

Appendix F

Standards of Performance Supporting Calculations & Data

§60.5740a(a)(6)(ii)

[40 C.F.R. §§ 60.5740a(a)(6)(ii)]

This information must be submitted to the U.S. EPA as part of your plan submittal but will not be codified as part of the federally enforceable plan upon approval by the U.S. EPA.

The State Plan submittal must include supporting material including materials supporting calculations for designated facility's standard of performance according to 40 C.F.R. § 60.5755a.

West Virginia Plan Source Specific Demonstration - Longview Power LLC (LVP)

The information provided in Appendix F completes the demonstration from Section 4.4.c of the State Plan by providing the materials supporting the calculations for the standards of performance demonstrated in Appendices C and D to the State Plan.

The demonstration is organized as follows:

- Section A provides the data sources and high-level calculation explanations for the rate-based standard. [40 C.F.R. § 60.5755a(a)(1)]
- Section B provides the baseline calculations and analysis. [40 C.F.R. § 60.5755a(a)(2)]
- Section C provides calculations related to the future operating characteristics related to the standard of performance calculations. [40 C.F.R. § 60.5755a(a)(2)]
- Section D provides the calculations for the degree of emission limitation achievable through application of HRI. [40 C.F.R. § 60.5755a(a)(2)]
- Section E provides the degradation factor calculations. [40 C.F.R. § 60.5755a(a)(2)]
- Section F provides the coal adjustment factor calculations. [40 C.F.R. § 60.5755a(a)(2)]
- Section G provides the supporting calculations for the quantifiable, verifiable, permanent, and enforceable demonstration provided in Appendix D. [40 C.F.R. §§ 60.5755a(b) - (f)]
- Section H provides the R code used for initial data analysis R code outputs.
- Section I provides the raw data submitted by LVP, July 24, 2020, *LVP ACE Rule Data 2012 through 2020 Q2 - 2020-07-24 BH* used to establish the standards of performance.
- Section J provides the raw data submitted by LVP, June 26, 2020, *LVP Generation and OPM Heat Rates 2020-06-26* used to establish the standards of performance.

A. ESTABLISH A RATE BASED STANDARD [40 C.F.R. § 60.5755a(a)(1)]

Data and data collection discussion

The standards of performance for emission unit SB1 from emission point EA1 at LVP are rate-based standards expressed as pounds of CO₂ per megawatt-hour of net electricity generation (lb/MWhN) for load bins LB-1 through LB-5 and expressed as pounds of CO₂ per megawatt-hour of gross electric generation (lb/MWhG) for load bin LB-0. The standards of performance are established under condition 4.1.1 of Permit R13-3495 and include Level 1 standards for routine operations and Level 2 standards, as described and justified in Appendix C to the State Plan.

The raw data provided to the West Virginia DAQ by LVP is titled *LVP ACE Rule Data 2012 through 2020 Q2 - 2020-07-24 BH* and can be found in Section J of this appendix. The data includes the CO₂ concentration (ppm), boiler flow rate (scfh), CO₂ mass emissions (tph), and the gross boiler load (MWh) on an hourly basis for every day the SB1 unit was in operation from 2012 through the 2nd quarter of 2020. The data provided and used for the development of the standards of performance were unbiased and unadjusted.

The CO₂ data was collected from a CO₂ continuous emissions monitoring system (CEMS) that includes a CO₂ monitor which measures concentration in parts per million (ppm) and a flow monitor that measures the hourly average stack gas flow rates in standard cubic feet per hour (scfh). LVP installed, certified, operates, and maintains these monitoring systems according to 40 CFR §75.10(a)(3)(i). The CO₂ concentrations were measured according to the provisions of 40 C.F.R. Part 60.49Da(d). The flow rates were measured according to the provisions of 40 C.F.R. Part 60.49DA(m). The most recent Part 60 and Part 75 CEMS certification Relative Accuracy Test Audits (RATA) of the CEMS on the pulverized coal boiler at LVP were conducted November 4-5, 2019. The West Virginia DEP received the 2019 annual report from LVP on January 2, 2020 for the certification testing of the Part 60 and Part 75 CEMS.

The CO₂ hourly emissions were calculated as follows for each valid operating hour, as defined in 40 C.F.R. § 60.5540(a)(1) prior to being submitted to the West Virginia DAQ:

$$\text{CO}_2 \text{ (tons/hr)} = 5.7\text{e-}7 * \text{CO}_2 \text{ (ppm)} * \text{Flow (scfh)}$$

LVP has two gross watt-hour meters measured in megawatts (MWh) and a net meter that continuously measures the hourly gross and net electric output (MWh). The instruments use 0.2 class electricity metering instrumentation and calibration procedures as specified under ANSI Standards No. C12.20. The gross electric output (MWhG) was measured according to the provisions of 40 C.F.R. Part 60.49Da(k).

LVP has an Online Performance Monitoring (OPM) system, a distributed control system (DCS), and a data collection system that continuously records the high heat value (HHV), heat rate (Btu/kwh) and the unit operating hours. This was the source of the hourly heat rate and the gross loads that were provided to West Virginia DAQ for each valid operating hour of operation. The data, provided in Section K of this appendix, is identified as *LVP Generation and OPM Heat Rates 2020-06-26*.

The net electricity produced by LVP varies between 89 - 91 percent of the gross electricity generated according to LVPs historical data. The net electric generation was calculated as 90% of the gross electric generation.¹.

The net load (MWhN) calculation is:

$$\text{NLOAD (MWhN)} = \text{GLOAD (MWhG)} * 0.9$$

The hourly CO₂ mass emissions was converted from tons to pounds by diving by 2,000.

¹ Permit Application File R13-3495, June 26, 2020, LVP Generation and OPM Heat Rates 2020-06-26.xlsx.

Level 1 rate-based standards for routine operations discussion

The Level 1 standards of performance for routine operations were calculated by first determining the baseload emissions rate as described in Section B of this appendix. After the CO₂ emissions were analyzed throughout the baseload period and the baseload emissions rates were determined for each load bin of operation, a standard deviation of two was added to the baseload emission rate to develop the standard of performance for each load bin. The decision to apply a standard deviation of two to the baseline across each of the load bins is a source specific factor that is discussed in further detail in Section C of this Appendix. The consideration of accommodating future operating characteristics with respect to the standards of performance calculations is discussed in more detail in Section D of this Appendix.

The degree of heat rate improvement (HRI) achievable following the consideration of each BSER candidate technology is discussed in Appendix C to the State Plan. For LVP it was determined and demonstrated that there is no HRI opportunity from the implementation of candidate technologies. Any source specific factors involving the review of the BSER candidate technologies are discussed in Appendix C. Therefore, the HRI value of zero was used in the calculation for the standards of performance as discussed in Section E of this appendix.

The calculations for the standards of performance took into consideration the age of LVP as a source specific factor that was considered. LVP is still considered a young EGU that commenced construction on January 26, 2007, commissioned in 2011, and began operations in 2012. The EGU, identified as SB1, has not yet experienced its first major overhaul outage and the recovery rate is not yet known. The data and calculations involving the unit degradation adjustment factor (UDAF) can be found in Section F of this appendix and the justification for the DAF is provided in Appendix C.

A coal adjustment factor (CAF) may be applied to the standards of performance if the specified permit conditions in Permit R13-3495 are triggered. The calculations and discussion for when this scenario would be applied to the standards is provided in Section G of this appendix.

In accordance with the above discussion, the calculation for the Level 1 CO₂ standard of performance for load bins LB-1 through LB-5 as established in condition 4.1.1.a of Permit R13-3495 is:

Standard of performance (lbs CO₂/MWhN) = Mean of the baseline emissions rate + 2SD - zero HRI.

After the initial compliance period, the CO₂ limit for each of the load bins LB-1 through LB-5 is adjusted with a unit degradation adjustment factor (UDAF). The standard of performance is adjusted (increased) by 0.4% annually and once every five years after the initial compliance period a recovery (decreased) percentage of 0.7% shall be applied to the individual load bin units.

The Level 1 standard of performance for load bin LB-0 (lbs CO₂/MWhG) is calculated in the same manner as the other load bins and is established as condition 4.1.1.a of Permit R13-3495. The calculation is:

Standard of performance (lbs CO₂/MWhG) = Mean of the baseline emissions rate + 2SD - zero HRI.

Level 2 rate-based standards for routine operations discussion

Level 2 standards were developed to address the scenario, should it occur, of a high impact and low probability equipment failure as discussed in Appendix C. The calculation for the Level 2 standards of performance is based on an increase of 10% if the conditions established under condition 4.1.1.b of Permit R13-3495 are met. The Level 2 standards would only apply to load bins LB-1 through LB-5. The calculation to establish the Level 2 standards was:

$$\text{Level 2 standards of performance} = \text{Level 1 standards of performance} \times 1.1$$

B. ESTABLISHING THE STANDARDS OF PERFORMANCE

[60.5755a(a)(2)]

The baseline period chosen for LVP is calendar year 2016 through the second quarter of 2020, for reasons discussed in Appendix C. The raw data used to establish the baseline is provided in Section J of this Appendix F.

The data used for the analysis was validated unbiased CEMS hourly CO₂ mass emissions from emission point EA-1 and the hourly gross electrical output as measured by the watt-hour meters at LVP multiplied by 0.9 to calculate the net electrical output. The CO₂ (ppm) output concentrations were monitored according to the provisions of 40 C.F.R. § 60.49Da(b)(4), § 60.49Da(d) and § 60.49Da(w) (Subpart Da), the boiler flow rate (scfh) was measured according to the provisions of 40 C.F.R. § 60.49Da(m) (Subpart Da), and gross electrical output (MWh) was measured according to the provisions of 40 C.F.R. § 60.49Da(k) (Subpart Da).

The statistical analysis calculations used by the West Virginia DEP and discussed in the State Plan (including the Appendices) were calculated using Microsoft Excel formulas for average, confidence level, percentile, and standard deviation. As a precursor to the statistical analysis using Microsoft Excel, the raw emissions data provided by Longview was processed by an R script within the R Studio software to create rolling monthly CO₂ emissions values for each load bin.

The first decision was selecting the appropriate baseline period for the analysis. LVP initially provided data for West Virginia DAQ evaluation from 2012, when the facility commenced commercial operation, through 2019, the last full year of operation. As discussed in Appendix C, it was decided to start the baseline period in 2016 because the BSER heat rate improvements that were implemented outside of initial design were installed and operational prior to 2016.

Initially, West Virginia selected the baseline period from 2016 through 2019 to have three full representative years of analysis. In developing the baseline standard of performance for LVP, the data was analyzed and evaluated a variety of different ways. One of the issues identified early in the process concerned how to best account for start-up emissions with a rate based standard because during start-up, there is no electricity generated and it is not possible to divide by zero. Another consideration was that although LVP operates as a base-load unit with a high capacity factor, it is the PJM grid operator that dictates how much load is needed from the unit at any given time. Variability in emissions performance at an individual unit was addressed by the U.S. EPA in the ACE rule as follows:

(S)tandards of performance should reflect variability in emission performance at an individual designated facility due to changes in operating conditions. Specifically, the agency believes it would be appropriate for states to identify key factors that influence unit-level emission performance (e.g., load, maintenance schedules, and weather) and to establish emission standards that vary in accordance with those factors. In other words, states could establish standards of performance for an individual EGU that vary (i.e., differ) as factors underlying emission performance vary. For example, states could identify load segments (ranges of EGU load operation) that reflect consistent emission performance within the segment and varying emission performance between segments. States could then establish standards of performance for an EGU that differ by load segment.²

Although, LVP initially requested a different standard of performance in the voluntary permit application, the West Virginia DEP after review and analysis of the data provided, recommended setting standards of performance using a load bin approach, and this was the approach ultimately decided upon. The load bins were established by identifying a maximum load of 783 MWhG. Minimum load has been identified as 40% of maximum load (313 MWhG). The remaining load range was divided into five equal load segments with a range of 94 MWh for each load bin above the minimum load. All CO₂ valid emissions data was included in the analysis.

The West Virginia DEP established standards for each distinct load bin of operation. The load bins include emissions over the full operating range, including startup, and are defined as:

Table F-1. Load Bin Key	
Load Bin	Range (MWh Gross)
LB-0	0-313
LB-1	>313-407
LB-2	>407-501
LB-3	>501-595
LB-4	>595-689
LB-5	>689

Because the SB-1 unit at LVP operates as a base-load unit, on average it has operated approximately 90% of the time in LB-5. To provide additional operating time in each of the load bins, the West Virginia DEP included the first and second quarter data from 2020 into the baseload analysis, primarily LB-3 and LB-4.

The baseline analysis period, therefore, is 2016 through 2Q 2020. Figure F-1 below shows the cumulative hours of operation in each of the load bins during this baseline period.

² 84 Fed. Reg. 32552 (July 8, 2019).

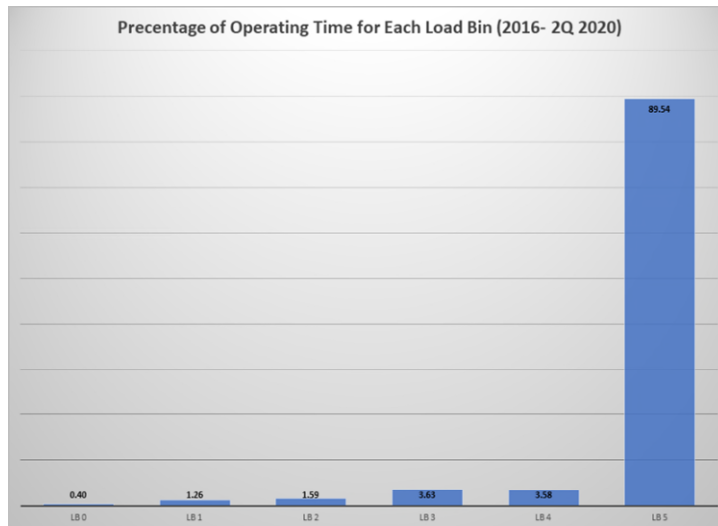


Figure F-1. Percent Operating Time for Each Load Bin (2016 – 2Q2020)

The baseline load bin standards of performance calculations were calculated the same for each of the load bins identified as LB-1 through LB-5 and were calculated in terms of net electric generation. The baseline standard of performance for the start-up and shutdown load bin identified as LB-0 was calculated in terms of gross electric generation. It is worth reiterating that power plants do not receive any revenue when they are in start-up or shutdown operation and therefore, make every effort to move as quickly out of that operating bin as possible.

Load Bins 1 - 5 Baseline Discussion

The raw data provided for the analysis is hourly data for each valid operating day. As shown in the following graphs identified as Figures F-2 and F-3, the hourly data demonstrates a high degree of variability which required the data to be analyzed further before calculating a baseline emission rate.

Hourly CO₂/MWh Net Emissions (2016-2017)

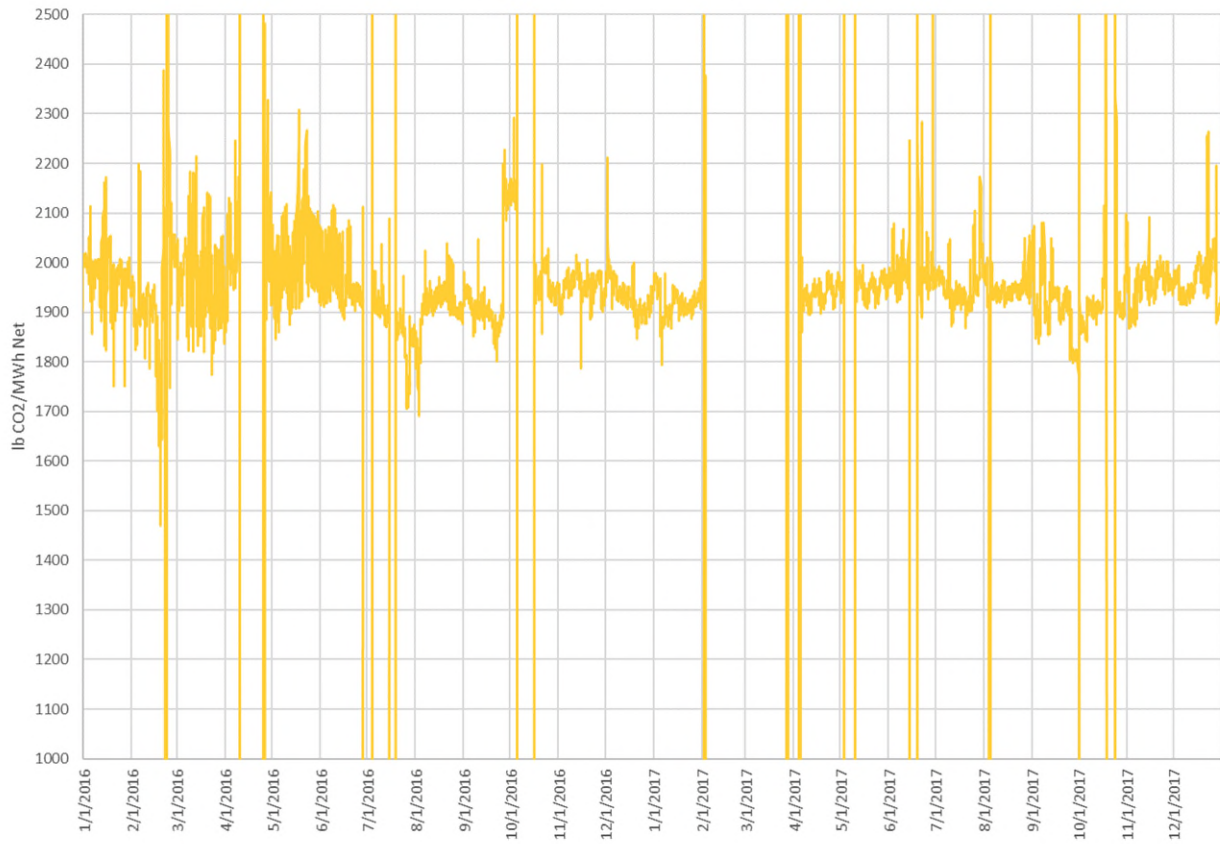


Figure F-2. Hourly CO₂/MWh Net Emissions (2016-2017)³

³ Data submitted by LVP, July 24, 2020, LVP ACE Rule Data 2012 through 2020 Q2 - 2020-07-24 BH.xlsx.



Figure F-3. Hourly CO₂/MWh Net Emissions (2018-2Q 2020)⁴

A monthly average was established by summing the hourly emissions data for each month and dividing by the sum of the net electric generation for each month within each year. This calculation was performed for each of the LB-1 through LB-5 operating bins.

The monthly average was then used to analyze the data a variety of ways including on a quarterly average basis, a calendar year basis, a 12-month rolling average basis, and an 18-month rolling average basis. The data was also analyzed with consideration to margin of compliance including review of different percentiles and standard deviations (SD). Figures F-4 through F-8 below show the comparison between a 1.5 SD and a 2SD that was reviewed during the data evaluation phase.

After a thorough analysis, the standard of performance for each of the load bins identified as LB-1 through LB-5 was decided to be based on the maximum rolling 12-month average plus 2SD. The justification for this decision is provided in Appendix C.

⁴ Data submitted by LVP, July 24, 2020, LVP ACE Rule Data 2012 through 2020 Q2 - 2020-07-24 BH.xlsx.

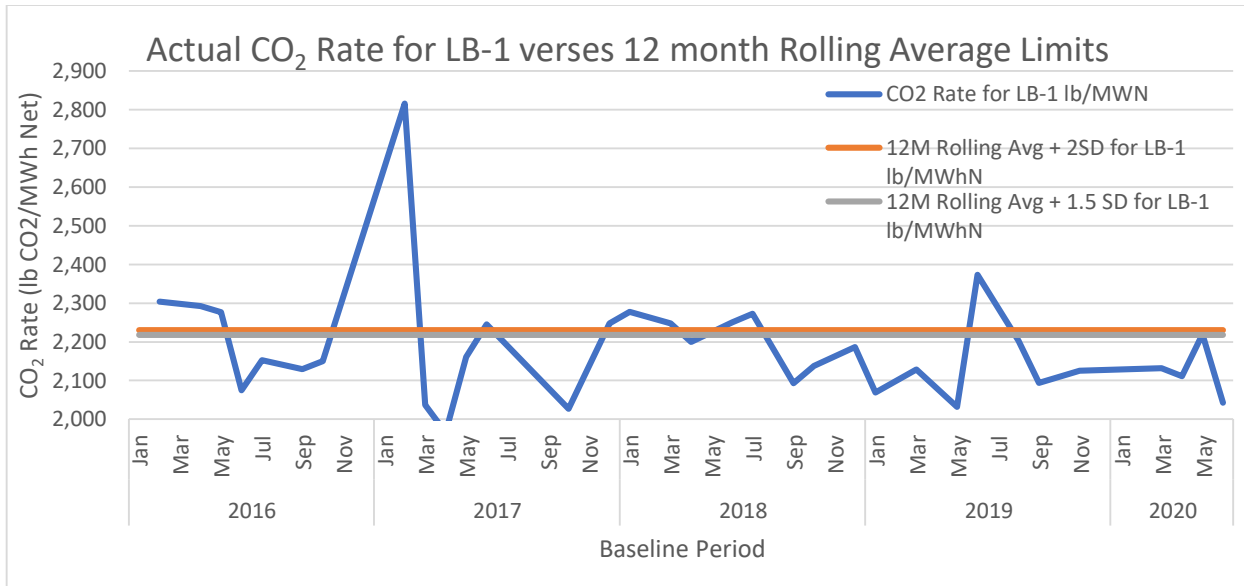


Figure F-4. Comparison of 2SD versus 1.5 SD for LB-1 over baseline period.

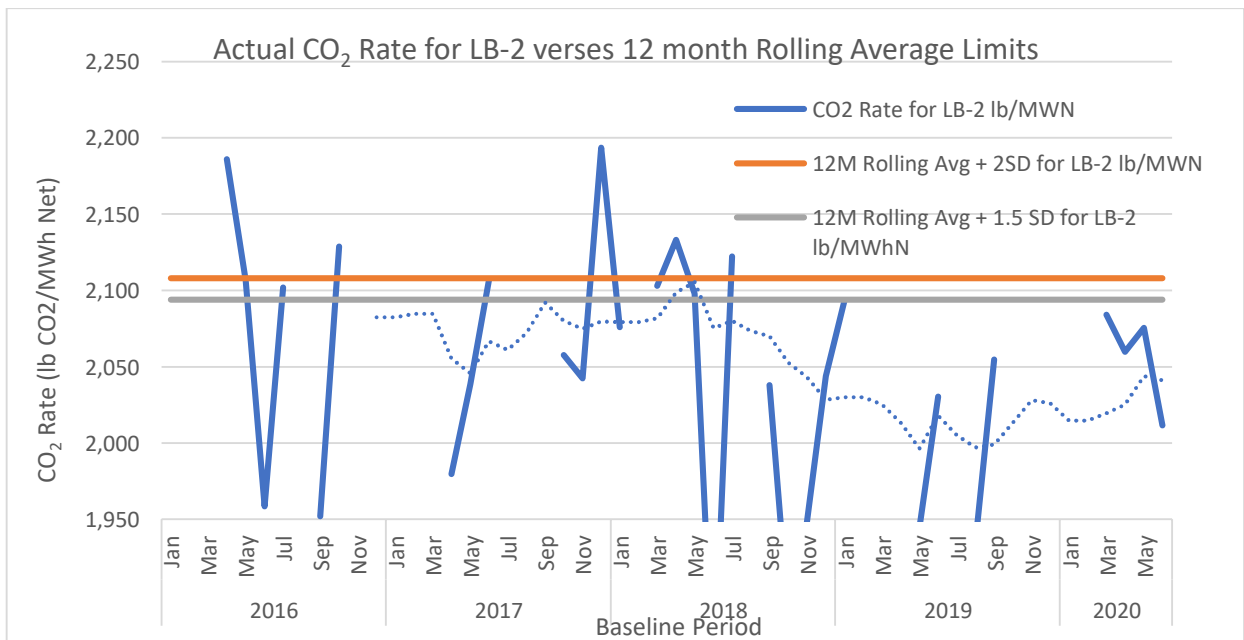


Figure F-5. Comparison of 2SD versus 1.5 SD for LB-2 over baseline period.

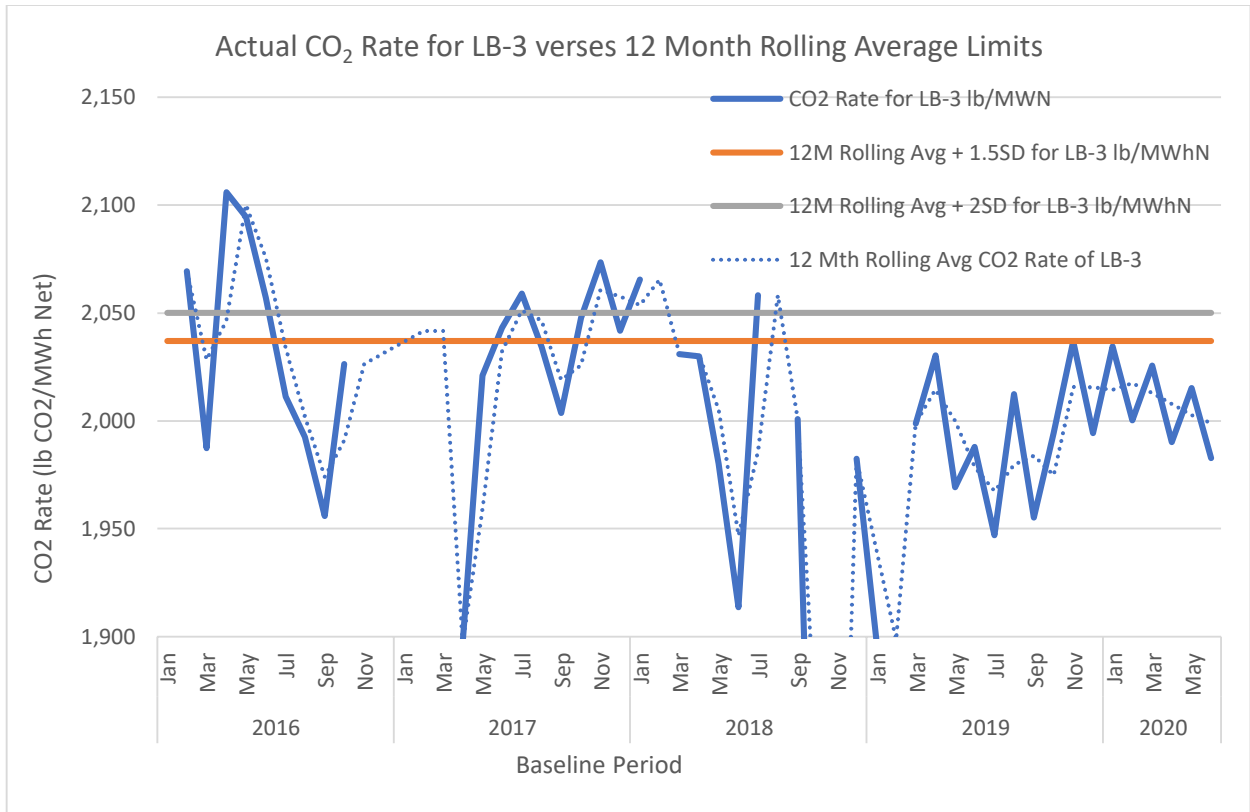


Figure F-6. Comparison of 2SD versus 1.5 SD for LB-3 over baseline period.

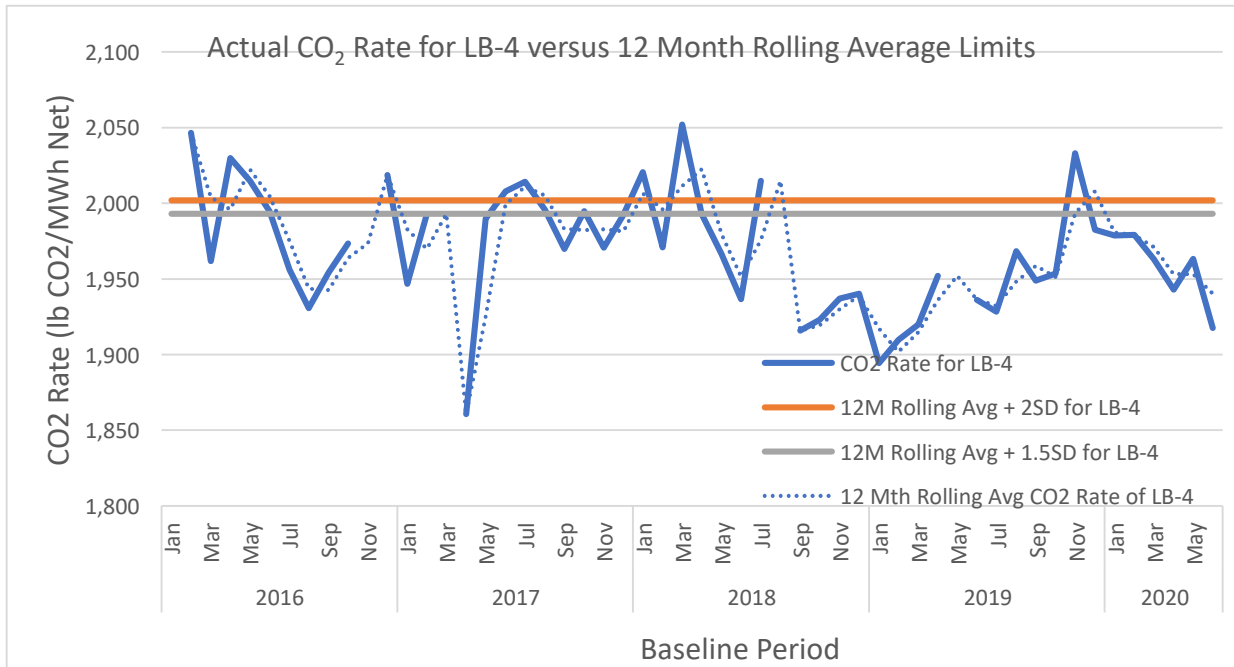


Figure F-7. Comparison of 2SD versus 1.5 SD for LB-4 over baseline period.

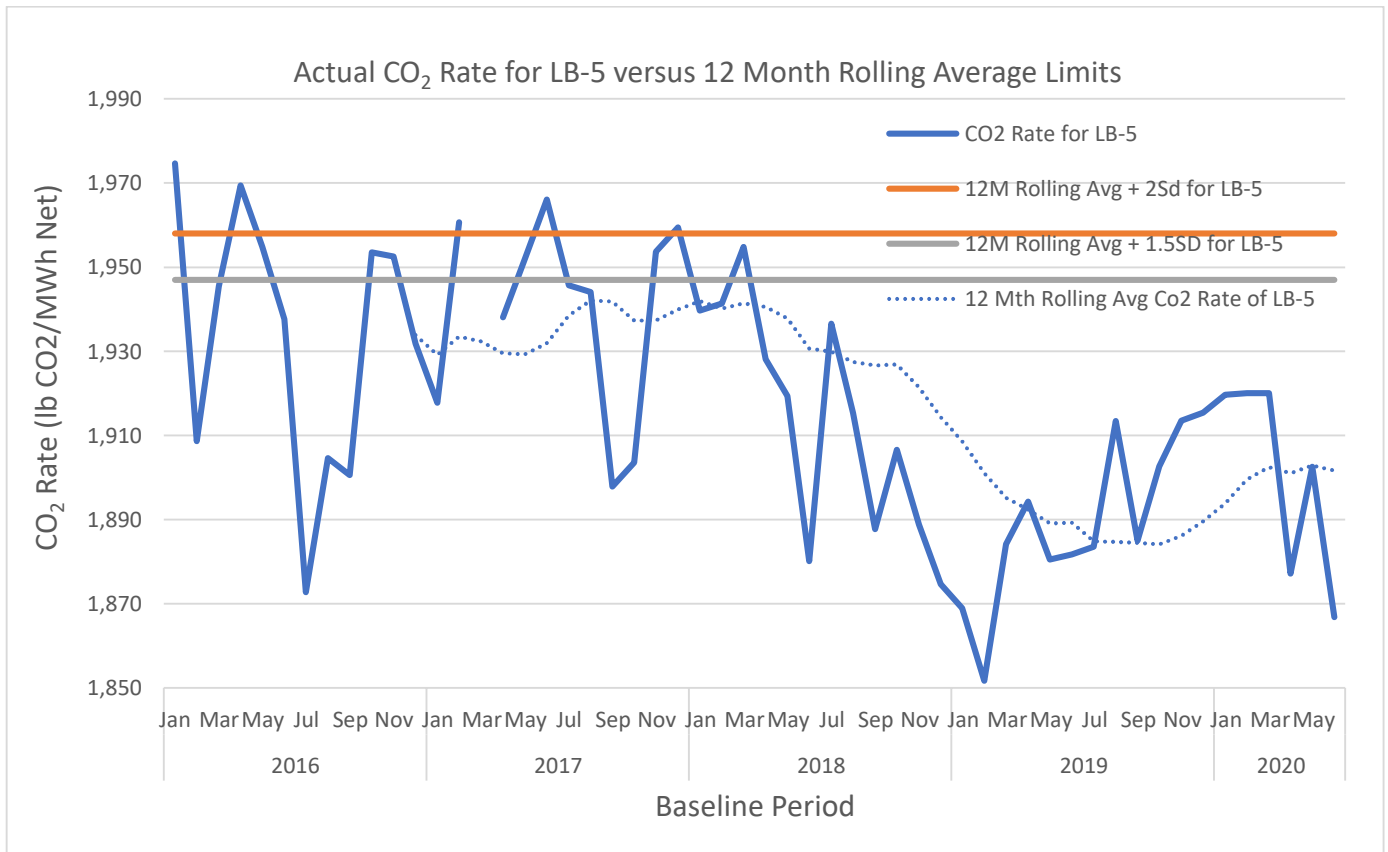


Figure F-8. Comparison of 2SD versus 1.5SD for LB-5 over baseline period.

The average of the monthly data converted, in mass rate of CO₂ per energy output (electricity generated), for the normal operation bins was compiled. The monthly average, standard deviation, kurtosis, and skewness of the respective load bin during an early stage of analysis is illustrated in Table F-2 below.

Table F-2. Summary of Monthly Average of the Normal Operations Load Bins⁵

Load Bin	Average (lbCO ₂ /MWh gross)	Standard Deviation (lb CO ₂ /MWh gross)	Kurtosis	Skewness
LB-1	2,184	146	9.60	2.40
LB-2	2,053	80	0.45	-0.71
LB-3	2,004	66	10.56	-2.52
LB-4	1,968	40	-0.02	-0.11
LB-5	1,917	31	-1.01	-0.02

⁵ Data submitted by LVP that was processed by the DAQ, July 24, 2020, LVP ACE Rule Data 2012 through 2020 Q2 - 2020-07-24 BH.xlsx.

Kurtosis and skewness are indicators of the normal distribution of data. Kurtosis is a measure of whether the data are heavy-tailed or light-tailed relative to a normal distribution. For an ideal normal distribution curve, kurtosis should approach zero. Kurtosis above +1 indicates a peaking curve and values less than -1 indicate the curve is flattening. The skewness for data with a normal distribution is zero. Load Bins 2, 4 and 5 are approaching a normal distribution curve. Considering the low number of operating hours for Load Bins 1 and 3, these statistical results were expected. For Load Bin 2, the statistical results were better than expected.

Skewness is the distortion or asymmetry in a symmetrical bell curve of a normal distribution of data in a data set. The skewness for data with a normal distribution is zero. Load Bins 2, 4 and 5 are approaching a normal distribution curve. Considering the low number of operating hours for Load Bins 1 and 3, these results were expected. However, for Load Bin 2 the results were not expected

As shown in Table F-2, the SD for the data in LB-5 is very low, so by incorporating the calculated mean, as well as 2 times the standard deviation, the Bin Standard (Mean + 2SD) is a very accurate representation of where most of the actual data has, and future data will fall, based on this load range. Statistically speaking, 95% of the data will fall within 2 standard deviations of the mean.

For load bins LB-1 through LB-4 (313 MWG through 689 MWG), a challenge presents itself because those load bins account for less than 7% of the unit’s total run-time hours. There is a significant lack of data points, and the unit is generally increasing load as quickly as possible to achieve maximum gross generation in LB-5. Based on this situation, the average is of a lesser certainty calculation than what was seen in LB-5 and demonstrates a higher variability due to transient generation load as well as a lower number of data points in these load bins. This results in a higher SD in each of the LB-1 through LB-4 load bins than was calculated for LB-5 and shown in Table F-2. However, due to the significance of the standard deviation, the concept of the mean + 2SD remains relevant and applicable. The data in these load bins is less evident; however, the Bin Standard calculations (Mean + 2SD) provide reliable and meaningful results because 95% of the data fits within this standard.

Based on the review of the data summarized in Table F-2 and observing the value of the standard deviations, it was obvious that another approach was needed to reduce these values. The next approach was to use the monthly rates and determine a 12-month rolling (moving) average for each of the operating bins. Additionally, 18-month rolling averages of the monthly data were assessed. Another approach, which was suggested by U.S. EPA, was to sum the mass of CO₂ emissions over a 12-month period and then divide by the sum of the electricity generated over the 12-month period (sum of the CO₂ divided by the sum of the generation). See Table F-3 below that provides a comparison of these approaches in regard to their respective standard deviations.

Table F-3. Standard Deviation Comparison of Possible Approaches.

Load Bin	Method	Average (lbs CO₂/MWhN)	Standard Deviation (lbs CO₂/MWhN)
LB-1	12 Mo. Rolling Average	2,183	24
	18 Mo. Rolling Average	2,186	16
	SUM of CO ₂ /SUM of MWh	2,177	35

Load Bin	Method	Average (lbs CO₂/MWhN)	Standard Deviation (lbs CO₂/MWhN)
LB-2	12 Mo. Rolling Average	2,050	29
	18 Mo. Rolling Average	2,051	19
	SUM of CO ₂ /SUM of MWh	2,158	85
LB-3	12 Mo. Rolling Average	1,998	26
	18 Mo. Rolling Average	1,997	19
	SUM of CO ₂ /SUM of MWh	2,002	85
LB-4	12 Mo. Rolling Average	1,966	18
	18 Mo. Rolling Average	1,966	14
	SUM of CO ₂ /SUM of MWh	1,967	23
LB-5	12 Mo. Rolling Average	1,916	21
	18 Mo. Rolling Average	1,917	19
	SUM of CO ₂ /SUM of MWh	1,916	20

Review of the SD data in Table F-4 immediately ruled out the “SUM of the SUM” option. Although the 18-month rolling average option provided somewhat lower values than the 12-month rolling average option, the 12-month rolling average option was selected because it is much more practical to implement. The justification for this approach was discussed in greater detail in Appendix C.

Load Bin 0 (LB-0) Discussion

The nature of the actual operation and purpose of the startup and shutdown operations will not allow the peaks and valleys in the CO₂ emissions data to be minimized (smoothed) out into any reasonable levels. The CO₂ emission rate is a declining curve, and the CO₂ rate cannot fall within a normal distribution curve. During the startup phase, EGU’s have a negative heat rate for a certain period until the unit begins to generate electricity. When examining the data closely, one realizes there are several hours during startups with CO₂ emissions while no electricity is being generated. To avoid a division by zero error while ensuring all CO₂ emissions during the startup and shutdown phase are counted, the sum of the hourly CO₂ mass emission rates and sum electricity generation were aggregated into monthly totals throughout the baseline period. These monthly totals of CO₂ mass emissions and electricity generated were then used to determine the CO₂ rate of the unit for the corresponding month. This same approach was used for each of the load bin as well.

C. ANTICIPATED FUTURE OPERATION CHARACTERISTICS, AS APPLICABLE

[40 C.F.R. § 60.5740a(a)(4)]

There are no supporting calculations required for this section beyond the information already provided in Appendix C and supplied by LVP.

D. DEGREE OF EMISSION LIMITATION ACHIEVABLE THROUGH APPLICATION OF HRI DESCRIBED IN 40 C.F.R. §60.5740a(a)(1) and (2) [60.5755a(a)(2)]:

Because LVP has already implemented each of the candidate technologies established as BSER or has demonstrated they are at least as equivalent to the candidate technologies in Appendix C, no supporting calculations are needed in this section. The degree of emission limitation achievable through the application of HRI was demonstrated to be zero.

E. DEGRADATION FACTOR ANALYSIS

There are no supporting calculations required for this section beyond the information already provided in Appendix C.

F. COAL ADJUSTMENT FACTOR

The CO₂ emissions data over the baseline was sorted for CO₂ emissions that occurred when the unit was operating within the gross load range of LB- 5. This data was reduced into seven-day periods (weekly) and sorted for weeks that contained 151 hours of data (90% operating within Load Bin 5). The average of the standard deviation was 13.2 with the highest value of 68.8. If LVP maintains current O&M practices, the baseline testing data should readily fit within the average standard deviation. The new source test is dependent on the consistency of the coal that is supplied and tuning of the unit in a relative short period.

The CAF is the ratio of future CO₂ emissions divided by the baseline CO₂ emissions as determined in accordance with Permit R13-3495 condition 4.3.1.

H. CALCULATIONS FOR QUANTIFIABLE, VERIFIABLE, PERMANENT, AND ENFORCEABLE [40 C.F.R. §§ 60.5755a(b)-(f)]

The equations for calculation of a weighted emission limit are as follows:

Equation 1:

Level 1 CO₂ weighted Avg =

$$\frac{\sum OPHL_{1LB-1} \times CO_{2LB-1} + \sum OPHL_{1LB-2} \times CO_{2LB-2} + \sum OPHL_{1LB-3} \times CO_{2LB-3} + \sum OPHL_{1LB-4} \times CO_{2LB-4} + \sum OPHL_{1LB-5} \times CO_{2LB-5}}{\sum OPHL_{1total}}$$

Where:

Level 1 CO₂ weighted Avg =

Level 1 CO₂ Weighted Average Limit for the compliance period in terms of pounds of CO₂ per MWh (net).

$\sum OPHL_{1LB-1}$ = Total Level 1 operating hours in Load Bin 1

CO_{2LB-1} = The CO₂ limit for Load Bin 1 in terms of pounds of CO₂ per MWh (net)

$\sum OPHL1_{LB-2}$ = Total Level 1 operating hours in Load Bin 2
 $CO2_{LB-2}$ = The CO₂ limit for Load Bin 2 in terms of pounds of CO₂ per MWh (net)
 $\sum OPHL1_{LB-3}$ = Total Level 1 operating hours in Load Bin 3
 $CO2_{LB-3}$ = The CO₂ limit for Load Bin 3 in terms of pounds of CO₂ per MWh (net)
 $\sum OPHL1_{LB-4}$ = Total Level 1 operating hours in Load Bin 4
 $CO2_{LB-4}$ = The CO₂ limit for Load Bin 4 in terms of pounds of CO₂ per MWh (net)
 $\sum OPHL1_{LB-5}$ = Total Level 1 operating hours in Load Bin 5
 $CO2_{LB-5}$ = The CO₂ limit for Load Bin 5 in terms of pounds of CO₂ per MWh (net)
 $\sum OPHL1_{total}$ = Total Level 1 operating hours excluding hours operating in Load Bin 0 (LB-0)

Equation 2:

Level 2 CO₂ weighted Avg =

$$1.10 \times \left(\frac{\sum OPHL2_{LB-1} \times CO2_{LB-1} + \sum OPHL2_{LB-2} \times CO2_{LB-2} + \sum OPHL2_{LB-3} \times CO2_{LB-3} + \sum OPHL2_{LB-4} \times CO2_{LB-4} + \sum OPHL2_{LB-5} \times CO2_{LB-5}}{\sum OPHL2_{total}} \right)$$

Where:

Level 2 CO₂ weighted Avg =

Level 2 CO₂ Weighted Average Limit for the compliance period in terms of pounds of CO₂ per MWh (net).

$\sum OPHL2_{LB-1}$ = Total Level 2 operating hours in Load Bin 1
 $CO2_{LB-1}$ = The CO₂ limit for Load Bin 1 in terms of pounds of CO₂ per MWh (net)
 $\sum OPHL2_{LB-2}$ = Total Level 2 operating hours in Load Bin 2
 $CO2_{LB-2}$ = The CO₂ limit for Load Bin 2 in terms of pounds of CO₂ per MWh (net)
 $\sum OPHL2_{LB-3}$ = Total Level 2 operating hours in Load Bin 3
 $CO2_{LB-3}$ = The CO₂ limit for Load Bin 3 in terms of pounds of CO₂ per MWh (net)
 $\sum OPHL2_{LB-4}$ = Total Level 2 operating hours in Load Bin 4
 $CO2_{LB-4}$ = The CO₂ limit for Load Bin 4 in terms of pounds of CO₂ per MWh (net)
 $\sum OPHL2_{LB-5}$ = Total Level 2 operating hours in Load Bin 5
 $CO2_{LB-5}$ = The CO₂ limit for Load Bin 5 in terms of pounds of CO₂ per MWh (net)
 $\sum OPHL2_{total}$ = Total Level 2 operating hours excluding hours operating in Load Bin 0 (LB-0)
 1.10 = Ten (10) percent increase of the Level 1 Limits in Condition 4.1.1.a.

Equation 3:

$$CO_2 \text{ Weighted Avg} = \frac{(Level\ 1\ CO_2\ weighted\ avg \times \sum OPHL1_{total}) + (Level\ 2\ CO_2\ weighted\ avg \times \sum OPHL2_{total})}{\sum OPHL1_{total} + \sum OPHL2_{total}}$$

Where:

CO₂ weighted Avg =

CO₂ Weighted Average Limit for the compliance period in terms of pounds of CO₂ per MWh (net).

$\sum OPHL1_{total}$ = Total Level 1 operating hours excluding hours operating in Load Bin 0 (LB-0)

$\sum OPHL2_{total}$ = Total Level 2 operating hours excluding hours operating in Load Bin 0 (LB-0)

For times when a CAF is applied after the beginning of a compliance period, the permittee shall determine the Level 1 *CO₂ weighted avg* and Level 2 *CO₂ weighted avg* for the before the CAF and after the CAF using Equations 1 and 2 and the appropriate CO₂ limits for each of the load bins. The permittee shall use the following equation to determine the *CO₂ weighted avg* in lieu of Equation 3.

Equation 4:

CO₂ Weighted Avg =

$$\frac{(Level\ 1\ CO_2_{WBCAF} \times \sum OPHL1_{BCAF}) + (Level\ 2\ CO_2_{WBCAF} \times \sum OPHL2_{BCAF}) + (Level\ 1\ CO_2_{WACAF} \times \sum OPHL1_{ACAF}) + (Level\ 2\ CO_2_{WACAF} \times \sum OPHL2_{ACAF})}{\sum OPHL1_{BCAF} + \sum OPHL2_{BCAF} + \sum OPHL1_{ACAF} + \sum OPHL2_{ACAF}}$$

Where:

CO₂ Weighted Avg = the weighted average of the CO₂ Limits adjusted for the compliance period when a CAF is applicable, in terms of lb of CO₂ per MWh of net generation.

Level 1 CO₂_{WBCAF} = Level 1 CO₂ weighted average limit calculated using Equation 1 of the time period before the CAF was taken into effect.

$\sum OPHL1_{BCAF}$ = The sum of the operating hours of the unit in Level 1 before the CAF was taken into effect.

Level 2 CO₂_{WBCAF} = Level 2 CO₂ weighted average limit calculated using Equation 2 of the time period before the CAF was taken into effect.

$\sum OPHL2_{BCAF}$ = The sum of the operating hours of the unit in Level 2 before the CAF was taken into effect.

Level 1 CO₂_{WACAF} = Level 1 CO₂ weighted average limit calculated using Equation 1 of the time period after the CAF was taken into effect.

$\sum OPHL1_{ACAF}$ = The sum of the operating hours of the unit in Level 1 after the CAF was taken into effect.

Level 2 $CO2_{WACAF}$ = Level 1 CO_2 weighted average limit calculated using Equation 2 of the time period after the CAF was taken into effect.

$\sum OPHL2_{ACAF}$ = The sum of the operating hours of the unit in Level 2 after the CAF was taken into effect.

An example of the weighted average limit for load bins LB-1 through LB-5 is provided below based on the information used to develop the emissions inventory table in section 4.2 of the State Plan from the 2019 calendar year operating hours.

In 2019, the time LVP spent in each of the load bins LB-1 through LB-5 is listed below:

- LB-0 104 hours
- LB-1 18 hours
- LB-2 27 hours
- LB-3 242 hours
- LB-4 298.1 hours
- LB-5 7,067.8 hours

Using Equation 1, the load bin standards, and the hours of operation presented above, the calculation is:

$$\text{Level 1 } CO_2 \text{ weighted Avg} = \frac{\sum OPHL1_{LB-1} \times CO2_{LB-1} + \sum OPHL1_{LB-2} \times CO2_{LB-2} + \sum OPHL1_{LB-3} \times CO2_{LB-3} + \sum OPHL1_{LB-4} \times CO2_{LB-4} + \sum OPHL1_{LB-5} \times CO2_{LB-5}}{\sum OPHL1_{total}}$$

Where:

Level 1 CO_2 weighted Avg =

Level 1 CO_2 Weighted Average Limit for the compliance period in terms of pounds of CO_2 per MWh (net).

$$\begin{aligned} \text{Level 1 } CO_2 \text{ weighted Avg (2019)} = & ((18 \text{ hours} \times 2,230 \text{ lbs } CO_2/MWhN) + \\ & (27 \text{ hours} \times 2,108 \text{ lbs } CO_2/MWhN) + \\ & (242 \text{ hours} \times 2,050 \text{ lbs } CO_2/MWhN) + \\ & (298.1 \text{ hours} \times 2,002 \text{ lbs } CO_2/MWhN) + \\ & (7,067.8 \text{ hours} \times 1,958 \text{ lbs } CO_2/MWhN)) \\ & \div (18 + 27 + 242 + 298 + 7,068 \text{ hours}) \end{aligned}$$

Level 1 CO₂ weighted Avg (2019) = (40,140 + 56,916 + 496,100 + 596,796 + 13,838,752) ÷ 7,653

Level 1 CO₂ weighted Avg (2019) = 1,964 lbs CO₂/MWhN

H. R CODE USED FOR INITIAL DATA ANALYSIS AND R CODE OUTPUTS

Background of R Programming Language

R is a programming language and free software environment for statistical computing and graphics supported by the R Foundation for Statistical Computing. The R language is widely used among statisticians for developing statistical software and data analysis. Studies of scholarly literature databases show substantial increases in R popularity; as of September 2020, R ranks 9th in the TIOBE index, a measure of popularity of programming languages.

A GNU package, the official R software environment is written primarily in C, Fortran, and R itself (thus, it is partially self-hosting) and is freely available under the GNU General Public License. Pre-compiled executables are provided for various operating systems. Although R has a command line interface, there are several third-party graphical user interfaces, such as RStudio (<https://rstudio.com/>).

Description of Data Analysis Using R

Longview Power provided the WV DEP DAQ with an Excel file containing CO₂ emissions data collected from a 40 C.F.R. Part 75 certified continuously emission monitoring system (CEMS). This data was analyzed to determine CO₂ emissions as a function of power output from the facility (lb CO₂/MWh).

To aid in this process, an R script was written to analyze emissions data. This script took data provided in Excel file provided by Longview Power and calculated 12 and 18-month rolling averages CO₂ emissions values for each load bin. The R script summarized these calculations in several Comma Separated Values (CSV) files: one file for each load bin and a summary file.

R Script

```
library(data.table)
```

```
library(zoo)
```

```
# specify the working directory - you must manually change backslashes to forward slashes!
```

```
# setting the working directory allows you to reference files by name rather than the file path
```

```
# if you intend to use files from multiple folders you may not want to set the working directory  
setwd("C:/Users/E007604/Desktop/R projects/DAQ R project")
```

```
# specify csv
```

```
rd <- read.csv("RawData_2016-2020.csv", header = TRUE, na.strings = c("NA"))
```

```
# if you did not specify the working directory, comment out the read.csv line above (using #) and  
uncomment the read.csv line below
```

```
# remember to manually change backslashes (\) to forward slashes (/) as R doesn't like  
backslashes in directory addresses
```

```
# rd <- read.csv("C:/Users/E007604/Desktop/R projects/DAQ R project/RawData_2016-  
2020.csv", header = TRUE, na.strings = c("NA"))
```

```
# creates column for just the date
```

```
rd[,"Date"] <- as.POSIXct(substr(rd$Date.Hour, 1,10), format = "%m/%d/%Y")
```

```
# view the structure of the file and identify any columns which may need reformatted
```

```
str(rd)
```

```

# formats numeric columns as numeric while suppressing warnings
rd$BOILER01.CO2 <- suppressWarnings(as.numeric(rd$BOILER01.CO2))
rd$BOILER01.CO2T.HR <- suppressWarnings(as.numeric(rd$BOILER01.CO2T.HR))
rd$BOILER01.FLOWSCFH <- suppressWarnings(as.numeric(rd$BOILER01.FLOWSCFH))
rd$BOILER01.LOAD_MW <- suppressWarnings(as.numeric(rd$BOILER01.LOAD_MW))
rd$BOILER01.UNITOPHR <- suppressWarnings(as.numeric(rd$BOILER01.UNITOPHR))
rd$lbs.CO2.hr <- suppressWarnings(as.numeric(rd$lbs.CO2.hr))
rd$lbs.CO2.MWh.Net <- suppressWarnings(as.numeric(rd$lbs.CO2.MWh.Net))
rd$lbs.CO2.MWh.Gross <- suppressWarnings(as.numeric(rd$lbs.CO2.MWh.Gross))

# View the structure of the file to see changes
str(rd)

# reassigns empty values (NA) to 0
rd$BOILER01.CO2[is.na(rd$BOILER01.CO2)] <- 0
rd$BOILER01.CO2T.HR[is.na(rd$BOILER01.CO2T.HR)] <- 0
rd$BOILER01.FLOWSCFH[is.na(rd$BOILER01.FLOWSCFH)] <- 0
rd$BOILER01.LOAD_MW[is.na(rd$BOILER01.LOAD_MW)] <- 0
rd$BOILER01.UNITOPHR[is.na(rd$BOILER01.UNITOPHR)] <- 0
rd$lbs.CO2.hr[is.na(rd$lbs.CO2.hr)] <- 0
rd$lbs.CO2.MWh.Net[is.na(rd$lbs.CO2.MWh.Net)] <- 0
rd$lbs.CO2.MWh.Gross[is.na(rd$lbs.CO2.MWh.Gross)] <- 0

# define LoadBin based on MW generated
rd[,"LoadBin"] <- ifelse(rd$BOILER01.LOAD_MW < 313, "LB-0",
ifelse(rd$BOILER01.LOAD_MW < 407, "LB-1", ifelse(rd$BOILER01.LOAD_MW <501, "LB-
2", ifelse(rd$BOILER01.LOAD_MW <595, "LB-3", ifelse(rd$BOILER01.LOAD_MW <689,
"LB-4",ifelse(rd$BOILER01.LOAD_MW >=689, "LB-5", "error")))))))

```

```

# displays unique LoadBin values
# used as a manual/visual check to make sure values are as expected
unique(rd$LoadBin)

# creates a new table with only the necessary info
rdsusb <- rd[c(1:nrow(rd)), c(10, 11, 3, 5)]

# renames columns
names(rdsusb)[names(rdsusb) == "BOILER01.CO2T.HR"] <- "CO2T"
names(rdsusb)[names(rdsusb) == "BOILER01.LOAD_MW"] <- "MWg"

# view subset data
View(rdsusb)

# reformats date
setDT(rdsusb)[,Date := as.POSIXct(substr(Date, 1,10), format = "%Y-%m-%d")]

# collapses hourly data into daily sum by load-bin
CO2T_Daily <- rdsusb[, .(CO2T = sum(CO2T)), by = list(Date, LoadBin)]
MWg_Daily <- rdsusb[, .(MWg = sum(MWg)), by = list(Date, LoadBin)]

# merges daily sums
Daily_Merge <- merge(CO2T_Daily, MWg_Daily, by.CO2T_Daily = list(Date, LoadBin), sort
= TRUE)

# extracts month-year
rdsusb$Month_Yr <- format(as.Date(rdsusb$Date), "%Y-%m")

```

```

# collapses daily data into monthly sum by load-bin
CO2T_Monthly <- rsub[, .(CO2T = sum(CO2T)), by = list(Month_Yr, LoadBin)]
MWg_Monthly <- rsub[, .(MWg = sum(MWg)), by = list(Month_Yr, LoadBin)]

# merges monthly sums
Monthly_Merge <- merge(CO2T_Monthly, MWg_Monthly, by.CO2T_Monthly =
list(Month_Yr, LoadBin), sort = TRUE)

# creates subsets for each Load-Bin
LB0sub <- Monthly_Merge[Monthly_Merge$LoadBin == "LB-0",]
LB1sub <- Monthly_Merge[Monthly_Merge$LoadBin == "LB-1",]
LB2sub <- Monthly_Merge[Monthly_Merge$LoadBin == "LB-2",]
LB3sub <- Monthly_Merge[Monthly_Merge$LoadBin == "LB-3",]
LB4sub <- Monthly_Merge[Monthly_Merge$LoadBin == "LB-4",]
LB5sub <- Monthly_Merge[Monthly_Merge$LoadBin == "LB-5",]

# calculates rolling 12- and 18- month average for CO2T and MWg
LB0sub[, "roll12CO2"] <- rollmeanr(x = LB0sub$CO2T, k = 12, fill = NA)
LB0sub[, "roll12MWg"] <- rollmeanr(x = LB0sub$MWg, k = 12, fill = NA)
LB0sub[, "roll18CO2"] <- rollmeanr(x = LB0sub$CO2T, k = 18, fill = NA)
LB0sub[, "roll18MWg"] <- rollmeanr(x = LB0sub$MWg, k = 18, fill = NA)
LB1sub[, "roll12CO2"] <- rollmeanr(x = LB1sub$CO2T, k = 12, fill = NA)
LB1sub[, "roll12MWg"] <- rollmeanr(x = LB1sub$MWg, k = 12, fill = NA)
LB1sub[, "roll18CO2"] <- rollmeanr(x = LB1sub$CO2T, k = 18, fill = NA)
LB1sub[, "roll18MWg"] <- rollmeanr(x = LB1sub$MWg, k = 18, fill = NA)
LB2sub[, "roll12CO2"] <- rollmeanr(x = LB2sub$CO2T, k = 12, fill = NA)
LB2sub[, "roll12MWg"] <- rollmeanr(x = LB2sub$MWg, k = 12, fill = NA)
LB2sub[, "roll18CO2"] <- rollmeanr(x = LB2sub$CO2T, k = 18, fill = NA)
LB2sub[, "roll18MWg"] <- rollmeanr(x = LB2sub$MWg, k = 18, fill = NA)

```



```
LB3sub[, "roll12CO2"] <- rollmeanr(x = LB3sub$CO2T, k = 12, fill = NA)
LB3sub[, "roll12MWg"] <- rollmeanr(x = LB3sub$MWg, k = 12, fill = NA)
LB3sub[, "roll18CO2"] <- rollmeanr(x = LB3sub$CO2T, k = 18, fill = NA)
LB3sub[, "roll18MWg"] <- rollmeanr(x = LB3sub$MWg, k = 18, fill = NA)
LB4sub[, "roll12CO2"] <- rollmeanr(x = LB4sub$CO2T, k = 12, fill = NA)
LB4sub[, "roll12MWg"] <- rollmeanr(x = LB4sub$MWg, k = 12, fill = NA)
LB4sub[, "roll18CO2"] <- rollmeanr(x = LB4sub$CO2T, k = 18, fill = NA)
LB4sub[, "roll18MWg"] <- rollmeanr(x = LB4sub$MWg, k = 18, fill = NA)
LB5sub[, "roll12CO2"] <- rollmeanr(x = LB5sub$CO2T, k = 12, fill = NA)
LB5sub[, "roll12MWg"] <- rollmeanr(x = LB5sub$MWg, k = 12, fill = NA)
LB5sub[, "roll18CO2"] <- rollmeanr(x = LB5sub$CO2T, k = 18, fill = NA)
LB5sub[, "roll18MWg"] <- rollmeanr(x = LB5sub$MWg, k = 18, fill = NA)
```

```
# views the data subsets
```

```
View(LB0sub)
```

```
View(LB1sub)
```

```
View(LB2sub)
```

```
View(LB3sub)
```

```
View(LB4sub)
```

```
View(LB5sub)
```

```
# combines individual LoadBin subsets into one dataset called RollingSummary
```

```
RollingSummary <- rbind(LB0sub, LB1sub, LB2sub, LB3sub, LB4sub, LB5sub)
```

```
# views the dataset
```

```
View(RollingSummary)
```

```
# saves the data subsets as csv
```

if a working directory has not been defined the file path will need to be included

```
write.csv(LB0sub, "LB0sub.csv")
```

```
write.csv(LB1sub, "LB1sub.csv")
```

```
write.csv(LB2sub, "LB2sub.csv")
```

```
write.csv(LB3sub, "LB3sub.csv")
```

```
write.csv(LB4sub, "LB4sub.csv")
```

```
write.csv(LB5sub, "LB5sub.csv")
```

```
write.csv(RollingSummary, "RollingSummary.csv")
```

if you did not specify the working directory, comment out the write.csv lines above (using #) and uncomment the write.csv lines below

remember to manually change backslashes (\) to forward slashes (/) as R doesn't like backslashes in directory addresses

```
#write.csv(LB0sub, "C:/Users/E007604/Desktop/R projects/DAQ R project/LB0sub.csv")
```

```
#write.csv(LB1sub, "C:/Users/E007604/Desktop/R projects/DAQ R project/LB1sub.csv")
```

```
#write.csv(LB2sub, "C:/Users/E007604/Desktop/R projects/DAQ R project/LB2sub.csv")
```

```
#write.csv(LB3sub, "C:/Users/E007604/Desktop/R projects/DAQ R project/LB3sub.csv")
```

```
#write.csv(LB4sub, "C:/Users/E007604/Desktop/R projects/DAQ R project/LB4sub.csv")
```

```
#write.csv(LB5sub, "C:/Users/E007604/Desktop/R projects/DAQ R project/LB5sub.csv")
```

```
#write.csv(RollingSummary, "C:/Users/E007604/Desktop/R projects/DAQ R project/RollingSummary.csv")
```

Outputs Generated by Using R Script

The following tables show the output generated by the R script.

Note: the tables were reformatted for readability, but the data itself is the R script output.

Table 2: Output Generated for Load Bin 0 (R Script Output File Name: LB0sub.csv)

Month_Yr	LoadBin	CO2T	MWg	CO2_MW	roll12CO2	roll12MWg	roll12CO2_MW	roll18CO2	roll18MWg	roll18CO2_MW
2016-02	LB-0	2478.8	902	5496.231	NA	NA	NA	NA	NA	NA
2016-04	LB-0	3457.5	1274	5427.786	NA	NA	NA	NA	NA	NA
2016-06	LB-0	294.1	239	2461.088	NA	NA	NA	NA	NA	NA
2016-07	LB-0	3357.1	923	7274.323	NA	NA	NA	NA	NA	NA
2016-10	LB-0	2884.6	461	12514.53	NA	NA	NA	NA	NA	NA
2017-02	LB-0	1922.6	432	8900.926	NA	NA	NA	NA	NA	NA
2017-03	LB-0	5445.7	2149	5068.125	NA	NA	NA	NA	NA	NA
2017-04	LB-0	4717.8	1360	6937.941	NA	NA	NA	NA	NA	NA
2017-05	LB-0	2436	518	9405.405	NA	NA	NA	NA	NA	NA
2017-06	LB-0	2897.5	1700	3408.824	NA	NA	NA	NA	NA	NA
2017-08	LB-0	847.3	450	3765.778	NA	NA	NA	NA	NA	NA
2017-10	LB-0	2803.1	1234	4543.112	2795.175	970.1667	6267.006	NA	NA	NA
2018-03	LB-0	3659.8	538	13605.2	2893.592	939.8333	6942.754	NA	NA	NA
2018-04	LB-0	1956.8	1177	3325.064	2768.533	931.75	6767.527	NA	NA	NA
2018-09	LB-0	1150	67	34328.36	2839.858	917.4167	9423.133	NA	NA	NA
2018-10	LB-0	2808.6	1134	4953.439	2794.15	935	9229.726	NA	NA	NA
2018-11	LB-0	259.6	145	3580.69	2575.4	908.6667	8485.239	NA	NA	NA
2018-12	LB-0	994.4	343	5798.251	2498.05	901.25	8226.683	2465.072	835.8889	7821.949
2019-01	LB-0	1846.7	920	4014.565	2198.133	798.8333	8138.886	2429.956	836.8889	7739.634
2019-03	LB-0	1660.7	749	4434.446	1943.375	747.9167	7930.261	2330.133	807.7222	7684.448

Month_Yr	LoadBin	CO2T	MWg	CO2_MW	roll12CO2	roll12MWg	roll12CO2_MW	roll18CO2	roll18MWg	roll18CO2_MW
2019-05	LB-0	201.4	103	3910.68	1757.158	713.3333	7472.367	2324.983	800.1667	7764.981
2019-06	LB-0	4264.8	1064	8016.541	1871.1	660.3333	7856.344	2375.411	808	7806.216
2019-08	LB-0	865	400	4325	1872.575	656.1667	7902.946	2263.211	804.6111	7351.242
2019-09	LB-0	3392.1	753	9009.562	1921.658	616.0833	8275.15	2344.85	822.4444	7357.277
2019-11	LB-0	630	217	5806.452	1669.175	589.3333	7625.254	2077.311	715.1111	7398.295
2020-04	LB-0	549.5	286	3842.657	1551.9	515.0833	7668.387	1845.739	655.4444	7226.335
2020-05	LB-0	1370.5	593	4622.26	1570.275	558.9167	5192.879	1786.544	659.6111	6960.605
2020-06	LB-0	1815.1	652	5567.791	1487.483	518.75	5244.075	1726.411	601.3889	7080.547

Table 3: Output Generated for Load Bin 1 (R Script Output File Name: LB1sub.csv)

Month_Yr	LoadBin	CO2T	MWg	CO2_MW	roll12CO2	roll12MWg	roll12CO2_MW	roll18CO2	roll18MWg	roll18CO2_MW
2016-02	LB-1	12109.9	11683	2303.423	NA	NA	NA	NA	NA	NA
2016-04	LB-1	2602.4	2523	2292.157	NA	NA	NA	NA	NA	NA
2016-05	LB-1	1184.4	1156	2276.817	NA	NA	NA	NA	NA	NA
2016-06	LB-1	336.1	360	2074.691	NA	NA	NA	NA	NA	NA
2016-07	LB-1	364.2	376	2152.482	NA	NA	NA	NA	NA	NA
2016-09	LB-1	41664.5	43487	2129.091	NA	NA	NA	NA	NA	NA
2016-10	LB-1	45159.6	46685	2149.613	NA	NA	NA	NA	NA	NA
2017-02	LB-1	857.9	677	2816.018	NA	NA	NA	NA	NA	NA
2017-03	LB-1	1547.4	1688	2037.125	NA	NA	NA	NA	NA	NA
2017-04	LB-1	654.5	740	1965.465	NA	NA	NA	NA	NA	NA

Month_Yr	LoadBin	CO2T	MWg	CO2_MW	roll12CO2	roll12MWg	roll12CO2_MW	roll18CO2	roll18MWg	roll18CO2_MW
2017-05	LB-1	1003.6	1032	2161.068	NA	NA	NA	NA	NA	NA
2017-06	LB-1	702.2	695	2245.244	9015.558	9258.5	2216.933	NA	NA	NA
2017-10	LB-1	1706.4	1871	2026.724	8148.6	8440.833	2193.875	NA	NA	NA
2017-12	LB-1	5238.3	5180	2247.233	8368.258	8662.25	2190.131	NA	NA	NA
2018-01	LB-1	378.2	369	2277.627	8301.075	8596.667	2190.198	NA	NA	NA
2018-03	LB-1	656.3	649	2247.218	8327.758	8620.75	2204.576	NA	NA	NA
2018-04	LB-1	1065.2	1076	2199.917	8386.175	8679.083	2208.529	NA	NA	NA
2018-06	LB-1	13507	13379	2243.483	6039.717	6170.083	2218.061	7263.228	7423.667	2213.633
2018-07	LB-1	1491.7	1459	2272.028	2400.725	2401.25	2228.263	6673.328	6855.667	2211.889
2018-09	LB-1	1708.6	1814	2093.103	2471.617	2496	2168.02	6623.672	6816.278	2200.83
2018-10	LB-1	365.5	380	2137.427	2373.125	2387	2176.378	6578.178	6773.167	2193.087
2018-12	LB-1	335.5	341	2186.38	2346.542	2353.75	2194.788	6578.144	6772.111	2199.291
2019-01	LB-1	1028.8	1105	2068.979	2348.642	2359.833	2187.114	6615.067	6812.611	2194.652
2019-03	LB-1	754.8	788	2128.596	2353.025	2367.583	2177.393	4342.306	4440.444	2194.625
2019-05	LB-1	1941.7	2124	2031.492	2372.633	2388.667	2177.79	1941.311	1964.833	2188.063
2019-06	LB-1	339.6	318	2373.166	1964.408	1983.5	2188.285	1912.517	1944.889	2163.46
2019-08	LB-1	371.8	375	2203.259	1963.875	1984	2182.087	1847.206	1871.944	2172.689
2019-09	LB-1	1021.5	1084	2094.096	1994.308	2020.25	2169.327	1867.594	1891.056	2179.836
2019-11	LB-1	732.7	766	2125.616	1966.6	1994.417	2163.135	1852.544	1876.278	2177.866
2020-03	LB-1	9316.7	9711	2131.992	1617.408	1688.75	2153.845	2331.128	2377.167	2171.574
2020-04	LB-1	1852.3	1950	2110.883	1647.458	1729.667	2140.416	2339.233	2381.556	2176.25

Month_Yr	LoadBin	CO2T	MWg	CO2_MW	roll12CO2	roll12MWg	roll12CO2_MW	roll18CO2	roll18MWg	roll18CO2_MW
2020-05	LB-1	4338.9	4345	2219.102	1866.65	1940.583	2150.916	2289.267	2335.167	2174.687
2020-06	LB-1	649.9	707	2042.747	1890.35	1967.833	2143.026	2304.361	2353.944	2161.638

Table 4: Output Generated for Load Bin 2 (R Script Output File Name: LB2sub.csv)

Month_Yr	LoadBin	CO2T	MWg	CO2_MW	roll12CO2	roll12MWg	roll12CO2_MW	roll18CO2	roll18MWg	roll18CO2_MW
2016-02	LB-2	3026.3	3255	2066.086	NA	NA	NA	NA	NA	NA
2016-04	LB-2	1731.9	1758	2189.23	NA	NA	NA	NA	NA	NA
2016-05	LB-2	455	480	2106.481	NA	NA	NA	NA	NA	NA
2016-06	LB-2	429.2	487	1958.476	NA	NA	NA	NA	NA	NA
2016-07	LB-2	1733.7	1833	2101.837	NA	NA	NA	NA	NA	NA
2016-09	LB-2	399.7	455	1952.137	NA	NA	NA	NA	NA	NA
2016-10	LB-2	1732.9	1809	2128.739	NA	NA	NA	NA	NA	NA
2016-12	LB-2	1303.3	1341	2159.748	NA	NA	NA	NA	NA	NA
2017-04	LB-2	6486.7	7281	1979.795	NA	NA	NA	NA	NA	NA
2017-05	LB-2	875.2	954	2038.668	NA	NA	NA	NA	NA	NA
2017-06	LB-2	1742.3	1838	2106.517	NA	NA	NA	NA	NA	NA
2017-08	LB-2	416.7	433	2138.568	1694.408	1827	2077.19	NA	NA	NA
2017-10	LB-2	2992.7	3232	2057.687	1691.608	1825.083	2076.49	NA	NA	NA
2017-11	LB-2	385.1	419	2042.429	1579.375	1713.5	2064.257	NA	NA	NA
2017-12	LB-2	475.8	482	2193.638	1581.108	1713.667	2071.52	NA	NA	NA
2018-01	LB-2	921.1	986	2075.952	1622.1	1755.25	2081.31	NA	NA	NA

Month_Yr	LoadBin	CO2T	MWg	CO2_MW	roll12CO2	roll12MWg	roll12CO2_MW	roll18CO2	roll18MWg	roll18CO2_MW
2018-03	LB-2	1267.1	1339	2102.896	1583.217	1714.083	2081.398	NA	NA	NA
2018-04	LB-2	863.9	900	2133.086	1621.9	1751.167	2096.477	1513.256	1626.778	2085.109
2018-05	LB-2	3036.9	3217	2097.814	1730.567	1868.5	2093.9	1513.844	1624.667	2086.872
2018-06	LB-2	2922	3400	1909.804	1865.458	2040.083	2073.071	1579.961	1715.889	2071.348
2018-07	LB-2	865.2	906	2122.149	1397	1508.833	2084.934	1602.75	1739.556	2072.219
2018-09	LB-2	2121.5	2304	2046.2	1500.858	1621.333	2085.562	1696.767	1840.5	2077.092
2018-10	LB-2	1128.2	1330	1885.046	1449.683	1579	2067.106	1663.128	1812.556	2065.048
2018-11	LB-2	400.7	457	1948.456	1448.35	1581	2051.263	1663.183	1812.667	2064.844
2018-12	LB-2	424.9	462	2043.771	1234.367	1350.167	2050.103	1590.517	1737.833	2060.124
2019-01	LB-2	3828.6	4065	2092.989	1521.325	1654	2054.317	1730.811	1889.167	2056.415
2019-03	LB-2	2793.4	3019	2056.163	1714.458	1865.417	2042.86	1525.628	1652.389	2060.657
2019-05	LB-2	435.1	497	1945.45	1673.958	1824.667	2031.985	1501.178	1627	2055.479
2019-06	LB-2	1272.8	1393	2030.47	1674.433	1829.167	2025.95	1475.094	1602.278	2051.254
2019-08	LB-2	362	416	1933.761	1632.608	1788.833	2009.339	1472.056	1601.333	2039.876
2019-09	LB-2	405.9	439	2054.67	1413.358	1557.333	2005.744	1328.344	1446.167	2039.708
2019-11	LB-2	1677.6	1806	2064.23	1309.658	1424.5	2018.613	1400.15	1523.222	2040.919
2020-03	LB-2	4148.9	4424	2084.037	1583.3	1717.667	2015.437	1604.211	1742.222	2034.83
2020-04	LB-2	5178.8	5587	2059.861	1838.075	1991.25	2016.575	1840.75	1997.833	2033.936
2020-05	LB-2	93044.4	99608	2075.79	9497.758	10181.08	2032.471	6939.489	7457.222	2032.43
2020-06	LB-2	79422.4	87733	2011.72	16082.9	17454.08	2037.743	11303.85	12281.28	2025.688

Table 5: Output Generated for Load Bin 3 (R Script Output File Name: LB3sub.csv)

Month_Yr	LoadBin	CO2T	MWg	CO2_MW	roll12CO2	roll12MWg	roll12CO2_MW	roll18CO2	roll18MWg	roll18CO2_MW
2016-02	LB-3	2576.6	2767	2069.309	NA	NA	NA	NA	NA	NA
2016-03	LB-3	84130.1	94080	1987.2	NA	NA	NA	NA	NA	NA
2016-04	LB-3	28645.4	30209	2107.201	NA	NA	NA	NA	NA	NA
2016-05	LB-3	58247.5	61791	2094.785	NA	NA	NA	NA	NA	NA
2016-06	LB-3	40136.1	43359	2057.043	NA	NA	NA	NA	NA	NA
2016-07	LB-3	4464.7	4933	2011.262	NA	NA	NA	NA	NA	NA
2016-08	LB-3	9202.6	10264	1992.422	NA	NA	NA	NA	NA	NA
2016-09	LB-3	960.2	1091	1955.8	NA	NA	NA	NA	NA	NA
2016-10	LB-3	1542	1691	2026.414	NA	NA	NA	NA	NA	NA
2017-02	LB-3	947.2	1031	2041.599	NA	NA	NA	NA	NA	NA
2017-04	LB-3	1387.1	1625	1896.889	NA	NA	NA	NA	NA	NA
2017-05	LB-3	1545.2	1699	2021.058	19482.06	21211.67	2021.749	NA	NA	NA
2017-06	LB-3	11569.3	12593	2041.575	20231.45	22030.5	2019.438	NA	NA	NA
2017-07	LB-3	8173.1	8821	2059.001	13901.7	14925.58	2025.421	NA	NA	NA
2017-08	LB-3	9282.9	10141	2034.185	12288.16	13253.25	2019.336	NA	NA	NA
2017-09	LB-3	21418	23753	2003.77	9219.033	10083.42	2011.752	NA	NA	NA
2017-10	LB-3	5029.4	5458	2047.718	6293.475	6925	2010.974	NA	NA	NA
2017-11	LB-3	2001.3	2144	2074.316	6088.192	6692.583	2016.229	16181.04	17636.11	2028.975
2017-12	LB-3	2039.6	2194	2065.836	5491.275	6020.083	2022.347	16151.21	17604.28	2028.782
2018-01	LB-3	1578.3	1698	2065.567	5542.783	6070.667	2031.494	11564.99	12471.94	2033.136

Month_Yr	LoadBin	CO2T	MWg	CO2_MW	roll12CO2	roll12MWg	roll12CO2_MW	roll18CO2	roll18MWg	roll18CO2_MW
2018-03	LB-3	524.6	574	2030.972	5458	5977.583	2031.874	10002.73	10825.56	2028.901
2018-04	LB-3	501.5	549	2029.953	5420.858	5937.417	2030.903	6794.617	7423.222	2025.299
2018-05	LB-3	7519.6	8426	1983.174	5931.9	6504.167	2038.094	4982.589	5482.5	2021.195
2018-06	LB-3	9914.5	11553	1907.056	6629.342	7325.333	2028.594	5285.356	5850.278	2015.406
2018-07	LB-3	1632.9	1763	2058.234	5801.308	6422.833	2029.982	4864.817	5378	2019.062
2018-09	LB-3	1391	1545	2000.719	5236.133	5816.5	2025.125	4888.75	5403.222	2021.558
2018-10	LB-3	869.8	1143	1691.066	4535.042	5066.667	1996.532	4851.406	5372.778	2002.927
2018-12	LB-3	2495.1	2797	1982.362	2958.133	3320.333	1994.748	4937.4	5470.889	1999.636
2019-01	LB-3	6819.9	7983	1898.451	3107.342	3530.75	1982.309	5239.222	5824.111	1999.723
2019-03	LB-3	2397.9	2666	1998.75	3140.392	3574.25	1976.012	5286.594	5877.833	1998.484
2019-04	LB-3	2149	2352	2030.423	3149.508	3587.417	1973.061	4763.244	5308.889	1997.864
2019-05	LB-3	518.4	585	1969.231	3061.183	3494.667	1965.033	4337.983	4851.333	1992.877
2019-06	LB-3	54796.9	61238	1988.486	7583.875	8550	1961.492	6866.539	7690.056	1990.338
2019-07	LB-3	9534	10882	1946.946	8336.583	9411.083	1954.575	6206.317	6975	1987.181
2019-08	LB-3	18171.1	20062	2012.772	9224.208	10380.75	1957.041	6936.411	7786.333	1985.24
2019-09	LB-3	8259.6	9388	1955.12	9086.3	10200.33	1961.047	7284.094	8188.778	1978.618
2019-10	LB-3	11247	12532	1994.361	9887.475	11097.75	1955.724	7795.617	8763.111	1974.647
2019-11	LB-3	3441.2	3743	2043.043	10058.33	11280.92	1959.251	7899.111	8876.722	1973.396
2019-12	LB-3	2081.1	2319	1994.25	10159.27	11378.92	1984.516	7985.583	8973.667	1971.355
2020-01	LB-3	4658.3	5088	2034.548	10339.53	11569.83	1988.865	8216.517	9225.833	1971.611
2020-02	LB-3	3093.8	3437	2000.323	10029.03	11191	1997.354	7970.639	8948.667	1972.563

Month_Yr	LoadBin	CO2T	MWg	CO2_MW	roll12CO2	roll12MWg	roll12CO2_MW	roll18CO2	roll18MWg	roll18CO2_MW
2020-03	LB-3	72450.7	79483	2025.61	15866.76	17592.42	1999.593	11444.87	12722.56	1979.15
2020-04	LB-3	2510.2	2803	1990.09	15896.86	17630	1996.232	11493.61	12780.33	1975.364
2020-05	LB-3	44291	48838	2015.325	19544.58	21651.08	2000.073	13876.94	15407.72	1976.175
2020-06	LB-3	36375.1	40768	1982.77	18009.43	19945.25	1999.596	15849.46	17609.11	1992.381

Table 6: Output Generated for Load Bin 4 (R Script Output File Name: LB4sub.csv)

Month_Yr	LoadBin	CO2T	MWg	CO2_MW	roll12CO2	roll12MWg	roll12CO2_MW	roll18CO2	roll18MWg	roll18CO2_MW
2016-02	LB-4	2974.7	3230	2046.577	NA	NA	NA	NA	NA	NA
2016-03	LB-4	34258.9	38808	1961.732	NA	NA	NA	NA	NA	NA
2016-04	LB-4	35090.2	38328	2034.498	NA	NA	NA	NA	NA	NA
2016-05	LB-4	40767.8	44917	2016.945	NA	NA	NA	NA	NA	NA
2016-06	LB-4	15609.7	17373	1996.674	NA	NA	NA	NA	NA	NA
2016-07	LB-4	6965.1	7913	1956.022	NA	NA	NA	NA	NA	NA
2016-08	LB-4	6150.2	7075	1931.747	NA	NA	NA	NA	NA	NA
2016-09	LB-4	1087.3	1227	1969.211	NA	NA	NA	NA	NA	NA
2016-10	LB-4	4529.9	5101	1973.426	NA	NA	NA	NA	NA	NA
2016-12	LB-4	1186.3	1306	2018.547	NA	NA	NA	NA	NA	NA
2017-01	LB-4	1164.3	1329	1946.827	NA	NA	NA	NA	NA	NA
2017-02	LB-4	579.3	646	1992.776	12530.31	13937.75	1987.082	NA	NA	NA
2017-04	LB-4	547.6	654	1860.686	12328.05	13723.08	1971.591	NA	NA	NA
2017-05	LB-4	1195.5	1335	1990.012	9572.767	10600.33	1973.948	NA	NA	NA

Month_Yr	LoadBin	CO2T	MWg	CO2_MW	roll12CO2	roll12MWg	roll12CO2_MW	roll18CO2	roll18MWg	roll18CO2_MW
2017-06	LB-4	12297.3	13590	2010.841	7673.358	8538.833	1971.976	NA	NA	NA
2017-07	LB-4	7604.6	8390	2014.197	4909.758	5494.917	1971.747	NA	NA	NA
2017-08	LB-4	8722.8	9712	1995.881	4335.85	4856.5	1971.681	NA	NA	NA
2017-09	LB-4	18549.6	20926	1969.862	5301.225	5940.917	1972.835	11071.17	12325.56	1982.581
2017-10	LB-4	7530.3	8389	1994.755	5416.233	6050.417	1978.085	11324.26	12612.17	1979.702
2017-11	LB-4	3955.4	4430	1984.148	5655.242	6317.333	1979.33	9640.733	10702.28	1980.948
2017-12	LB-4	4696.3	5250	1987.852	5669.108	6329.75	1980.532	7952.183	8864.611	1978.356
2018-01	LB-4	2908.8	3199	2020.631	5812.65	6487.5	1980.706	5848.906	6546.944	1978.561
2018-02	LB-4	2251.8	2539	1970.855	5903.275	6588.333	1982.708	5106.8	5722.833	1977.127
2018-03	LB-4	3619.9	3920	2052.098	6156.658	6861.167	1987.652	4920.956	5501	1982.464
2018-04	LB-4	3461.6	3860	1992.861	6399.492	7128.333	1998.666	4771.589	5322.389	1985.859
2018-05	LB-4	15645.5	17689	1965.503	7603.658	8491.167	1996.624	5580.378	6236.944	1985.653
2018-06	LB-4	15457.6	17712	1939.376	7867.017	8834.667	1990.668	6187.472	6937.556	1983.762
2018-07	LB-4	2923	3224	2014.75	7476.883	8404.167	1990.714	6283.956	7044.111	1983.551
2018-09	LB-4	49562.7	57514	1915	10880.21	12387.67	1983.974	8972.756	10165.5	1981.783
2018-10	LB-4	1692.5	1956	1922.858	9475.45	10806.83	1980.057	9034.6	10238.28	1977.898
2018-11	LB-4	7473.3	8573	1937.167	9470.7	10822.17	1975.258	9419.361	10678.22	1982.147
2018-12	LB-4	1620.5	1856	1940.254	9276.125	10607.67	1971.6	9442.972	10707.17	1979.383
2019-01	LB-4	3252.7	3816	1894.188	9155.825	10488.17	1963.795	8940.494	10164.17	1972.902
2019-02	LB-4	1141.2	1328	1909.639	9008.525	10332.25	1954.546	8581.417	9771.833	1967.093
2019-03	LB-4	1640.5	1899	1919.724	8957.583	10278.92	1950.285	8187.956	9337.778	1962.862

Month_Yr	LoadBin	CO2T	MWg	CO2_MW	roll12CO2	roll12MWg	roll12CO2_MW	roll18CO2	roll18MWg	roll18CO2_MW
2019-04	LB-4	5605.1	6381	1952.01	9123.017	10484	1941.944	7468.817	8529.722	1961.871
2019-06	LB-4	36431.8	41791	1937.249	11870.53	13644.92	1937.31	9074.456	10385.39	1958.676
2019-07	LB-4	18566.5	21396	1928.346	12113.95	13953.83	1934.213	9886.183	11327.94	1955.576
2019-08	LB-4	43037.5	48578	1968.77	14412.28	16526	1936.663	12016.25	13735.06	1954.515
2019-09	LB-4	11290.5	12873	1949.041	15109.57	17330.08	1931.187	12481.9	14272.5	1950.538
2019-10	LB-4	29262.2	33287	1953.529	13417.86	15311.17	1934.398	13982.48	15980.72	1949.576
2019-11	LB-4	1802.2	1970	2032.939	13427	15312.33	1943.571	13881.49	15872.39	1948.511
2019-12	LB-4	17429.5	19518	1984.436	14256.68	16224.42	1947.51	14657.49	16742.28	1948.043
2020-01	LB-4	5910.2	6642	1977.383	14614.16	16623.25	1950.604	14116.64	16128.56	1948.703
2020-02	LB-4	34779	39049	1979.223	17241.35	19559.33	1957.691	15190.05	17313.94	1950.917
2020-03	LB-4	71086.4	80476	1962.943	23070.12	26155	1962.133	18976.91	21605.72	1948.039
2020-04	LB-4	2793.7	3195	1943.106	23166.22	26263	1964.081	16378.63	18588	1949.6
2020-05	LB-4	51877	58673	1964.826	27022.21	30620.67	1965.149	19166.66	21738.94	1951.932
2020-06	LB-4	28114.5	32584	1917.403	26329.1	29853.42	1963.495	20313.39	23072.89	1950.834

Table 7: Output Generated for Load Bin 5 (R Script Output File Name: LB5sub.csv)

Month_Yr	LoadBin	CO2T	MWg	CO2_MW	roll12CO2	roll12MWg	roll12CO2_MW	roll18CO2	roll18MWg	roll18CO2_MW
2016-01	LB-5	514791.1	579329	1974.664	NA	NA	NA	NA	NA	NA
2016-02	LB-5	408208.9	475279	1908.628	NA	NA	NA	NA	NA	NA
2016-03	LB-5	343771.5	392691	1945.389	NA	NA	NA	NA	NA	NA
2016-04	LB-5	145999.6	164763	1969.153	NA	NA	NA	NA	NA	NA

Month_Yr	LoadBin	CO2T	MWg	CO2_MW	roll12CO2	roll12MWg	roll12CO2_MW	roll18CO2	roll18MWg	roll18CO2_MW
2016-05	LB-5	376947.8	428527	1954.747	NA	NA	NA	NA	NA	NA
2016-06	LB-5	380150.9	435997	1937.582	NA	NA	NA	NA	NA	NA
2016-07	LB-5	359731.5	426873	1872.696	NA	NA	NA	NA	NA	NA
2016-08	LB-5	475750.2	555089	1904.6	NA	NA	NA	NA	NA	NA
2016-09	LB-5	399584.6	467213	1900.559	NA	NA	NA	NA	NA	NA
2016-10	LB-5	237499.1	270167	1953.517	NA	NA	NA	NA	NA	NA
2016-11	LB-5	492298.7	560281	1952.586	NA	NA	NA	NA	NA	NA
2016-12	LB-5	500329	575569	1931.727	386255.2	444314.8	1933.821	NA	NA	NA
2017-01	LB-5	498727.5	577903	1917.767	384916.6	444196	1929.079	NA	NA	NA
2017-02	LB-5	32249	36551	1960.67	353586.6	407635.3	1933.416	NA	NA	NA
2017-04	LB-5	396412	454535	1938.059	357973.3	412789	1932.805	NA	NA	NA
2017-05	LB-5	389320.6	443192	1952.104	378250.1	435991.4	1931.384	NA	NA	NA
2017-06	LB-5	361363.7	408442	1966.082	376951.4	434317.7	1932.329	NA	NA	NA
2017-07	LB-5	486363.3	555510	1945.613	385802.4	444277.1	1932.998	377749.9	433772.8	1938.119
2017-08	LB-5	461861.4	527958	1944.016	394313.3	452700.8	1938.942	374809.4	430918.9	1936.416
2017-09	LB-5	426870.1	499829	1897.85	390239.9	448095.8	1938.379	375846.1	432282.8	1935.818
2017-10	LB-5	369356	431189	1903.553	387720.9	445093.8	1938.629	377267.5	434421.6	1933.493
2017-11	LB-5	485523.8	552256	1953.699	408389.6	468601.3	1938.644	396130	455948.9	1932.635
2017-12	LB-5	492858.7	558947	1959.473	408436.3	468490.1	1939.218	402569.5	463194.5	1932.897
2018-01	LB-5	499492.5	572258	1939.655	408366.6	468214.2	1939.878	409199.5	470764.6	1933.013
2018-02	LB-5	455505.3	521427	1941.277	404764.7	463507.8	1941.837	414520.3	476017.6	1936.823

Month_Yr	LoadBin	CO2T	MWg	CO2_MW	roll12CO2	roll12MWg	roll12CO2_MW	roll18CO2	roll18MWg	roll18CO2_MW
2018-03	LB-5	356455.6	405216	1954.818	431781.9	494229.9	1941.35	407892.8	467691.3	1939.612
2018-04	LB-5	290866.1	335242	1928.067	422986.4	484288.8	1940.517	401852.9	460359.6	1941.141
2018-05	LB-5	465912.4	539448	1919.297	429369.1	492310.2	1937.783	414542.5	475319.6	1939.24
2018-06	LB-5	415151.5	490688	1880.133	433851.4	499164	1930.621	410256.6	471453.3	1935.214
2018-07	LB-5	482558.2	553746	1936.54	433534.3	499017	1929.865	409269.3	470240.9	1935.482
2018-08	LB-5	485086.4	562821	1915.298	435469.7	501922.3	1927.472	408511.5	469403.1	1935.345
2018-09	LB-5	88957.4	104674	1888.56	407310.3	468992.7	1926.698	411661.9	473187.7	1931.338
2018-10	LB-5	382765.1	446143	1906.539	408427.8	470238.8	1926.946	410903.8	472721.4	1929.587
2018-11	LB-5	452073.8	531894	1888.738	405640.3	468542	1921.533	414390.1	477649.3	1926.067
2018-12	LB-5	460063.6	545369	1874.627	402907.3	467410.5	1914.463	419873.4	485256.4	1920.986
2019-01	LB-5	390364.7	464151	1868.955	393813.3	458401.6	1908.571	414540.1	480180.9	1916.727
2019-02	LB-5	434360.4	521284	1851.669	392051.3	458389.7	1901.103	413012.3	479810.1	1911.597
2019-03	LB-5	436653.3	515014	1884.105	398734.4	467539.5	1895.211	413555.8	480653.7	1910.834
2019-04	LB-5	468035.4	549079	1894.224	413498.5	485359.3	1892.39	419038	487203.2	1910.315
2019-05	LB-5	53965	63773	1880.454	379169.6	445719.7	1889.154	395062.5	460065.2	1906.246
2019-06	LB-5	275669.5	325549	1881.741	367546.1	431958.1	1889.288	382996.5	447098.7	1901.928
2019-07	LB-5	455566.9	537491	1883.512	365296.8	430603.5	1884.869	380556.1	445167.2	1898.809
2019-08	LB-5	390988.4	454085	1913.437	357455.3	421542.2	1884.713	376971.9	441425.9	1897.262
2019-09	LB-5	395943.3	466775	1885.007	383037.5	451717.3	1884.417	379165.6	444845.9	1893.384
2019-10	LB-5	444197.6	518815	1902.616	388156.8	457773.3	1884.09	387684.1	455044.4	1891.97
2019-11	LB-5	450891	523648	1913.461	388058.3	457086.1	1886.151	386849.5	454166.6	1891.645

Month_Yr	LoadBin	CO2T	MWg	CO2_MW	roll12CO2	roll12MWg	roll12CO2_MW	roll18CO2	roll18MWg	roll18CO2_MW
2019-12	LB-5	473217	549031	1915.362	389154.4	457391.3	1889.545	390075.4	457407.9	1893.603
2020-01	LB-5	484046.6	560300	1919.791	396961.2	465403.7	1893.782	390158.1	457772	1892.672
2020-02	LB-5	419552.6	485581	1920.049	395727.2	462428.4	1899.48	386517.3	453480.9	1892.936
2020-03	LB-5	290295.3	335970	1920.114	383530.7	447508.1	1902.481	397702.8	466330.7	1894.689
2020-04	LB-5	5746.6	6803	1877.146	345006.7	402318.4	1901.058	376757.3	441922.9	1893.056
2020-05	LB-5	167774	195952	1902.666	354490.7	413333.3	1902.908	360962.8	423259.4	1893.83
2020-06	LB-5	238103.6	283435	1866.809	351360.2	409823.8	1901.664	348631.7	408707.6	1893.395

Table 8: Combined Output for All Load Bins (R Script Output File Name: RollingSummary.csv)

Month_Yr	LoadBin	CO2T	MWg	CO2_MW	roll12CO2	roll12MWg	roll12CO2_MW	roll18CO2	roll18MWg	roll18CO2_MW
2016-02	LB-0	2478.8	902	5496.231	NA	NA	NA	NA	NA	NA
2016-04	LB-0	3457.5	1274	5427.786	NA	NA	NA	NA	NA	NA
2016-06	LB-0	294.1	239	2461.088	NA	NA	NA	NA	NA	NA
2016-07	LB-0	3357.1	923	7274.323	NA	NA	NA	NA	NA	NA
2016-10	LB-0	2884.6	461	12514.53	NA	NA	NA	NA	NA	NA
2017-02	LB-0	1922.6	432	8900.926	NA	NA	NA	NA	NA	NA
2017-03	LB-0	5445.7	2149	5068.125	NA	NA	NA	NA	NA	NA
2017-04	LB-0	4717.8	1360	6937.941	NA	NA	NA	NA	NA	NA
2017-05	LB-0	2436	518	9405.405	NA	NA	NA	NA	NA	NA
2017-06	LB-0	2897.5	1700	3408.824	NA	NA	NA	NA	NA	NA
2017-08	LB-0	847.3	450	3765.778	NA	NA	NA	NA	NA	NA

Month_Yr	LoadBin	CO2T	MWg	CO2_MW	roll12CO2	roll12MWg	roll12CO2_MW	roll18CO2	roll18MWg	roll18CO2_MW
2017-10	LB-0	2803.1	1234	4543.112	2795.175	970.1667	6267.006	NA	NA	NA
2018-03	LB-0	3659.8	538	13605.2	2893.592	939.8333	6942.754	NA	NA	NA
2018-04	LB-0	1956.8	1177	3325.064	2768.533	931.75	6767.527	NA	NA	NA
2018-09	LB-0	1150	67	34328.36	2839.858	917.4167	9423.133	NA	NA	NA
2018-10	LB-0	2808.6	1134	4953.439	2794.15	935	9229.726	NA	NA	NA
2018-11	LB-0	259.6	145	3580.69	2575.4	908.6667	8485.239	NA	NA	NA
2018-12	LB-0	994.4	343	5798.251	2498.05	901.25	8226.683	2465.072	835.8889	7821.949
2019-01	LB-0	1846.7	920	4014.565	2198.133	798.8333	8138.886	2429.956	836.8889	7739.634
2019-03	LB-0	1660.7	749	4434.446	1943.375	747.9167	7930.261	2330.133	807.7222	7684.448
2019-05	LB-0	201.4	103	3910.68	1757.158	713.3333	7472.367	2324.983	800.1667	7764.981
2019-06	LB-0	4264.8	1064	8016.541	1871.1	660.3333	7856.344	2375.411	808	7806.216
2019-08	LB-0	865	400	4325	1872.575	656.1667	7902.946	2263.211	804.6111	7351.242
2019-09	LB-0	3392.1	753	9009.562	1921.658	616.0833	8275.15	2344.85	822.4444	7357.277
2019-11	LB-0	630	217	5806.452	1669.175	589.3333	7625.254	2077.311	715.1111	7398.295
2020-04	LB-0	549.5	286	3842.657	1551.9	515.0833	7668.387	1845.739	655.4444	7226.335
2020-05	LB-0	1370.5	593	4622.26	1570.275	558.9167	5192.879	1786.544	659.6111	6960.605
2020-06	LB-0	1815.1	652	5567.791	1487.483	518.75	5244.075	1726.411	601.3889	7080.547
2016-02	LB-1	12109.9	11683	2303.423	NA	NA	NA	NA	NA	NA
2016-04	LB-1	2602.4	2523	2292.157	NA	NA	NA	NA	NA	NA
2016-05	LB-1	1184.4	1156	2276.817	NA	NA	NA	NA	NA	NA
2016-06	LB-1	336.1	360	2074.691	NA	NA	NA	NA	NA	NA

Month_Yr	LoadBin	CO2T	MWg	CO2_MW	roll12CO2	roll12MWg	roll12CO2_MW	roll18CO2	roll18MWg	roll18CO2_MW
2016-07	LB-1	364.2	376	2152.482	NA	NA	NA	NA	NA	NA
2016-09	LB-1	41664.5	43487	2129.091	NA	NA	NA	NA	NA	NA
2016-10	LB-1	45159.6	46685	2149.613	NA	NA	NA	NA	NA	NA
2017-02	LB-1	857.9	677	2816.018	NA	NA	NA	NA	NA	NA
2017-03	LB-1	1547.4	1688	2037.125	NA	NA	NA	NA	NA	NA
2017-04	LB-1	654.5	740	1965.465	NA	NA	NA	NA	NA	NA
2017-05	LB-1	1003.6	1032	2161.068	NA	NA	NA	NA	NA	NA
2017-06	LB-1	702.2	695	2245.244	9015.558	9258.5	2216.933	NA	NA	NA
2017-10	LB-1	1706.4	1871	2026.724	8148.6	8440.833	2193.875	NA	NA	NA
2017-12	LB-1	5238.3	5180	2247.233	8368.258	8662.25	2190.131	NA	NA	NA
2018-01	LB-1	378.2	369	2277.627	8301.075	8596.667	2190.198	NA	NA	NA
2018-03	LB-1	656.3	649	2247.218	8327.758	8620.75	2204.576	NA	NA	NA
2018-04	LB-1	1065.2	1076	2199.917	8386.175	8679.083	2208.529	NA	NA	NA
2018-06	LB-1	13507	13379	2243.483	6039.717	6170.083	2218.061	7263.228	7423.667	2213.633
2018-07	LB-1	1491.7	1459	2272.028	2400.725	2401.25	2228.263	6673.328	6855.667	2211.889
2018-09	LB-1	1708.6	1814	2093.103	2471.617	2496	2168.02	6623.672	6816.278	2200.83
2018-10	LB-1	365.5	380	2137.427	2373.125	2387	2176.378	6578.178	6773.167	2193.087
2018-12	LB-1	335.5	341	2186.38	2346.542	2353.75	2194.788	6578.144	6772.111	2199.291
2019-01	LB-1	1028.8	1105	2068.979	2348.642	2359.833	2187.114	6615.067	6812.611	2194.652
2019-03	LB-1	754.8	788	2128.596	2353.025	2367.583	2177.393	4342.306	4440.444	2194.625
2019-05	LB-1	1941.7	2124	2031.492	2372.633	2388.667	2177.79	1941.311	1964.833	2188.063

Month_Yr	LoadBin	CO2T	MWg	CO2_MW	roll12CO2	roll12MWg	roll12CO2_MW	roll18CO2	roll18MWg	roll18CO2_MW
2019-06	LB-1	339.6	318	2373.166	1964.408	1983.5	2188.285	1912.517	1944.889	2163.46
2019-08	LB-1	371.8	375	2203.259	1963.875	1984	2182.087	1847.206	1871.944	2172.689
2019-09	LB-1	1021.5	1084	2094.096	1994.308	2020.25	2169.327	1867.594	1891.056	2179.836
2019-11	LB-1	732.7	766	2125.616	1966.6	1994.417	2163.135	1852.544	1876.278	2177.866
2020-03	LB-1	9316.7	9711	2131.992	1617.408	1688.75	2153.845	2331.128	2377.167	2171.574
2020-04	LB-1	1852.3	1950	2110.883	1647.458	1729.667	2140.416	2339.233	2381.556	2176.25
2020-05	LB-1	4338.9	4345	2219.102	1866.65	1940.583	2150.916	2289.267	2335.167	2174.687
2020-06	LB-1	649.9	707	2042.747	1890.35	1967.833	2143.026	2304.361	2353.944	2161.638
2016-02	LB-2	3026.3	3255	2066.086	NA	NA	NA	NA	NA	NA
2016-04	LB-2	1731.9	1758	2189.23	NA	NA	NA	NA	NA	NA
2016-05	LB-2	455	480	2106.481	NA	NA	NA	NA	NA	NA
2016-06	LB-2	429.2	487	1958.476	NA	NA	NA	NA	NA	NA
2016-07	LB-2	1733.7	1833	2101.837	NA	NA	NA	NA	NA	NA
2016-09	LB-2	399.7	455	1952.137	NA	NA	NA	NA	NA	NA
2016-10	LB-2	1732.9	1809	2128.739	NA	NA	NA	NA	NA	NA
2016-12	LB-2	1303.3	1341	2159.748	NA	NA	NA	NA	NA	NA
2017-04	LB-2	6486.7	7281	1979.795	NA	NA	NA	NA	NA	NA
2017-05	LB-2	875.2	954	2038.668	NA	NA	NA	NA	NA	NA
2017-06	LB-2	1742.3	1838	2106.517	NA	NA	NA	NA	NA	NA
2017-08	LB-2	416.7	433	2138.568	1694.408	1827	2077.19	NA	NA	NA
2017-10	LB-2	2992.7	3232	2057.687	1691.608	1825.083	2076.49	NA	NA	NA

Month_Yr	LoadBin	CO2T	MWg	CO2_MW	roll12CO2	roll12MWg	roll12CO2_MW	roll18CO2	roll18MWg	roll18CO2_MW
2017-11	LB-2	385.1	419	2042.429	1579.375	1713.5	2064.257	NA	NA	NA
2017-12	LB-2	475.8	482	2193.638	1581.108	1713.667	2071.52	NA	NA	NA
2018-01	LB-2	921.1	986	2075.952	1622.1	1755.25	2081.31	NA	NA	NA
2018-03	LB-2	1267.1	1339	2102.896	1583.217	1714.083	2081.398	NA	NA	NA
2018-04	LB-2	863.9	900	2133.086	1621.9	1751.167	2096.477	1513.256	1626.778	2085.109
2018-05	LB-2	3036.9	3217	2097.814	1730.567	1868.5	2093.9	1513.844	1624.667	2086.872
2018-06	LB-2	2922	3400	1909.804	1865.458	2040.083	2073.071	1579.961	1715.889	2071.348
2018-07	LB-2	865.2	906	2122.149	1397	1508.833	2084.934	1602.75	1739.556	2072.219
2018-09	LB-2	2121.5	2304	2046.2	1500.858	1621.333	2085.562	1696.767	1840.5	2077.092
2018-10	LB-2	1128.2	1330	1885.046	1449.683	1579	2067.106	1663.128	1812.556	2065.048
2018-11	LB-2	400.7	457	1948.456	1448.35	1581	2051.263	1663.183	1812.667	2064.844
2018-12	LB-2	424.9	462	2043.771	1234.367	1350.167	2050.103	1590.517	1737.833	2060.124
2019-01	LB-2	3828.6	4065	2092.989	1521.325	1654	2054.317	1730.811	1889.167	2056.415
2019-03	LB-2	2793.4	3019	2056.163	1714.458	1865.417	2042.86	1525.628	1652.389	2060.657
2019-05	LB-2	435.1	497	1945.45	1673.958	1824.667	2031.985	1501.178	1627	2055.479
2019-06	LB-2	1272.8	1393	2030.47	1674.433	1829.167	2025.95	1475.094	1602.278	2051.254
2019-08	LB-2	362	416	1933.761	1632.608	1788.833	2009.339	1472.056	1601.333	2039.876
2019-09	LB-2	405.9	439	2054.67	1413.358	1557.333	2005.744	1328.344	1446.167	2039.708
2019-11	LB-2	1677.6	1806	2064.23	1309.658	1424.5	2018.613	1400.15	1523.222	2040.919
2020-03	LB-2	4148.9	4424	2084.037	1583.3	1717.667	2015.437	1604.211	1742.222	2034.83
2020-04	LB-2	5178.8	5587	2059.861	1838.075	1991.25	2016.575	1840.75	1997.833	2033.936

Month_Yr	LoadBin	CO2T	MWg	CO2_MW	roll12CO2	roll12MWg	roll12CO2_MW	roll18CO2	roll18MWg	roll18CO2_MW
2020-05	LB-2	93044.4	99608	2075.79	9497.758	10181.08	2032.471	6939.489	7457.222	2032.43
2020-06	LB-2	79422.4	87733	2011.72	16082.9	17454.08	2037.743	11303.85	12281.28	2025.688
2016-02	LB-3	2576.6	2767	2069.309	NA	NA	NA	NA	NA	NA
2016-03	LB-3	84130.1	94080	1987.2	NA	NA	NA	NA	NA	NA
2016-04	LB-3	28645.4	30209	2107.201	NA	NA	NA	NA	NA	NA
2016-05	LB-3	58247.5	61791	2094.785	NA	NA	NA	NA	NA	NA
2016-06	LB-3	40136.1	43359	2057.043	NA	NA	NA	NA	NA	NA
2016-07	LB-3	4464.7	4933	2011.262	NA	NA	NA	NA	NA	NA
2016-08	LB-3	9202.6	10264	1992.422	NA	NA	NA	NA	NA	NA
2016-09	LB-3	960.2	1091	1955.8	NA	NA	NA	NA	NA	NA
2016-10	LB-3	1542	1691	2026.414	NA	NA	NA	NA	NA	NA
2017-02	LB-3	947.2	1031	2041.599	NA	NA	NA	NA	NA	NA
2017-04	LB-3	1387.1	1625	1896.889	NA	NA	NA	NA	NA	NA
2017-05	LB-3	1545.2	1699	2021.058	19482.06	21211.67	2021.749	NA	NA	NA
2017-06	LB-3	11569.3	12593	2041.575	20231.45	22030.5	2019.438	NA	NA	NA
2017-07	LB-3	8173.1	8821	2059.001	13901.7	14925.58	2025.421	NA	NA	NA
2017-08	LB-3	9282.9	10141	2034.185	12288.16	13253.25	2019.336	NA	NA	NA
2017-09	LB-3	21418	23753	2003.77	9219.033	10083.42	2011.752	NA	NA	NA
2017-10	LB-3	5029.4	5458	2047.718	6293.475	6925	2010.974	NA	NA	NA
2017-11	LB-3	2001.3	2144	2074.316	6088.192	6692.583	2016.229	16181.04	17636.11	2028.975
2017-12	LB-3	2039.6	2194	2065.836	5491.275	6020.083	2022.347	16151.21	17604.28	2028.782

Month_Yr	LoadBin	CO2T	MWg	CO2_MW	roll12CO2	roll12MWg	roll12CO2_MW	roll18CO2	roll18MWg	roll18CO2_MW
2018-01	LB-3	1578.3	1698	2065.567	5542.783	6070.667	2031.494	11564.99	12471.94	2033.136
2018-03	LB-3	524.6	574	2030.972	5458	5977.583	2031.874	10002.73	10825.56	2028.901
2018-04	LB-3	501.5	549	2029.953	5420.858	5937.417	2030.903	6794.617	7423.222	2025.299
2018-05	LB-3	7519.6	8426	1983.174	5931.9	6504.167	2038.094	4982.589	5482.5	2021.195
2018-06	LB-3	9914.5	11553	1907.056	6629.342	7325.333	2028.594	5285.356	5850.278	2015.406
2018-07	LB-3	1632.9	1763	2058.234	5801.308	6422.833	2029.982	4864.817	5378	2019.062
2018-09	LB-3	1391	1545	2000.719	5236.133	5816.5	2025.125	4888.75	5403.222	2021.558
2018-10	LB-3	869.8	1143	1691.066	4535.042	5066.667	1996.532	4851.406	5372.778	2002.927
2018-12	LB-3	2495.1	2797	1982.362	2958.133	3320.333	1994.748	4937.4	5470.889	1999.636
2019-01	LB-3	6819.9	7983	1898.451	3107.342	3530.75	1982.309	5239.222	5824.111	1999.723
2019-03	LB-3	2397.9	2666	1998.75	3140.392	3574.25	1976.012	5286.594	5877.833	1998.484
2019-04	LB-3	2149	2352	2030.423	3149.508	3587.417	1973.061	4763.244	5308.889	1997.864
2019-05	LB-3	518.4	585	1969.231	3061.183	3494.667	1965.033	4337.983	4851.333	1992.877
2019-06	LB-3	54796.9	61238	1988.486	7583.875	8550	1961.492	6866.539	7690.056	1990.338
2019-07	LB-3	9534	10882	1946.946	8336.583	9411.083	1954.575	6206.317	6975	1987.181
2019-08	LB-3	18171.1	20062	2012.772	9224.208	10380.75	1957.041	6936.411	7786.333	1985.24
2019-09	LB-3	8259.6	9388	1955.12	9086.3	10200.33	1961.047	7284.094	8188.778	1978.618
2019-10	LB-3	11247	12532	1994.361	9887.475	11097.75	1955.724	7795.617	8763.111	1974.647
2019-11	LB-3	3441.2	3743	2043.043	10058.33	11280.92	1959.251	7899.111	8876.722	1973.396
2019-12	LB-3	2081.1	2319	1994.25	10159.27	11378.92	1984.516	7985.583	8973.667	1971.355
2020-01	LB-3	4658.3	5088	2034.548	10339.53	11569.83	1988.865	8216.517	9225.833	1971.611

Month_Yr	LoadBin	CO2T	MWg	CO2_MW	roll12CO2	roll12MWg	roll12CO2_MW	roll18CO2	roll18MWg	roll18CO2_MW
2020-02	LB-3	3093.8	3437	2000.323	10029.03	11191	1997.354	7970.639	8948.667	1972.563
2020-03	LB-3	72450.7	79483	2025.61	15866.76	17592.42	1999.593	11444.87	12722.56	1979.15
2020-04	LB-3	2510.2	2803	1990.09	15896.86	17630	1996.232	11493.61	12780.33	1975.364
2020-05	LB-3	44291	48838	2015.325	19544.58	21651.08	2000.073	13876.94	15407.72	1976.175
2020-06	LB-3	36375.1	40768	1982.77	18009.43	19945.25	1999.596	15849.46	17609.11	1992.381
2016-02	LB-4	2974.7	3230	2046.577	NA	NA	NA	NA	NA	NA
2016-03	LB-4	34258.9	38808	1961.732	NA	NA	NA	NA	NA	NA
2016-04	LB-4	35090.2	38328	2034.498	NA	NA	NA	NA	NA	NA
2016-05	LB-4	40767.8	44917	2016.945	NA	NA	NA	NA	NA	NA
2016-06	LB-4	15609.7	17373	1996.674	NA	NA	NA	NA	NA	NA
2016-07	LB-4	6965.1	7913	1956.022	NA	NA	NA	NA	NA	NA
2016-08	LB-4	6150.2	7075	1931.747	NA	NA	NA	NA	NA	NA
2016-09	LB-4	1087.3	1227	1969.211	NA	NA	NA	NA	NA	NA
2016-10	LB-4	4529.9	5101	1973.426	NA	NA	NA	NA	NA	NA
2016-12	LB-4	1186.3	1306	2018.547	NA	NA	NA	NA	NA	NA
2017-01	LB-4	1164.3	1329	1946.827	NA	NA	NA	NA	NA	NA
2017-02	LB-4	579.3	646	1992.776	12530.31	13937.75	1987.082	NA	NA	NA
2017-04	LB-4	547.6	654	1860.686	12328.05	13723.08	1971.591	NA	NA	NA
2017-05	LB-4	1195.5	1335	1990.012	9572.767	10600.33	1973.948	NA	NA	NA
2017-06	LB-4	12297.3	13590	2010.841	7673.358	8538.833	1971.976	NA	NA	NA
2017-07	LB-4	7604.6	8390	2014.197	4909.758	5494.917	1971.747	NA	NA	NA

Month_Yr	LoadBin	CO2T	MWg	CO2_MW	roll12CO2	roll12MWg	roll12CO2_MW	roll18CO2	roll18MWg	roll18CO2_MW
2017-08	LB-4	8722.8	9712	1995.881	4335.85	4856.5	1971.681	NA	NA	NA
2017-09	LB-4	18549.6	20926	1969.862	5301.225	5940.917	1972.835	11071.17	12325.56	1982.581
2017-10	LB-4	7530.3	8389	1994.755	5416.233	6050.417	1978.085	11324.26	12612.17	1979.702
2017-11	LB-4	3955.4	4430	1984.148	5655.242	6317.333	1979.33	9640.733	10702.28	1980.948
2017-12	LB-4	4696.3	5250	1987.852	5669.108	6329.75	1980.532	7952.183	8864.611	1978.356
2018-01	LB-4	2908.8	3199	2020.631	5812.65	6487.5	1980.706	5848.906	6546.944	1978.561
2018-02	LB-4	2251.8	2539	1970.855	5903.275	6588.333	1982.708	5106.8	5722.833	1977.127
2018-03	LB-4	3619.9	3920	2052.098	6156.658	6861.167	1987.652	4920.956	5501	1982.464
2018-04	LB-4	3461.6	3860	1992.861	6399.492	7128.333	1998.666	4771.589	5322.389	1985.859
2018-05	LB-4	15645.5	17689	1965.503	7603.658	8491.167	1996.624	5580.378	6236.944	1985.653
2018-06	LB-4	15457.6	17712	1939.376	7867.017	8834.667	1990.668	6187.472	6937.556	1983.762
2018-07	LB-4	2923	3224	2014.75	7476.883	8404.167	1990.714	6283.956	7044.111	1983.551
2018-09	LB-4	49562.7	57514	1915	10880.21	12387.67	1983.974	8972.756	10165.5	1981.783
2018-10	LB-4	1692.5	1956	1922.858	9475.45	10806.83	1980.057	9034.6	10238.28	1977.898
2018-11	LB-4	7473.3	8573	1937.167	9470.7	10822.17	1975.258	9419.361	10678.22	1982.147
2018-12	LB-4	1620.5	1856	1940.254	9276.125	10607.67	1971.6	9442.972	10707.17	1979.383
2019-01	LB-4	3252.7	3816	1894.188	9155.825	10488.17	1963.795	8940.494	10164.17	1972.902
2019-02	LB-4	1141.2	1328	1909.639	9008.525	10332.25	1954.546	8581.417	9771.833	1967.093
2019-03	LB-4	1640.5	1899	1919.724	8957.583	10278.92	1950.285	8187.956	9337.778	1962.862
2019-04	LB-4	5605.1	6381	1952.01	9123.017	10484	1941.944	7468.817	8529.722	1961.871
2019-06	LB-4	36431.8	41791	1937.249	11870.53	13644.92	1937.31	9074.456	10385.39	1958.676

Month_Yr	LoadBin	CO2T	MWg	CO2_MW	roll12CO2	roll12MWg	roll12CO2_MW	roll18CO2	roll18MWg	roll18CO2_MW
2019-07	LB-4	18566.5	21396	1928.346	12113.95	13953.83	1934.213	9886.183	11327.94	1955.576
2019-08	LB-4	43037.5	48578	1968.77	14412.28	16526	1936.663	12016.25	13735.06	1954.515
2019-09	LB-4	11290.5	12873	1949.041	15109.57	17330.08	1931.187	12481.9	14272.5	1950.538
2019-10	LB-4	29262.2	33287	1953.529	13417.86	15311.17	1934.398	13982.48	15980.72	1949.576
2019-11	LB-4	1802.2	1970	2032.939	13427	15312.33	1943.571	13881.49	15872.39	1948.511
2019-12	LB-4	17429.5	19518	1984.436	14256.68	16224.42	1947.51	14657.49	16742.28	1948.043
2020-01	LB-4	5910.2	6642	1977.383	14614.16	16623.25	1950.604	14116.64	16128.56	1948.703
2020-02	LB-4	34779	39049	1979.223	17241.35	19559.33	1957.691	15190.05	17313.94	1950.917
2020-03	LB-4	71086.4	80476	1962.943	23070.12	26155	1962.133	18976.91	21605.72	1948.039
2020-04	LB-4	2793.7	3195	1943.106	23166.22	26263	1964.081	16378.63	18588	1949.6
2020-05	LB-4	51877	58673	1964.826	27022.21	30620.67	1965.149	19166.66	21738.94	1951.932
2020-06	LB-4	28114.5	32584	1917.403	26329.1	29853.42	1963.495	20313.39	23072.89	1950.834
2016-01	LB-5	514791.1	579329	1974.664	NA	NA	NA	NA	NA	NA
2016-02	LB-5	408208.9	475279	1908.628	NA	NA	NA	NA	NA	NA
2016-03	LB-5	343771.5	392691	1945.389	NA	NA	NA	NA	NA	NA
2016-04	LB-5	145999.6	164763	1969.153	NA	NA	NA	NA	NA	NA
2016-05	LB-5	376947.8	428527	1954.747	NA	NA	NA	NA	NA	NA
2016-06	LB-5	380150.9	435997	1937.582	NA	NA	NA	NA	NA	NA
2016-07	LB-5	359731.5	426873	1872.696	NA	NA	NA	NA	NA	NA
2016-08	LB-5	475750.2	555089	1904.6	NA	NA	NA	NA	NA	NA
2016-09	LB-5	399584.6	467213	1900.559	NA	NA	NA	NA	NA	NA

Month_Yr	LoadBin	CO2T	MWg	CO2_MW	roll12CO2	roll12MWg	roll12CO2_MW	roll18CO2	roll18MWg	roll18CO2_MW
2016-10	LB-5	237499.1	270167	1953.517	NA	NA	NA	NA	NA	NA
2016-11	LB-5	492298.7	560281	1952.586	NA	NA	NA	NA	NA	NA
2016-12	LB-5	500329	575569	1931.727	386255.2	444314.8	1933.821	NA	NA	NA
2017-01	LB-5	498727.5	577903	1917.767	384916.6	444196	1929.079	NA	NA	NA
2017-02	LB-5	32249	36551	1960.67	353586.6	407635.3	1933.416	NA	NA	NA
2017-04	LB-5	396412	454535	1938.059	357973.3	412789	1932.805	NA	NA	NA
2017-05	LB-5	389320.6	443192	1952.104	378250.1	435991.4	1931.384	NA	NA	NA
2017-06	LB-5	361363.7	408442	1966.082	376951.4	434317.7	1932.329	NA	NA	NA
2017-07	LB-5	486363.3	555510	1945.613	385802.4	444277.1	1932.998	377749.9	433772.8	1938.119
2017-08	LB-5	461861.4	527958	1944.016	394313.3	452700.8	1938.942	374809.4	430918.9	1936.416
2017-09	LB-5	426870.1	499829	1897.85	390239.9	448095.8	1938.379	375846.1	432282.8	1935.818
2017-10	LB-5	369356	431189	1903.553	387720.9	445093.8	1938.629	377267.5	434421.6	1933.493
2017-11	LB-5	485523.8	552256	1953.699	408389.6	468601.3	1938.644	396130	455948.9	1932.635
2017-12	LB-5	492858.7	558947	1959.473	408436.3	468490.1	1939.218	402569.5	463194.5	1932.897
2018-01	LB-5	499492.5	572258	1939.655	408366.6	468214.2	1939.878	409199.5	470764.6	1933.013
2018-02	LB-5	455505.3	521427	1941.277	404764.7	463507.8	1941.837	414520.3	476017.6	1936.823
2018-03	LB-5	356455.6	405216	1954.818	431781.9	494229.9	1941.35	407892.8	467691.3	1939.612
2018-04	LB-5	290866.1	335242	1928.067	422986.4	484288.8	1940.517	401852.9	460359.6	1941.141
2018-05	LB-5	465912.4	539448	1919.297	429369.1	492310.2	1937.783	414542.5	475319.6	1939.24
2018-06	LB-5	415151.5	490688	1880.133	433851.4	499164	1930.621	410256.6	471453.3	1935.214
2018-07	LB-5	482558.2	553746	1936.54	433534.3	499017	1929.865	409269.3	470240.9	1935.482

Month_Yr	LoadBin	CO2T	MWg	CO2_MW	roll12CO2	roll12MWg	roll12CO2_MW	roll18CO2	roll18MWg	roll18CO2_MW
2018-08	LB-5	485086.4	562821	1915.298	435469.7	501922.3	1927.472	408511.5	469403.1	1935.345
2018-09	LB-5	88957.4	104674	1888.56	407310.3	468992.7	1926.698	411661.9	473187.7	1931.338
2018-10	LB-5	382765.1	446143	1906.539	408427.8	470238.8	1926.946	410903.8	472721.4	1929.587
2018-11	LB-5	452073.8	531894	1888.738	405640.3	468542	1921.533	414390.1	477649.3	1926.067
2018-12	LB-5	460063.6	545369	1874.627	402907.3	467410.5	1914.463	419873.4	485256.4	1920.986
2019-01	LB-5	390364.7	464151	1868.955	393813.3	458401.6	1908.571	414540.1	480180.9	1916.727
2019-02	LB-5	434360.4	521284	1851.669	392051.3	458389.7	1901.103	413012.3	479810.1	1911.597
2019-03	LB-5	436653.3	515014	1884.105	398734.4	467539.5	1895.211	413555.8	480653.7	1910.834
2019-04	LB-5	468035.4	549079	1894.224	413498.5	485359.3	1892.39	419038	487203.2	1910.315
2019-05	LB-5	53965	63773	1880.454	379169.6	445719.7	1889.154	395062.5	460065.2	1906.246
2019-06	LB-5	275669.5	325549	1881.741	367546.1	431958.1	1889.288	382996.5	447098.7	1901.928
2019-07	LB-5	455566.9	537491	1883.512	365296.8	430603.5	1884.869	380556.1	445167.2	1898.809
2019-08	LB-5	390988.4	454085	1913.437	357455.3	421542.2	1884.713	376971.9	441425.9	1897.262
2019-09	LB-5	395943.3	466775	1885.007	383037.5	451717.3	1884.417	379165.6	444845.9	1893.384
2019-10	LB-5	444197.6	518815	1902.616	388156.8	457773.3	1884.09	387684.1	455044.4	1891.97
2019-11	LB-5	450891	523648	1913.461	388058.3	457086.1	1886.151	386849.5	454166.6	1891.645
2019-12	LB-5	473217	549031	1915.362	389154.4	457391.3	1889.545	390075.4	457407.9	1893.603
2020-01	LB-5	484046.6	560300	1919.791	396961.2	465403.7	1893.782	390158.1	457772	1892.672
2020-02	LB-5	419552.6	485581	1920.049	395727.2	462428.4	1899.48	386517.3	453480.9	1892.936
2020-03	LB-5	290295.3	335970	1920.114	383530.7	447508.1	1902.481	397702.8	466330.7	1894.689
2020-04	LB-5	5746.6	6803	1877.146	345006.7	402318.4	1901.058	376757.3	441922.9	1893.056

Month_Yr	LoadBin	CO2T	MWg	CO2_MW	roll12CO2	roll12MWg	roll12CO2_MW	roll18CO2	roll18MWg	roll18CO2_MW
2020-05	LB-5	167774	195952	1902.666	354490.7	413333.3	1902.908	360962.8	423259.4	1893.83
2020-06	LB-5	238103.6	283435	1866.809	351360.2	409823.8	1901.664	348631.7	408707.6	1893.395