

ATTACHMENT 1

Calculation of NO_x and VOC Emissions Offsets From Brayton Point Station Shutdown

To quantify NO_x emissions offsets from the Brayton Point shutdown, MassDEP followed the following steps (see Attachment 2 for spreadsheet calculations):

1. Selection of representative, eligible two-year operating period;
2. Determination of the lesser of actual or allowable NO_x emissions during two-year-period;
3. Calculation of rate NO_x offsets quantity, totaling 1,360 tons per year;
4. Calculation of mass NO_x offsets quantity, totaling 19,877 tons.

1. Selection of representative, eligible two-year operating period

Offsets are reductions in actual emissions, quantified in terms of tons of a regulated pollutant emitted per year. The term, actual emissions, is defined in 310 CMR 7.00 Appendix A, (2) Definitions, as:

...as of a particular date,... the average rate, in tons per year, at which the unit actually emitted the pollutant during a two-year period which precedes the particular date and which is representative of normal source operation. The Department shall allow the use of a different time period upon a determination that it is more representative of normal source operation. Actual emissions shall be calculated using the unit's actual operating hours, production rates, and types of materials processed, stored, or combusted during the selected time period....

The definition of actual emissions in 310 CMR 7.00, Appendix B, limits the eligibility of past time periods to five years for ERC applications:

...the average rate, in tons per year, at which a unit actually emitted the pollutant during the two-year period which precedes the date of application and which is representative of normal production rates or activity levels. The Department shall allow the use of a different two year consecutive time period, within five years immediately prior to the date of application, upon a determination that the alternative two year period is more representative of normal source operation. Actual emissions shall be calculated using the eligible source's actual operating hours, production rates, and types of materials processed, stored, or combusted during the selected time period.

Neither the state nor federal regulations define *normal source operation*. EPA has written that

...10 years of data is reasonable to capture an entire industry cycle. Comments from various industries support a conclusion that a 10-year look back period is a fair and

representative time frame for encompassing a source's normal business cycle.¹

To determine *normal source operation*, MassDEP reviewed the fuel energy input (million Btu) and electric energy output (megawatt hours) data from the nine two-calendar-year periods in the last ten calendar years of operation (2008-2009, 2009-2010, 2016-2017) of Brayton Point Units 1, 2, 3 and 4. The operating data was obtained from EPA's Air Markets Program Data (AMPD), a searchable repository of publicly available information on fossil fuel-burning electric power generating units collected as part of EPA's emissions trading programs.

MassDEP then calculated the average (arithmetic mean) two-year value for both energy input and output, and the absolute value of the difference between each two-year-period and the average two-year period. Both energy input and energy output for the 2013-2014 period differed least from the two-calendar-year averages, compared to all the other two-calendar-year-periods.

The 2013-2014 period falls within five years immediately prior to the shutdown, the most restrictive "window" for determining past actual emissions, between Appendix A and Appendix B.

Since operations during this period are particularly representative of normal source operation, MassDEP decided to use actual emissions, and energy inputs and outputs, from the calendar years 2013 and 2014, for determining the offset quantities for the Brayton point shutdown.

2. Determination of the lesser of actual or allowable NO_x emissions during two-year-period

MassDEP tabulated actual emissions reported by Brayton Point to AMPD for each of Units 1-4 for 2013 and 2014, as well as emission factors calculated from actual emissions and energy input.

In order to calculate baseline (i.e., the lower of actual emissions or allowable emissions) MassDEP identified all applicable requirements and associated NO_x emission rates that would have applied to each unit, had each unit continued to operate in the future. MassDEP identified the following allowable emission rates that are less than the 2013 and 2014 actual NO_x emission rates:

- for Units 1 and 3, 0.08 lb per mmBtu pursuant to the July 13, 2013 Consent Decree signed by the United States and Dominion Energy Inc., Dominion Brayton Point, LLC, and Kincaid Generation, LLC (less than the actual 2013 emissions);
- for Unit 2, 0.12 lb per mmBtu pursuant to NO_x RACT emissions standards under 310 CMR 7.19(4)(b) promulgated on March 9, 2018 (less than actual 2013 and 2014 emissions); and

¹ 67 FR 80200, December 31, 2002 New Source Review rule.

- for Unit 4, 0.15 lb per mmBtu (oil-firing) and 0.08 lb per mmBtu (gas-firing), pursuant to NO_x RACT emissions standards under 310 CMR 7.19(4)(b) promulgated on March 9, 2018.

Where a more stringent emission rate would apply, MassDEP calculated the allowable annual tons of NO_x emissions for each unit by multiplying actual 2013 or 2014 operating levels (i.e., fuel inputs) times the more stringent emissions factors.

3. Calculation of rate NO_x offsets quantity

Based on the lower of actual or allowable emissions, MassDEP calculated a total of 1,360 tons per year of creditable NO_x rate offsets.

4. Calculation of mass NO_x offsets quantity

MassDEP then calculated mass NO_x offsets by converting rate offsets (tons per year) to mass offsets (tons) by following the procedure in 310 CMR 7.00 Appendix B(3)(e)11. for transferring emission reduction credits (ERCs) from the Rate ERC Bank (tons per year) to the Mass ERC bank (tons). This included assigning a “remaining useful life” and deducting the current ISO New England marginal emission rate.

a. Remaining useful life

Remaining useful life is defined in 310 CMR 7.00 Appendix B as:

the length of time for which the equipment that is being shut down would have continued to operate had the owner/operator chosen not to shut down the equipment and apply for certification of credits at that time. Remaining useful life shall be ten years except in those cases where the Department determines a shorter period is appropriate, or the applicant demonstrates to the Department's satisfaction that a period of longer than ten years is warranted. The Department will use the following criteria for making the determination including, but not limited to: the age of the equipment; the type of equipment; maintenance history; operating history; and industry norms. In any case, remaining useful life shall not exceed 20 years.

MassDEP assigned a remaining useful life of 20 years for each unit at shutdown based on the significant investments that were made in Brayton Point (totaling approximately one billion dollars) in air pollution control system upgrades for Units 1, 2, and 3 and natural draft cooling towers for Clean Water Act compliance for all four units, which would only be justified based a significant operating future

b. ISO New England marginal emission rate

The most recent ISO New England marginal emission rate is 0.23 pounds of NO_x per net megawatt-hour.²

MassDEP derived an average net-to-gross generation ratio from Energy Information Agency data on plant-wide net generation and the CAMD data on unit-specific gross generation, and performed a rate-to-mass conversion calculation for each unit using each unit's specific baseline pounds of NO_x emissions per megawatt-hour electric generation.

c. Final Calculation of mass NO_x offsets quantity

MassDEP calculated a total of 19,877 tons of creditable NO_x mass offsets assuming all 1,360 tons per year of rate offsets are converted to mass offsets. The conversion ratio between these amounts is 14.62

For practical purposes, MassDEP is not pre-determining which type of offset will be used for any given project but will use a ratio of 14.62 for the purpose of converting Brayton Point NO_x rate offsets to NO_x mass offsets.

Quantification of VOC Emissions Offsets from Brayton Point Shutdown

To quantify VOC emissions offsets from the Brayton Point shutdown, MassDEP followed the following steps (see Attachment 2 for spreadsheet calculations) :

1. Quantification of VOC emissions reductions from 2013- 2014 operations;
2. Discount of VOC emissions reductions using Compliance Assurance Multiplier;
3. Calculation of rate VOC offsets, totaling 32 tons per year; and
4. Calculation of mass VOC offsets quantity totaling 640 tons.

1. Quantification of VOC emissions reductions from 2013- 2014 operations

In order to quantify the VOC offsets available from the Brayton Point shutdown, MassDEP used the average of the 2013 and 2014 VOC emissions data reported by Brayton Point under Source Registration (SR), 310 CMR 7.12, for each of Units 1, 2, 3 and 4. There are no applicable requirements limiting allowable VOC emissions from these units. MassDEP calculated a total of 43 tons per year of actual VOC emissions reduction from the shutdown of Units 1, 2, 3 and 4.

2. Discount of VOC emissions reductions using Compliance Assurance Multiplier

Since, unlike NO_x emissions reported from real-time Continuous Emissions Monitoring System (CEMS) measurements, VOC emissions were calculated from fuel burning quantities and

² 2017 ISO New England Electric Generator Air Emissions Report, April 2019, https://www.iso-ne.com/static-assets/documents/2019/04/2017_emissions_report.pdf

literature emission factors, MassDEP discounted the VOC emissions reductions using a compliance assurance multiplier, as provided under 310 CMR 7.00 Appendix B(3)(c)4.b.

The VOC emission factors shown in Brayton's SR filings are the factors listed in EPA's Compilation of Air Emissions Factors, AP-42.³

AP-42 lists each emission factor with a corresponding quality rating, either A, B, C, D or E. An explanation of the basis for, and use of, the ratings appears in the general Introduction to AP-42.⁴

The emission factor quality ratings for the VOC emission factors used in Brayton Point's source registration filing are, A (excellent), B (above average), and C (average), for oil, coal, and natural gas, respectively.

Appendix B specifies a range from 0.50 to 0.80 for the Compliance Assurance Multiplier, for emissions determinations using emission factors.

Taking into account the average-or-above quality rating of the emission factors, MassDEP determined a Compliance Assurance Multiplier value of 0.75.

3. Calculation of rate VOC offsets

Therefore, creditable rate VOC offsets from the shutdown of Units 1-4 equal $43 * 0.75 = 32$ tons per year.

4. Calculation of mass VOC offsets quantity

MassDEP then converted VOC rate offsets (tons per year) to mass offsets (tons) by multiplying by the 20 year Remaining Useful Life. (ISO New England does not publish a marginal emission rate for VOC.) MassDEP calculated a total of 640 tons of creditable VOC mass offsets assuming all 32 tons per year of rate offsets are converted to mass offsets. The conversion ratio between these quantities is merely the 20 year Remaining Useful Life.

For practical purposes, MassDEP is not predetermining which type of offsets will be needed for any particular project, but will use 20 years for the purpose of converting Brayton Point VOC rate offsets to VOC mass offsets.

³ <https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors>

⁴ <https://www3.epa.gov/ttn/chief/ap42/c00s00.pdf>