

Attachment 1

NRECA Comments on NSPS Section 111(b) Proposed Rule

**CARBON DIOXIDE (CO<sub>2</sub>) EMISSIONS FROM SUPERCRITICAL LIGNITE-FIRED BOILERS: A REVIEW  
IN CONTEXT TO PROPOSED NEW SOURCE PERFORMANCE STANDARD (NSPS)  
FOR COAL-FIRED GENERATING UNITS**

Prepared for the

National Rural Electric Cooperative Association

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# **CARBON DIOXIDE (CO<sub>2</sub>) EMISSIONS FROM SUPERCRITICAL LIGNITE-FIRED BOILERS: A REVIEW IN CONTEXT TO PROPOSED NEW SOURCE PERFORMANCE STANDARD (NSPS) FOR COAL-FIRED GENERATING UNITS**

## **INTRODUCTION**

This report describes the CO<sub>2</sub> emission rate from the two lignite-fired pulverized coal supercritical boilers operating in the U.S. – Luminant’s Oak Grove Units 1 and 2. This discussion addresses (a) the operating hours at a given load over the period of 2010 through 2018, (b) the CO<sub>2</sub> emission rate (lbs/MWh) versus load as recorded over the same time period, (c) CO<sub>2</sub> emission rate history over the recent period of 2016-2018, and (d) the 30-day rolling average CO<sub>2</sub> emission rate, the latter data partitioned into full load and part load “bins”. All data presented in this document is acquired from the Environmental Protection Agency’s Air Markets Program data files.<sup>1</sup>

## **OPERATING HOURS**

Figure 1 depicts the operating hours as a function of load for Oak Grove Units 1 and 2, expressed as a percent of unit available time for the years 2010 through 2018. For both Units 1 and 2 the significant fraction of operating hours – at least 60% for both units – are in the top 90% of generating capacity output.

## **CO<sub>2</sub> EMISSION RATE vs. LOAD**

Figure 2 presents the CO<sub>2</sub> emission rate (lbs/MWh) versus load over the reporting period, with the proposed NSPS rate of 1,900 lbs/MWh highlighted on the figure. For Unit 1 the CO<sub>2</sub> emission rate escalates by approximately 100 lbs/MWh for operation at near minimum load - approximately 400 MW. The CO<sub>2</sub> rate further escalates at lower loads, although sparse data and high scatter suggest uncertainties in the CEMS measurement at such low loads. For Unit 2 there is not a significant change in CO<sub>2</sub> emission rate with load.

## **CO<sub>2</sub> HOURLY EMISSION RATE (lbs/MWh): 2016-2018**

Figures 3 and 4 present the reported CO<sub>2</sub> emission rate (lbs/MWh basis) for 2016-2018 for Units 1 and 2, respectively. The figures show three years of data for brevity – this period is representative of Unit 1 operation for 2010-2018, and for Unit 2 the 2016-2018 period represents some of the lower emission rates. Unit 1 data is relatively constant within each year; for Unit 2 CO<sub>2</sub> emissions peak in Spring/Summer and exhibit a minimum in November and December.

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<sup>1</sup> <https://ampd.epa.gov/ampd/>.

FIGURE 1: OAK GROVE UNITS 1, 2 OPERATING LOAD

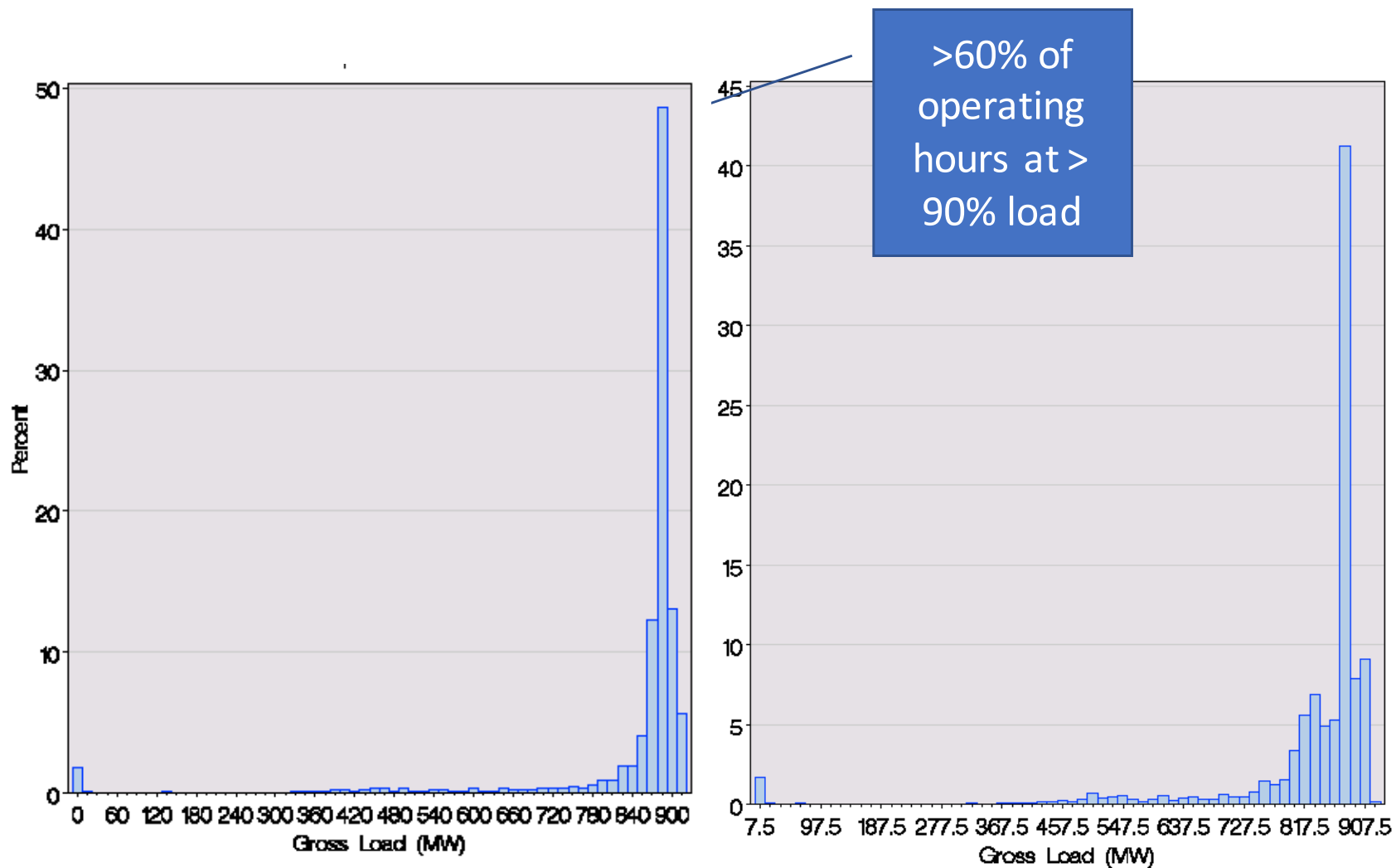


FIGURE 2: OAK GROVE UNITS 1, 2 CO<sub>2</sub> EMISSION RATE (LBS/MWh) vs. LOAD

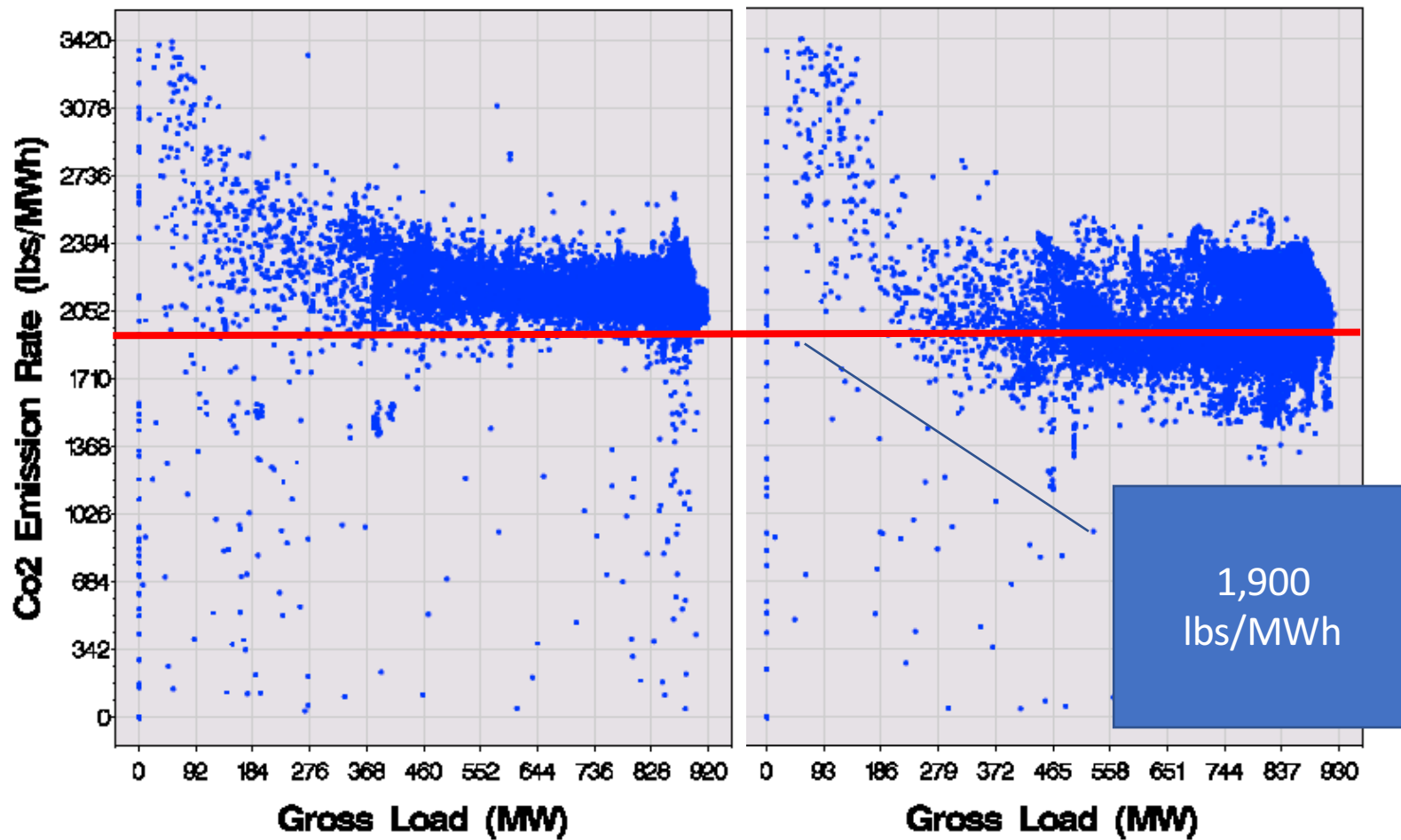


FIGURE 3: OAK GROVE UNIT 1 HOURLY CO<sub>2</sub> EMISSION RATE (lbs/MWh): 2016-2018

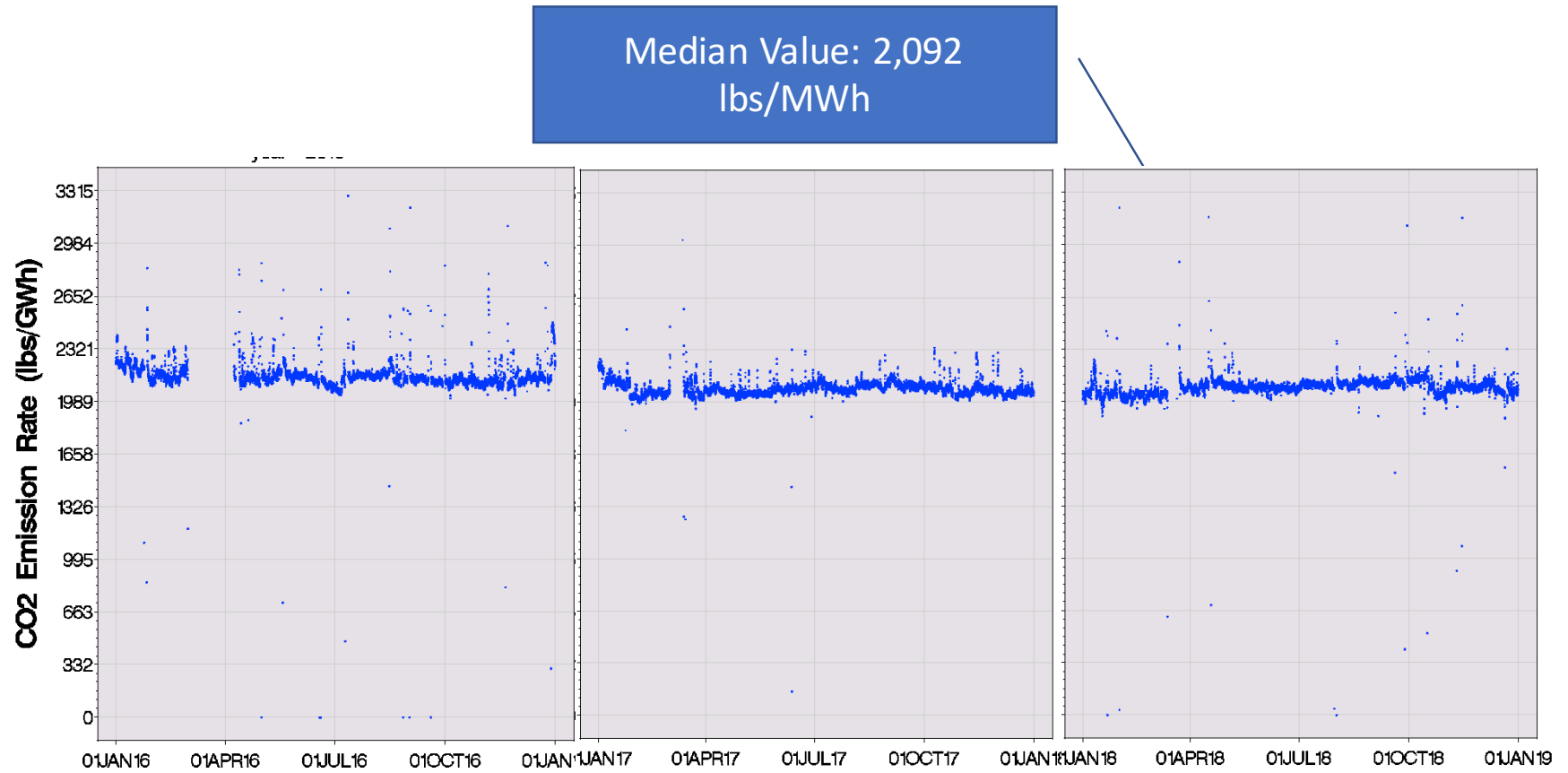
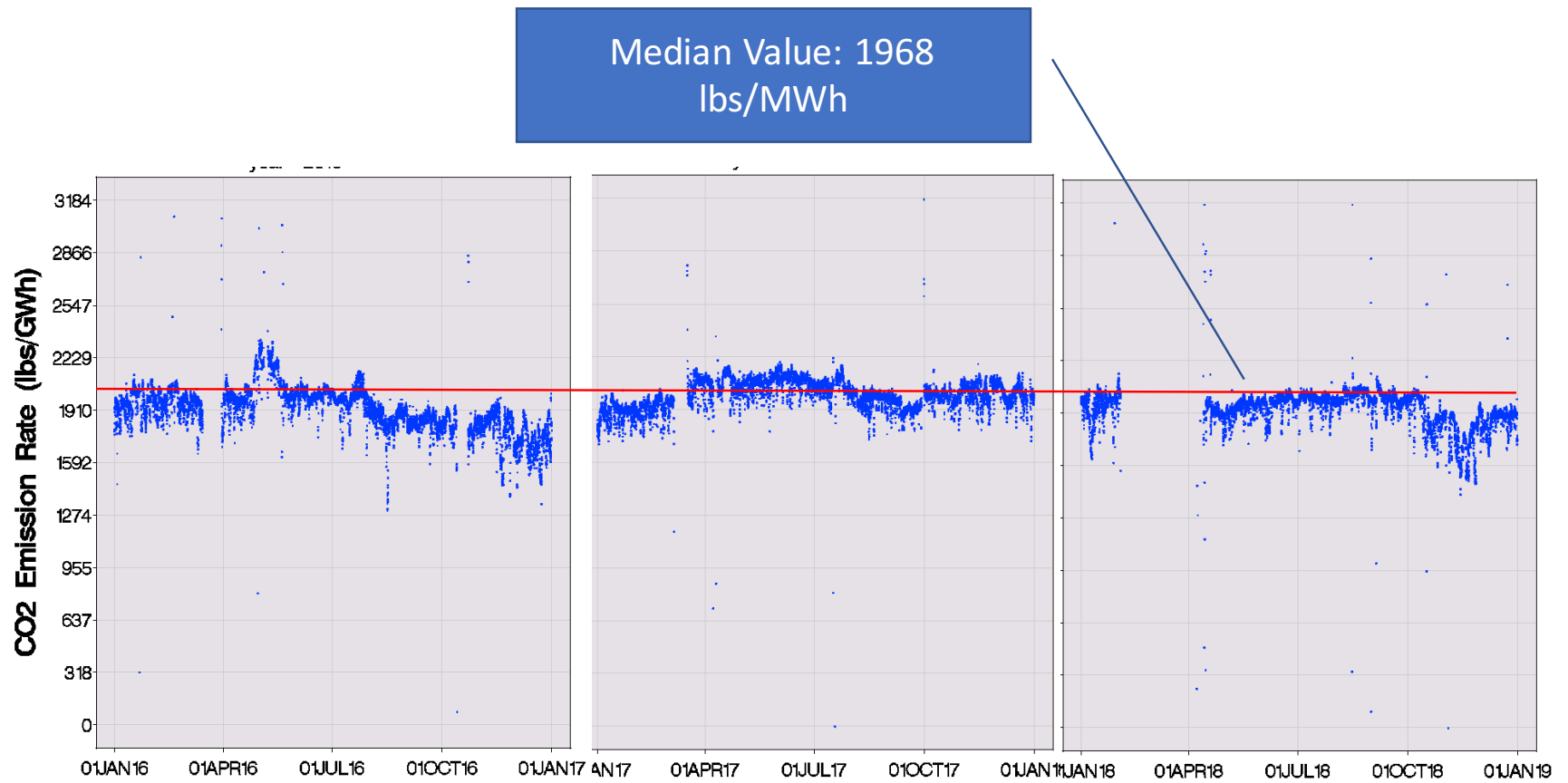


FIGURE 4: OAK GROVE UNIT 2 HOURLY CO<sub>2</sub> EMISSION RATE (lbs/MWh): 2016-2018



For the entire nine-year period, the median hourly rate is 2,108 lbs/MWh for Unit 1 and 2,016 lbs/MWh for Unit 2. The median values for the 3-year period in Figures 3 and 4 are as shown on the graphics - 2,092 and 1968 lbs/MWh for Units 1 and 2, respectively.

#### CO<sub>2</sub> HOURLY AVERAGE (lbs/MWh): NINE YEAR TREND

Figures 5 and 6 present the calculated 12-month average of CO<sub>2</sub> emission rate (lbs/MWh) over the period from 2010 through 2018 for Units 1 and 2, respectively. Both the median and mean 12-month CO<sub>2</sub> emission rate averages are shown; the data is further partitioned into a high load bin defined by operation at 66-100% of maximum capacity and a low load bin defined by 45-66% of maximum capacity.

Figure 5 shows for Unit 1 the CO<sub>2</sub> emission rate over the nine-year period exhibits a slight decrease over time; also a higher CO<sub>2</sub> emission rate is witnessed at lower load. There is no distinct trend in the mean and median CO<sub>2</sub> emission rate values at full load, and these two metrics are essentially indistinguishable for the low load bin. Figure 6 shows for Unit 2 a significant decrease in reported CO<sub>2</sub> emission rate in the first 3 years approximating 300 lbs/MWh. For Unit 2 the trend of CO<sub>2</sub> emission rate between the high and low load bins is unusual –higher CO<sub>2</sub> emission rates are reported for the higher load bin, inverse to the conventional trend. This trend could be due to measurement uncertainties noted in the CO<sub>2</sub> emission rate versus load depiction.

#### 12-MONTH ROLLING AVERAGE

Figure 7 presents the CO<sub>2</sub> emission rate in terms of the metric by which the NSPS is evaluated – the 12-month rolling average. Figure 7 shows that for both Units 1 and 2 the 12-month rolling average decreases over the term slightly for Unit 1 but significantly so for Unit 2 – with least CO<sub>2</sub> emission rate for Unit 2 observed in 2016 but still exceeding 1,900 lbs/MWh.

Figure 7 shows that the sole supercritical boilers firing lignite in the U.S. cannot attain the proposed rate of 1,900 lbs/MWh.

FIGURE 5: OAK GROVE UNIT 1 CO<sub>2</sub> EMISSION RATE: LOW, HIGH LOAD BINS, 2010-2018

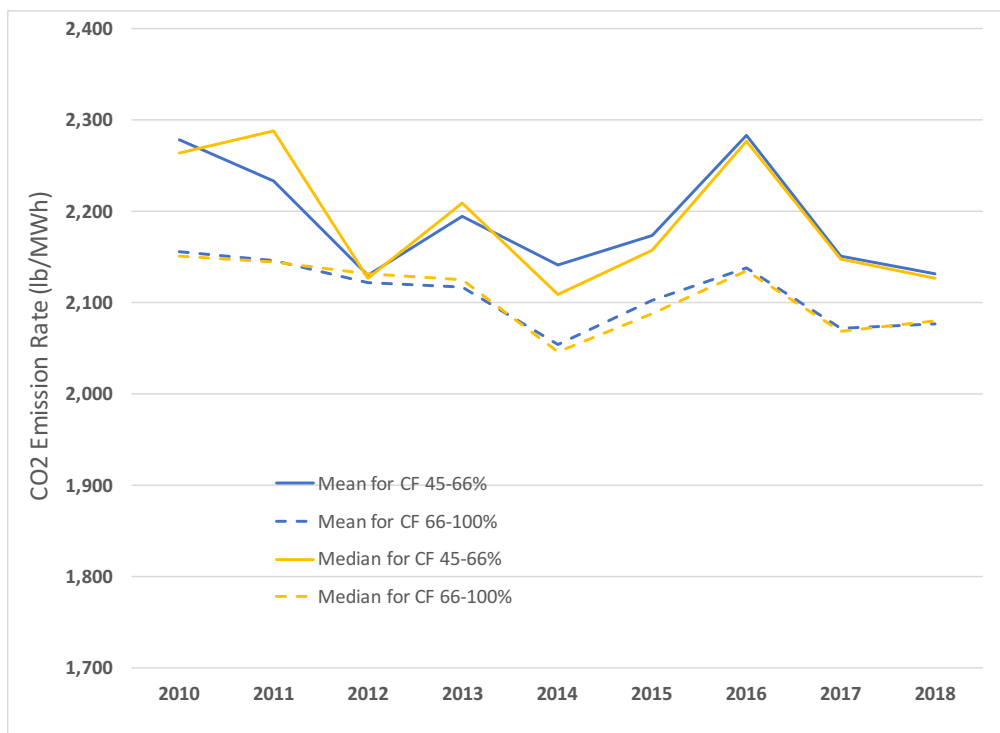


FIGURE 6: OAK GROVE UNIT 2 CO<sub>2</sub> EMISSION RATE: LOW, HIGH LOAD BINS, 2010-2018

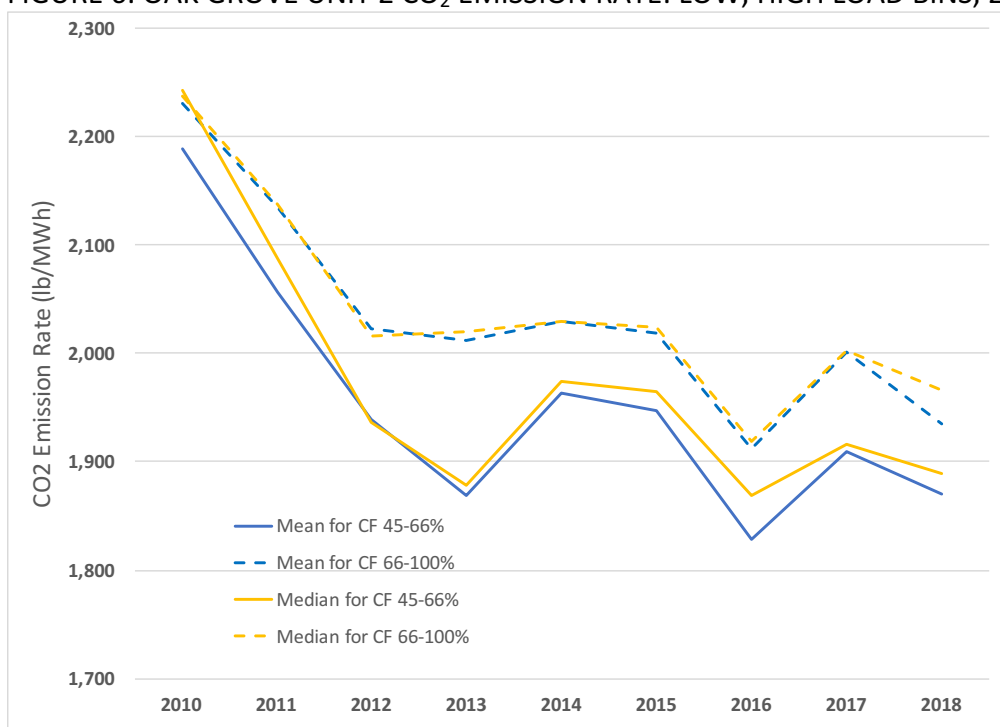
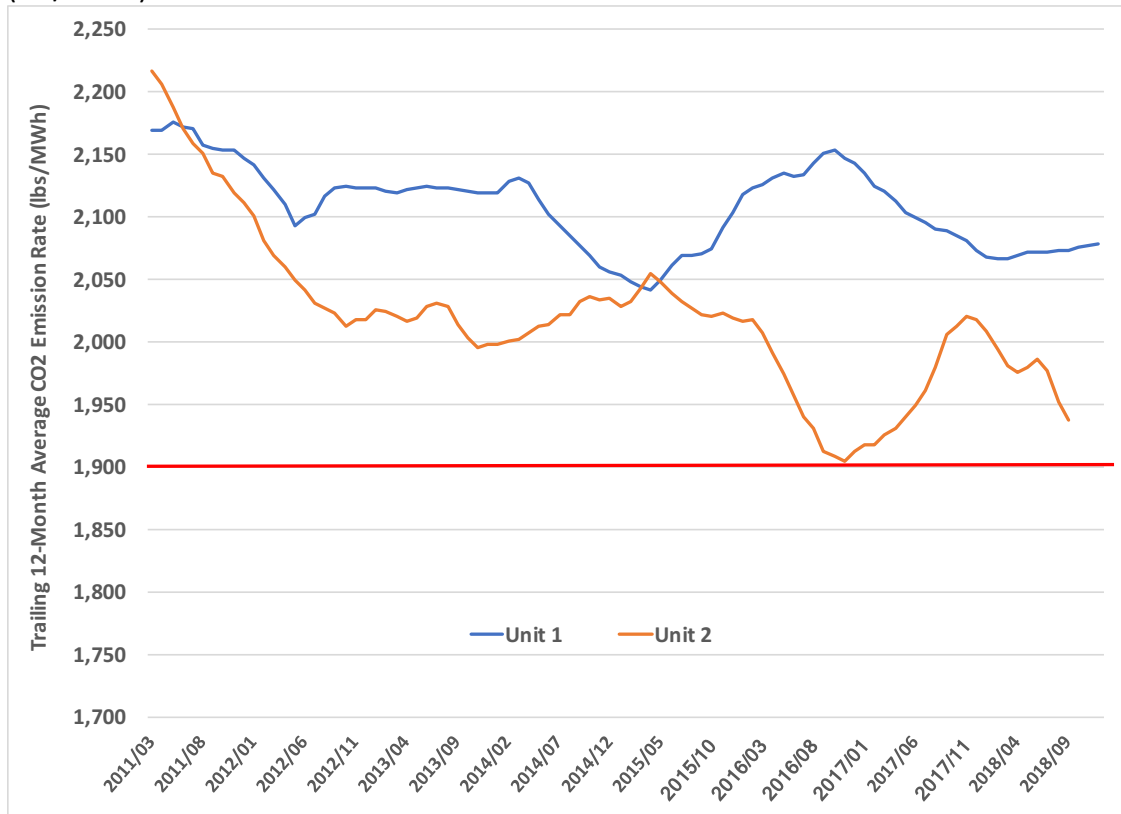




FIGURE 7: OAK GROVE UNITS 1, 2: 12-MONTH ROLLING AVERAGE CO<sub>2</sub> EMISSION RATE (lbs/MWh)



## OBSERVATIONS

Key observations are summarized as follows:

- Neither Oak Grove Units 1, 2 could meet the proposed 1,900 lbs/MWh rate per 12-month rolling average
- A strong relationship between CO<sub>2</sub> emission rate and load is not evident:
  - Unit 1: least CO<sub>2</sub> emission rate observed at high load, no significant change over the observation period of 8 years.
  - Unit 2: least CO<sub>2</sub> emission rate observed at low load, with a decrease of 300 lbs/MWh over the observation period of 8 years.
  - Median CO<sub>2</sub> emission rate for both Units 1 and 2 is consistent over the last 3 years, as the standard deviation of CO<sub>2</sub> emission rate at high load is a relatively low value of 55-67 lbs/MWh).

These data suggest a subcategory for NSPS CO<sub>2</sub> emission rate can be justified for lignite-fired supercritical boilers.