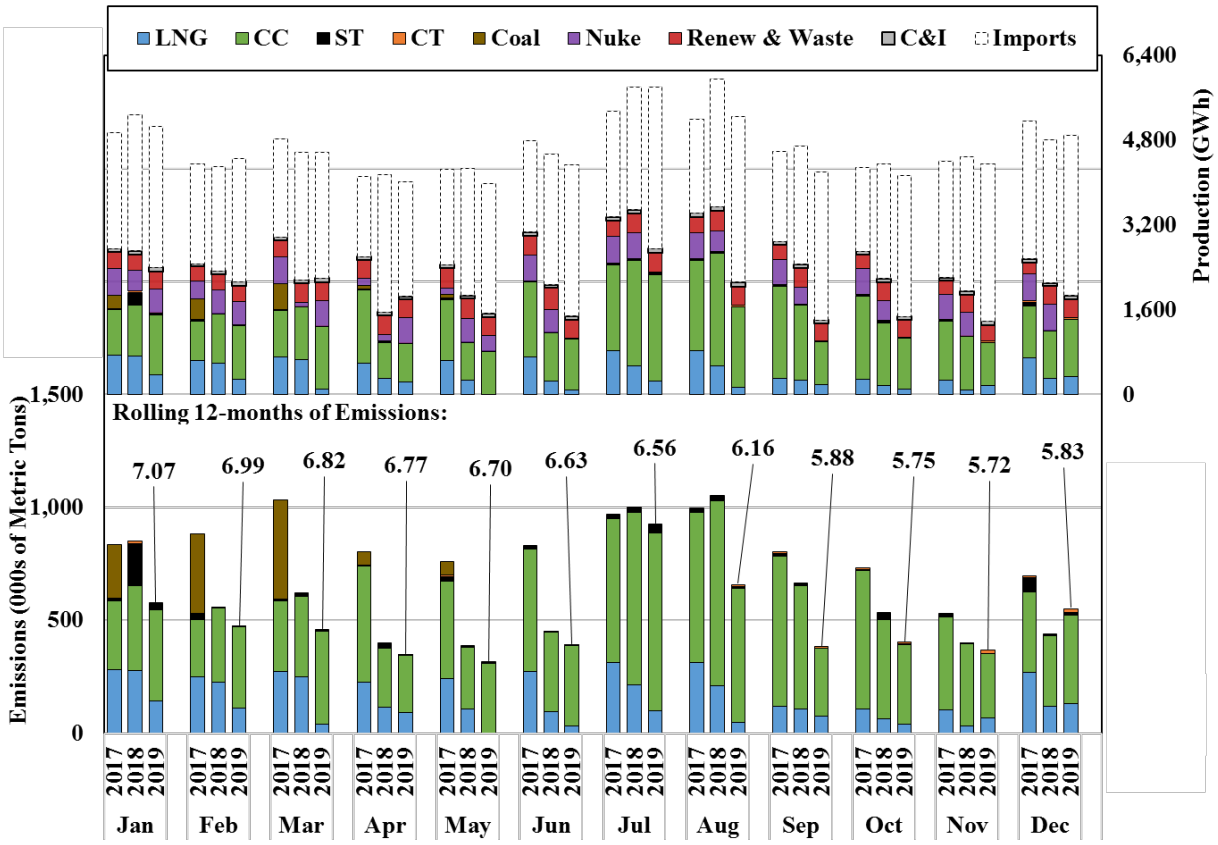
Table 1: Electricity Supply and Emissions, 2017-2019 [11] [12]

Year	Generation By Type (TWh)									
	LNG	CC	ST	CT	Coal	Nuclear	Waste	C&I	Imports	Total
2017	7.2	15.2	0.26	0.10	1.3	5.0	3.6	0.75	22.8	56.3
2018	4.7	13.8	0.40	0.08	0.0	4.4	4.3	0.79	28.8	57.2
2019	2.2	13.0	0.11	0.12	0.0	2.2	4.0	0.89	32.4	55.0
	Carbon Dioxide Emissions (Million Metric Tons)									
2017	2.8	5.7	0.2	0.1	1.1	-	-	-	-	9.87
2018	1.8	5.2	0.3	0.05	0.0	-	-	-	-	7.35
2019	0.9	4.8	0.1	0.1	0.0	-	-	-	-	5.83

[11] Generation is based on EIA Form 923 data and Real-Time Load from the ISO-NE website. Form 923 data for 2019 is not final, so values for 2019 may change in future reports.

[12] Table 1 includes emissions covered by the regulation and coal units that retired before the regulation was implemented. This excludes emissions from eligible combined heat and power output that do not count toward its compliance obligation and other non-regulated sources.

Figure 2: Monthly Electricity Supply and Emissions, 2017-2019 [13]



Emissions fell significantly from 2017 to 2018, and this trend continued from 2018 to 2019.

Emissions fell from 7.35 million metric tons in 2018 to just 5.83 million metric tons in 2019.

This steep decline in emissions reflected:

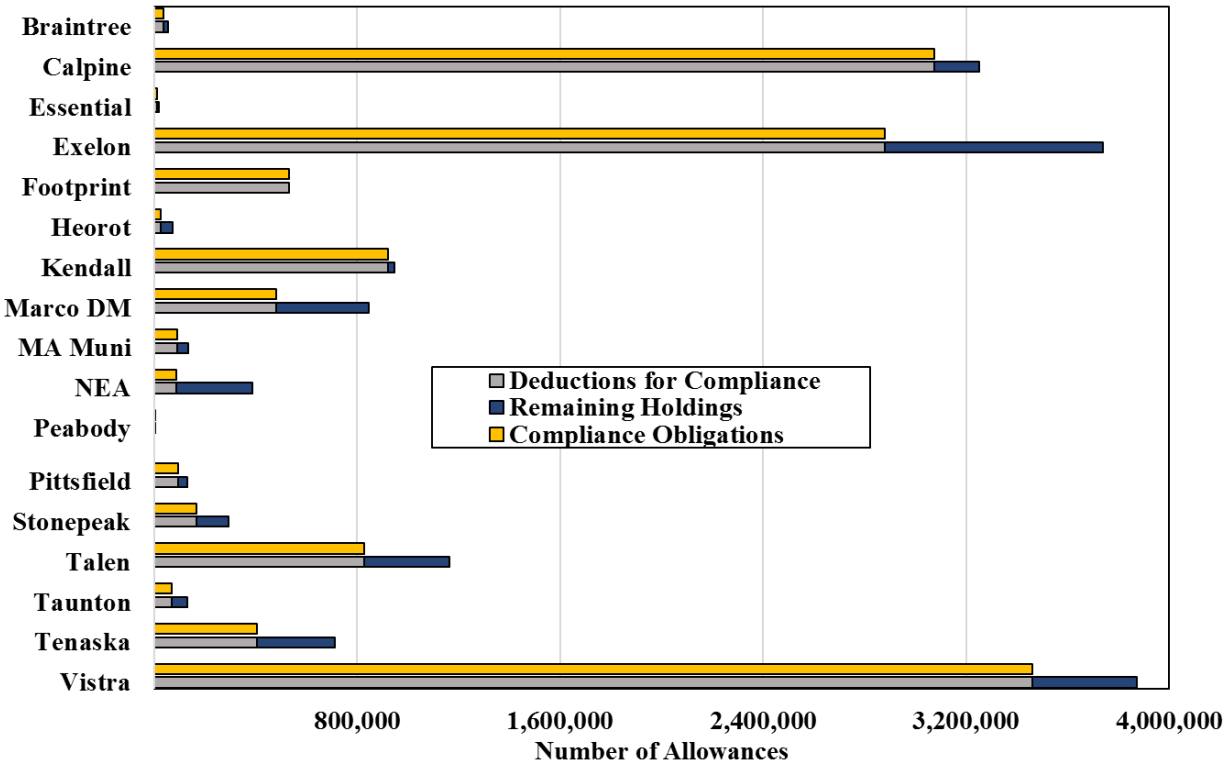
- Relatively mild weather in 2019, which contributed to 4 percent (or 2.2 TWh) lower load levels. (In evaluating the effects of this load reduction, it is useful to consider that if 2.2 TWh of load was served by gas-fired CCs, it would result in around 1.0 million metric tons of emissions.)
- Electricity imports rose 13 percent (or 3.6 TWh) from 2018 to 2019. Imports rose most significantly after the Pilgrim nuclear retirement at the end of May 2019. The pilgrim unit accounted for a 2.2 TWh reduction in generation from 2018 to 2019.

13 Figure 2 includes emissions covered by the regulation and coal units that retired before the regulation was implemented. This excludes emissions from eligible combined heat and power output that do not count toward its compliance obligation and other non-regulated sources.

- Emissions from LNG-supplied generation fell 52 percent (or 930 thousand metric tons) from 2018 partly due to pipeline gas prices being low relative to prices of imported LNG.
- Emissions from steam turbines fell 71 percent (or 207 thousand metric tons) compared to 2018. This reduction was primarily related to milder winter weather in the first quarter of 2019 compared to the same quarter of 2018.

For each regulated entity, Figure 3 summarizes compliance obligations from 2018 and 2019, allowance deductions for 2018 and 2019, and remaining holdings after the deductions for compliance (i.e., allowances banked for 2020).[14] 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, 2018-2019

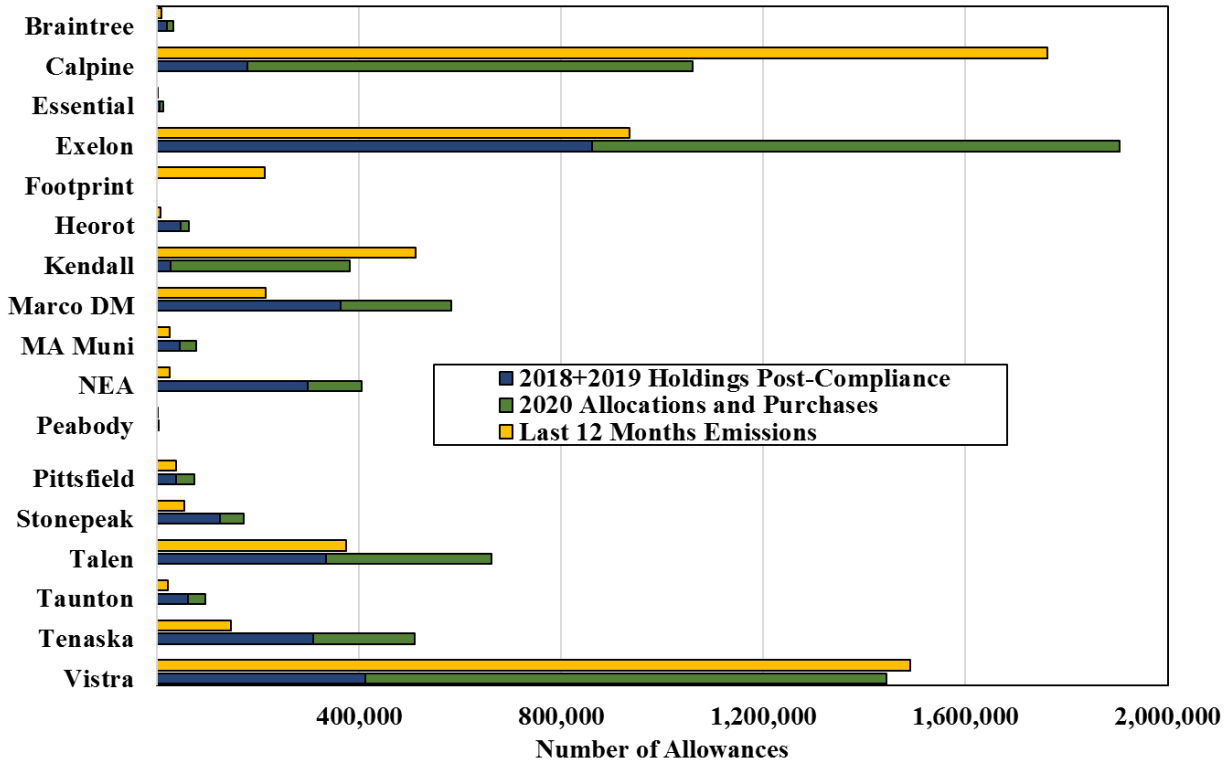


14 Holdings and deductions are shown as of March 15, 2020.

The figure above illustrates that most regulated entities were able to bank a significant number of allowances from 2019, since their emissions were far lower than their allowance holdings at the deadline for 2019 compliance. The large surplus of allowances has coincided with low load and increased electricity imports. Most of the allowance that were originally set aside for new facilities have been redistributed to existing facilities because they were not used by new facilities. Most regulated entities were able to satisfy their 2019 compliance obligations without making additional purchases.

Figure 4 shows for each regulated entity, the number of allowances banked from 2019 ("2018+2019 Holdings Post-Compliance) and their 2020 allocations and auction purchases to date. The figure also shows their emissions over the last 12 months that have been reported.

Figure 4: Allowance Holdings and Last 12 Months of Emissions by Regulated Entity [15]



15 Holdings and allocations are shown as of March 15, 2020. Emissions reporting available at the time of report creation covered the twelve months of 2019.

The figure shows that most regulated entities already have a number of allowances for 2020 that exceeds their compliance obligations over the most recent 12-month period. However, several larger participants currently hold a number that is lower than their emissions over the most recent 12-month period. Regulated entities whose emissions for 2020 are trending above their allowance holdings will be able to satisfy their obligations through some combination of:

- Allowances reallocated from new facilities – In 2020, the new facility allocation is 750k. New facilities used less than 300k of the new facility allocation in 2019, although some new peaking facilities did not enter operation until the latter half of 2019.

- Reduced emissions relative to recent patterns of operation – Emissions fell 41 percent from 2017 to 2019. There is relatively little transmission congestion into Massachusetts from neighboring states, which would allow additional electricity imports if fossil-fuel generators in Massachusetts reduce production further.

- Allowance purchases in the secondary market – Based on Figure 4, it is likely that six regulated entities already have sufficient allowances to satisfy their likely compliance obligations in 2020. However, some regulated entities may prefer to bank a significant number of allowances for 2021.

- Purchases of the remaining 2020 auction allowances – Approximately 500k allowances remain available to be auctioned for 2020.

Thus, it appears that regulated entities will have options for satisfying their 2020 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.