QUARTERLY REPORT ON THE ELECTRICITY GENERATOR EMISSIONS LIMITS PROGRAM (310 CMR 7.74): THIRD QUARTER 2021

Prepared for:

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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 third quarter of 2021, 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 (2.9 million) after the 2020 compliance deadline.
  - ✓ The 2018 cap was 9.15 million allowances vs 7.35 million metric tons of emissions.
  - ✓ The 2019 cap was 8.73 million allowances vs 5.83 million metric tons of emissions.
  - ✓ In 2020, the cap was 8.51 million allowances compared to 5.54 million metric tons of emissions. The cap will not fall below this level of emissions until 2034.
  - ✓ In 2021, the cap is 8.24 million allowances, while emissions were up 0.55 million metric tons through September 2021 compared to the first nine months of 2020.
- *Load, Generation, and Emissions Trends*: Emissions from covered generation have fallen compared to 2018, while electric load has fallen and electricity imports have risen. However, 2021 is on track to have higher emissions than 2019 and 2020.
  - ✓ Increased electric load accounts for part of the increase in emissions from 2020. Electric load rebounded in 2021 from the significant decline that occurred during the initial phase of the COVID-19 pandemic (in particular, March to May 2020),
  - ✓ Electricity imports have consistently risen since 2018 through 2020 but fell in the first eight months of 2021 over the same period in 2020. When imports fall, more load has to be met from internal covered generators. Given the low levels of transmission congestion into Massachusetts from neighboring states, potential remains for higher imports. These patterns are discussed further in Section D.
  - ✓ Generation from covered units rose from 9.7 TWh in the first eight months of 2020 to 11.3 TWh during the same period in 2021. This was accounted for by combined cycle generation, which increased by 2.3 TWh
- *CO_2 Allowance Prices and Trading Activity*: Although trading activity increased compared to the prior year, it was still limited in 2021.
  - ✓ Prices averaged $8.60 per metric ton for 613k allowance transfers during 2021 with the highest price transaction occurring in September.

- ✓ The four auctions for 2021 vintage allowances cleared at:
  - $7.25 per metric ton in Auction 2021-1 in December 2020)
  - $6.50 per metric ton in Auction 2021-2 in March 2021
  - $7.75 per metric ton in Auction 2021-3 in June 2021
  - $10 per metric ton in Auction 2021-4 in September 2021.
- ✓ Given the large surplus of allowances relative to 2021 emissions, the prices in 2021 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 as evidenced when 2020 compliance year allowances traded at a premium over 2021 compliance year allowances. 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 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, 8,238,423 metric tons in 2021, 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, the MassDEP no longer distributes allowances by direct allocation, but instead only offers allowances through auctions.

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 the new provisions, if the number of banked allowances after a particular year exceeds 223,875, the

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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)

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, after 2020 compliance obligations were satisfied, 3,191,261 allowances were held in facility accounts on April 1st, 2021. Thus, the number of allowances to be distributed for the 2021 compliance year was adjusted down by 2,967,386 (which equals the 3,191,261 allowances held after 2020 minus the limit of 223,875 allowances). Consequently, the adjusted emissions cap for the 2021 compliance year was 8,507,298 metric tons (including 3,191,261 banked allowances and 5,316,037 vintage 2021 allowances sold in auctions 2021-1 through 4). .

Auctions

The MassDEP plans to distribute allowances for the 2022 compliance year through four quarterly auctions:

- On December 15, 2021: 20 percent of the 2022 unadjusted emissions limit will be offered (1,611,909 allowances).
- On March 16, 2022, 20 percent of the total 2022 unadjusted emissions limit will be offered (1,611,909 allowances).
- On June 8, 2022: 50 percent of the allowances remaining after the first two auctions and the adjustment for allowances banked after 2021 will be offered. Publication of the final amount will occur following the adjustment for banking, which will occur during the 2021 compliance process in March 2022.
- On September 14, 2022: All remaining 2022 allowances will be offered for sale.

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 2020 compliance, they are required to hold a number of allowances for 2021 compliance equal to their 2021 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 each year from 2018 to 2020, 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.

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.

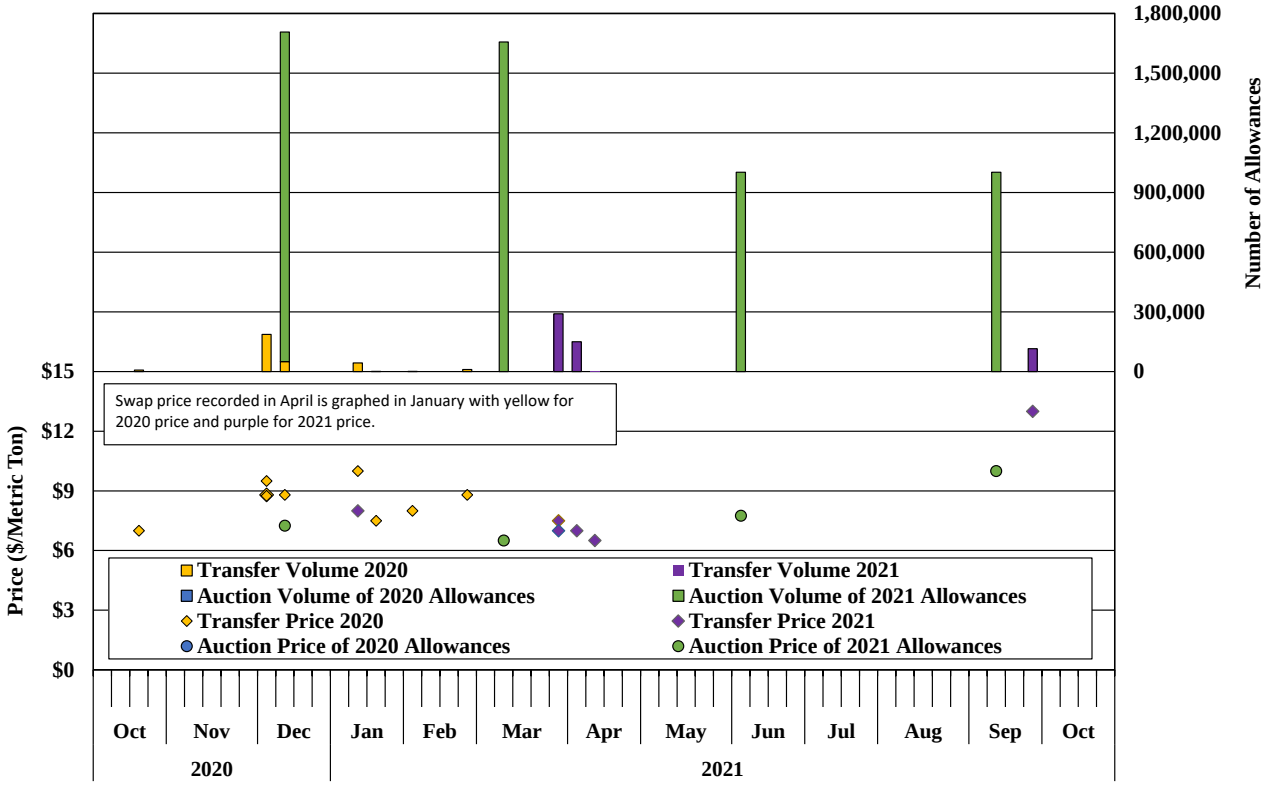
6 These are periods when ISO New England has triggered "Master Local Control Center Procedure No.2"

7 310 CMR 7.74(6)(d)

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]



There were 13 transfers between unaffiliated entities in 2021:

- Transactions in January and February were for 2020 vintage allowances and priced between $8 and $10 for an average of $9.71 per metric ton for a volume of 54.5k. The prices of these transactions were somewhat higher than the prices paid for 2021 vintage allowances in the auctions and the secondary market around that time. This indicates that some regulated entities were seeking 2020 vintage allowances ahead of the compliance deadline on March 1, 2021, leading them to a premium for the 2020 vintage.

8 Figure 1 shows transfers reported to the registry by the end of October 2021, but since there is no prompt reporting requirement, other transactions may have occurred that have not yet been reported.

- In April, 444k allowances for the 2021 vintage were transferred with an average price of $7.32 per metric ton.
- In September, 115k allowances for the 2021 vintage were transferred at a price of $13 per metric ton.

In the four allowance auctions held for 2021 vintage allowances:

- Auction 2021-1 (on December 16, 2020) cleared at $7.25 per metric ton.
- Auction 2021-2 (on March 11) cleared at $6.50 per metric ton.
- Auction 2021-3 (on June 9) cleared at $7.75 per metric ton.
- Auction 2021-4 (on September 15) cleared at $10 per metric ton.

Given the large surplus of allowances compared to anticipated emissions in 2021, the current pricing of allowances must be driven by expectations of higher prices in the future. Section D of this report shows that emissions were below the emissions cap by 35 percent in 2020, and emissions are on pace to be below the cap by 28 percent in 2021. The banking provisions encourage firms to hold allowances if they anticipate higher prices in the future. However, the annual emissions cap will not fall to the level of 2021 emissions until the 2031 compliance year.

The Mass DEP discontinued allocating allowances in 2021 and now distributes allowances entirely through the quarterly auctions, providing additional opportunities for regulated entities seeking allowances. We observed more allowance transfer activity in the secondary market in 2021 than in the previous year. However, the allowance market continues to provide limited price discovery and exhibit illiquid conditions. There were lengthy periods with no transactions reported during 2021, and some regulated entities had to pay a substantial premium for 2020 vintage allowances despite the large surplus before the compliance deadline.

Consequently, some 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 2022 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 current vintage allowances as a hedge for obligations in future years.

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 Figure 3 compares allowance holdings to emissions by regulated entity.

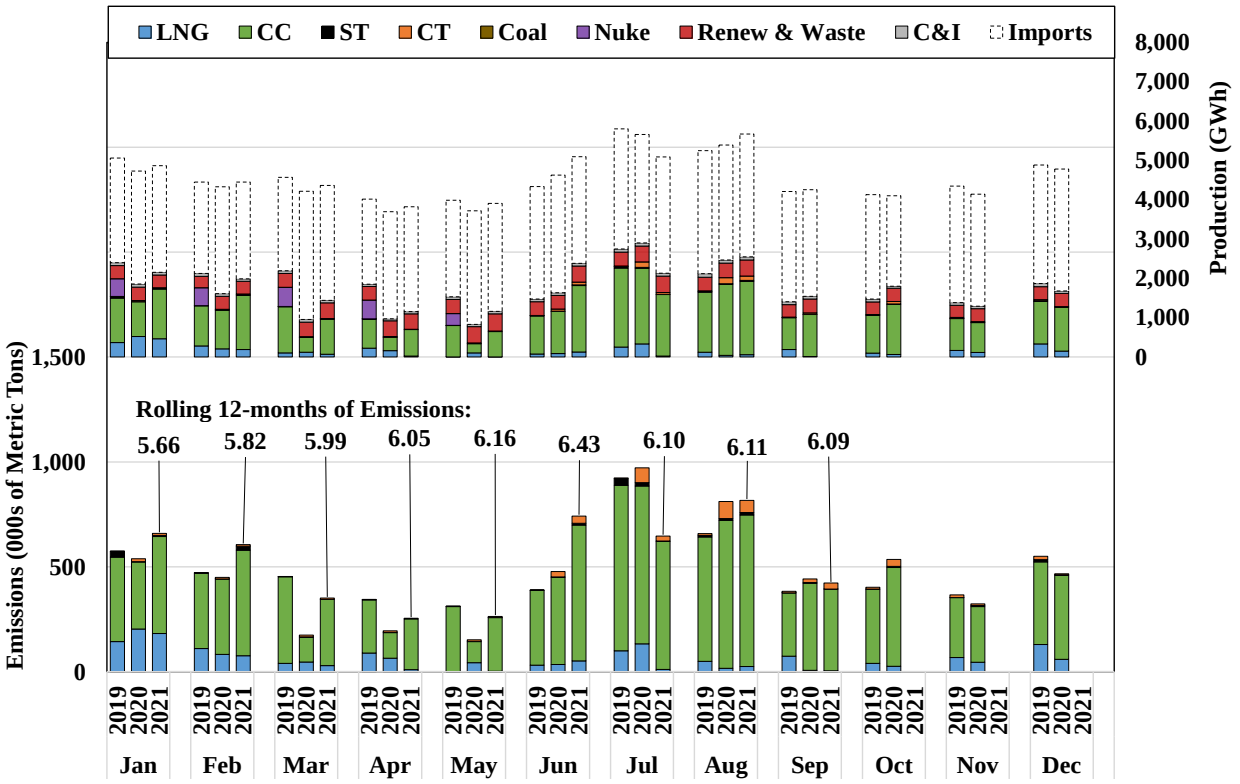
Table 1 summarizes electricity supply and emissions through part of 2021 compared to the same time periods in 2019 and 2020. Data is provided for regulated facilities by type: combined cycle units running on liquified natural gas ("LNG"), all other combined cycle units ("CC"), gas/oil-fired steam turbines ("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"). Two different time horizons are specified for generation and emissions due to data availability issues. Generation data is provided through August of each year while emission estimates extend through September. 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[9] and Emissions

Year	Generation By Type, January-August (TWh)								
	LNG	CC	ST	CT	Nuclear	Renew & Waste	C&I	Imports	Total
2019	1.4	9.4	0.10	0.03	2.2	2.7	0.59	21.0	37.5
2020	1.6	7.6	0.05	0.43	0.0	3.0	0.54	23.1	36.4
2021	1.0	10.0	0.07	0.29	0.0	3.1	0.54	22.3	37.2
	Carbon Dioxide Emissions, January-September (Million Metric Tons)								
2019	0.6	3.8	0.07	0.02	-	-	-	-	4.51
2020	0.6	3.3	0.04	0.24	-	-	-	-	4.21
2021	0.4	4.1	0.05	0.18	-	-	-	-	4.76

[9] Generation is based on EIA Form 923 data, and Real-Time Load is from the ISO-NE website. Form 923 data for 2021 is not final, so values for 2021 may change in future reports. Form 923 data was not available for September 2021 when this report was produced, so generation is shown for January to August only.

Figure 2: Monthly Electricity Supply and Emissions, 2019-2021



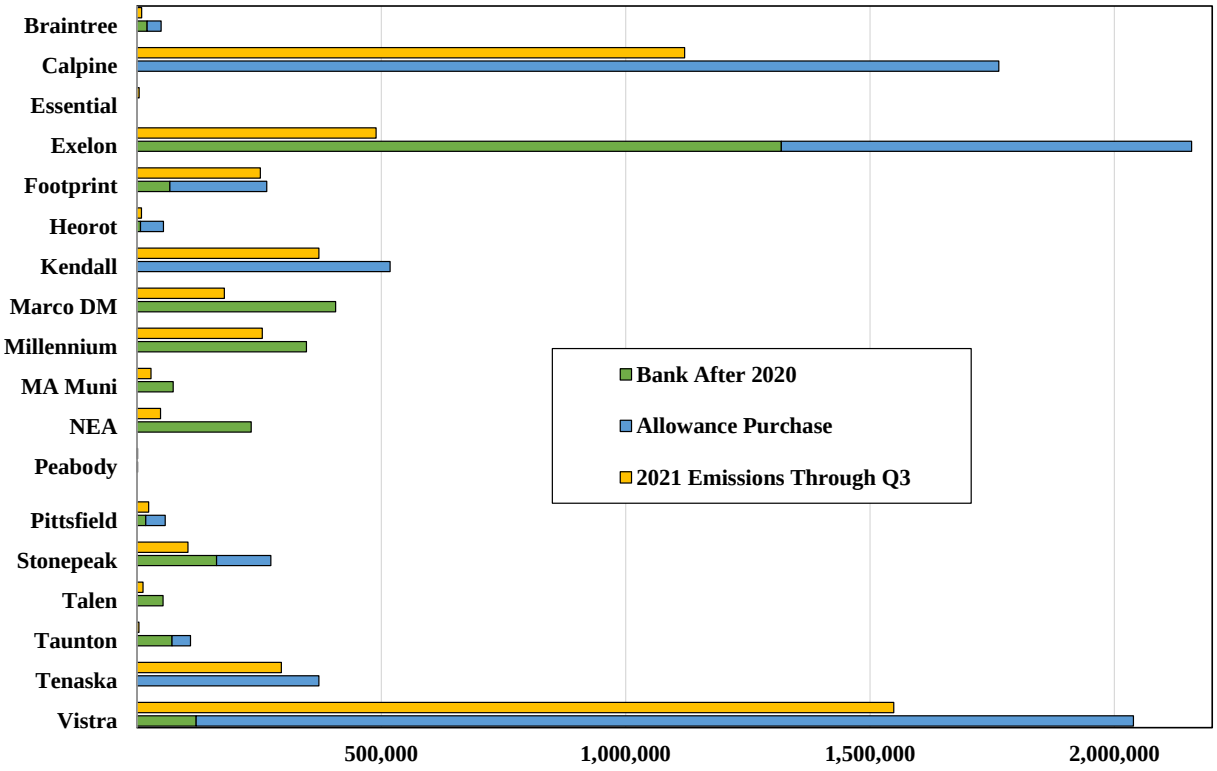
Emissions fell slightly from 2019 to 2020 (for the first-three quarters of the year); however, 2021 emissions have increased from both 2019 and 2020. Twelve month-rolling-average emissions rose to 6.09 million metric tons in September 2021, which is up from annual emissions of 5.54 million metric tons in 2020. This increase in emissions reflected:

- The economic recovery in 2021 following the reduction in energy generation and load levels related to the COVID-19 pandemic in 2020. In particular, generation from March to May 2020 was abnormally low.
- Fewer imports in 2021 compared to the same period in 2020.

Emissions from pipeline gas-fired combined cycle generators increased by 800 thousand metric tons from the first three quarters of 2020. This was partly offset by reduced emissions from LNG-supplied generation, which has been very low since 2019 partly due to pipeline gas prices being low relative to prices of imported LNG. Among the covered generators, combined cycle units are the least carbon-intensive.

Figure 3 shows, for each regulated entity, its reported emissions over the three quarters of 2021 compared to its estimated holdings to-date, which is comprised of the sum of allowances banked from 2020 ("Bank After 2020"), and allowance purchases (including both transfers and auction purchases).

Figure 3: Allowance Holdings and Emissions through 2021-Q3 by Regulated Entity [10]



The figure shows that all regulated entities have a number of allowances for 2021 that exceeds their compliance obligations over the first three quarters and is likely to remain larger than their ultimate compliance obligations. Several participants hold enough banked allowances that they opted not to participate in the auctions. Regulated entities whose total projected emissions for 2021 are trending close to their allowance holdings will be able to satisfy their obligations through some combination of:

10 Holdings and allocations are shown as of November 2, 2021. Emissions reporting available at the time of report creation covered the first three quarters of 2021.

- Reduced emissions relative to recent patterns of operation – Increased use of electricity imports, given relatively little transmission congestion into Massachusetts from neighboring states, could reduce fossil-fuel generation within Massachusetts.
- Allowance purchases in the secondary market – Based on Figure 3, most 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.
- Emergency deferred compliance – Several MLCCP#2 events occurred in 2021, and emissions that occurred during these events can be offset on a two for one basis at the 2022 compliance deadline, instead of the 2021 deadline. The use of emergency deferred compliance would likely not be economic because of the two for one compliance requirement. However, facilities with emissions that exceed their allowance holdings may benefit from the option to consider accepting the two for one obligation for a small portion of their emissions, rather than risking non-compliance with the requirements of 310 CMR 7.74.

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.