

March 16, 2015

Mr. Jimmy Don Havins, P.E.  
Senior Vice president, Generation  
Sim Gideon Power Plant Designated Representative  
Lower Colorado River Authority  
P.O. Box 220  
Austin, Texas 78767

Re: Petition for Approval of an Alternative Data Substitution Methodology for Units 2 and 3 at the Sim Gideon Power Plant (Facility ID (ORISPL) 3601)

Dear Mr. Havins:

The United States Environmental Protection Agency (EPA) has reviewed the May 30, 2014 petition submitted under 40 CFR 75.66 by Lower Colorado River Authority (LCRA) requesting approval to use alternative missing data substitution procedures to report nitrogen oxides (NO<sub>x</sub>) emissions data for Units 2 and 3 at the Sim Gideon Power Plant. EPA approves the petition in part, with conditions, as discussed below.

### Background

LCRA owns and operates the Sim Gideon Power Plant (Sim Gideon) in Bastrop County, Texas. Sim Gideon Unit 2 is a wall-fired, dry bottom boiler serving a generator with reported nameplate capacity of 144 MW, and Sim Gideon Unit 3 is a tangentially-fired boiler serving a generator with reported nameplate capacity of 351 MW.<sup>1</sup> Both units combust primarily pipeline natural gas but may also combust diesel oil. According to LCRA, Units 2 and 3 are or have been subject to the Acid Rain Program and to trading programs for sulfur dioxide (SO<sub>2</sub>) and NO<sub>x</sub> under the Clean Air Interstate Rule (CAIR) and the Cross-State Air Pollution Rule (CSAPR).<sup>2</sup> LCRA is therefore required to continuously monitor and report SO<sub>2</sub>, NO<sub>x</sub>, and carbon dioxide (CO<sub>2</sub>) mass emissions, NO<sub>x</sub> emission rate, and heat input for these units in accordance with 40 CFR Part 75.

To meet the Sim Gideon units' Part 75 NO<sub>x</sub> emissions monitoring requirements, LCRA has installed and certified NO<sub>x</sub>-diluent CEMS at each of the units. A NO<sub>x</sub>-diluent CEMS continuously measures the concentrations of NO<sub>x</sub> and a diluent gas – in Sim Gideon's case, CO<sub>2</sub> – in a unit's flue gas, and the two sets of concentration data are used in combination to compute the unit's hourly NO<sub>x</sub> emission rate (in lb/mmBtu). The hourly NO<sub>x</sub> emission rate data can then be combined with the unit's hourly heat input data (in mmBtu) to compute hourly NO<sub>x</sub> mass

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<sup>1</sup> The reported nameplate capacity values are from EIA Form 860.

<sup>2</sup> During the period at issue in the petition, CAIR rather than CSAPR was in effect.

emissions. The Sim Gideon CEMS use dilution-extractive probes to obtain flue gas samples for analysis. The flue gas samples are continuously extracted from the stack, diluted with purified air in a known ratio outside the stack environment, and transported to the NO<sub>x</sub> and CO<sub>2</sub> concentration analyzers. If a dilution probe is not operating properly, the actual dilution ratio can deviate from the design dilution ratio, leading to biased concentration measurements. At the Sim Gideon units, a downward bias in concentration measurements could be expected to cause downward bias in the values reported for both NO<sub>x</sub> emission rate and NO<sub>x</sub> mass emissions.<sup>3, 4</sup>

In August 2011 and December 2011, LCRA discovered dilution probe problems at Sim Gideon Unit 2 and Unit 3, respectively, that had gone undetected for significant periods of time. The May 30, 2014 petition concerns NO<sub>x</sub> emissions data quality issues resulting from these two distinct problems. In the petition, LCRA discusses its investigations of the probe leak problems and requests authorization to use an alternative to the standard Part 75 missing data substitution procedures. LCRA also describes steps being taken to ensure that any future probe leaks are detected and addressed in a more timely manner.

### Problems with Unit 2's dilution probe

According to the May 30, 2014 petition, LCRA initially became concerned about potential NO<sub>x</sub> emissions data quality issues at Sim Gideon Unit 2 following a relative accuracy test audit (RATA) performed in August 2011. Plant personnel had previously observed multiple o-ring failures in Unit 2's dilution probe (believed to be caused by poor probe temperature control) and had selectively invalidated CEMS data when specific o-ring failures were identified. However, it was not until after the August 2011 RATA that LCRA decided that the potential for the recurring o-ring failures to cause data quality issues merited a more systematic investigation.

One portion of LCRA's investigation consisted of analyses of the historical data measured by Unit 2's NO<sub>x</sub>-diluent CEMS over the period from 2009 through 2011, focusing particularly on the relationship of measured CO<sub>2</sub> concentration to load. An analysis of quarterly average measured CO<sub>2</sub> concentrations sorted by load bin showed a distinct change in the CO<sub>2</sub>-to-load relationship beginning in the second quarter of 2010. Starting in that quarter, the average measured CO<sub>2</sub> concentrations dropped substantially below the comparatively stable average measured CO<sub>2</sub> concentrations from previous quarters, particularly in the lowest load bins, where LCRA found a decline in average measured CO<sub>2</sub> concentrations of approximately 60%.

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<sup>3</sup> The formula LCRA uses to determine the reported values for NO<sub>x</sub> emission rate includes measured NO<sub>x</sub> concentration in the numerator and measured CO<sub>2</sub> concentration in the denominator, making it theoretically possible for equal biases in the two measured concentrations to offset one another and not cause a bias in the reported NO<sub>x</sub> emission rate values. However, LCRA also exercises the option provided under section 3.3.4.1 of Appendix F to Part 75 to substitute the CO<sub>2</sub> "diluent cap" value of 5.0% in hours when measured CO<sub>2</sub> concentrations are below that level. During the time periods at issue here, the measured CO<sub>2</sub> concentrations at Sim Gideon Units 2 and 3 were frequently below 5%, and use of the 5% CO<sub>2</sub> diluent cap value in combination with downward-biased NO<sub>x</sub> concentration measurements therefore would have resulted in a downward bias in reported NO<sub>x</sub> emission rate values. To determine the reported values for NO<sub>x</sub> mass emissions LCRA multiplies NO<sub>x</sub> emission rate by heat input, so a downward bias in reported NO<sub>x</sub> emission rate values also would have resulted in a downward bias in reported NO<sub>x</sub> mass emissions values.

<sup>4</sup> Dilution probe problems at the Sim Gideon units do not implicate reported values for SO<sub>2</sub> emissions, CO<sub>2</sub> emissions, or heat input. LCRA determines these reported values using protocols under Appendices D and G to Part 75 that do not rely on gas concentration measurements obtained through use of the dilution probes.

The second portion of LCRA's investigation consisted of interviews with plant personnel and examination of Unit 2's operating and maintenance records and quality assurance (QA) test results. According to the petition, LCRA apparently found nothing unusual in this portion of the investigation other than the previously known o-ring issue described above. However, EPA's examination of the results of a RATA performed in September 2010 showed significant discrepancies between the NO<sub>x</sub> and CO<sub>2</sub> concentrations as measured by the CEMS and as measured using the EPA reference method.<sup>5</sup>

Based on its investigation of the Unit 2 dilution probe problems, LCRA concluded that the CO<sub>2</sub> concentration data and NO<sub>x</sub> concentration data measured using the faulty dilution probe, and therefore the NO<sub>x</sub> emission rate and NO<sub>x</sub> mass emissions data computed based on those concentration data, should be invalidated for the period from April 1, 2010, hour 0000, through October 17, 2011, hour 2000.<sup>6</sup>

### Problems with Unit 3's dilution probe

According to the May 30, 2014 petition, LCRA initially became concerned about potential NO<sub>x</sub> emissions data quality issues at Sim Gideon Unit 3 in December 2011 when maintenance personnel inspecting the CEMS discovered that the dilution probe "stinger" – the portion of the probe extending into the stack – was missing. Upon this discovery, an identical stinger from Unit 2 was removed (Unit 2 was offline at the time) and installed on Unit 3. New probes and replacement stingers were then ordered and installed on July 24, 2012.

LCRA investigated the potential for the faulty Unit 3 dilution probe to cause NO<sub>x</sub> emissions data quality issues in a manner similar to its investigation for Unit 2. In the case of Unit 3, LCRA evaluated the hourly historical CO<sub>2</sub> and NO<sub>x</sub> data measured over the period from 2007 through 2011. The data analysis revealed a sudden drop in the measured concentrations of both CO<sub>2</sub> and NO<sub>x</sub> on August 21, 2009, hour 22, which appears likely to have been when the probe stinger fell off. The data analysis also showed a sudden increase in the measured concentrations of both NO<sub>x</sub> and CO<sub>2</sub>, as well as in the reported NO<sub>x</sub> emission rate, in December 2011 after the replacement stinger from Unit 2 was installed.

As at Unit 2, LCRA also interviewed plant personnel and examined Unit 3's operating and maintenance records and QA test results. Although most of this portion of the investigation apparently showed nothing that LCRA found unusual, when reviewing the results of the 2009, 2010, and 2011 RATAs at Unit 3, LCRA observed that there was a "noticeable disparity" between the NO<sub>x</sub> and CO<sub>2</sub> concentrations measured for the RATAs using the EPA reference

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<sup>5</sup> CEMS measurements were approximately 25% below the reference method measurements. The petition notes that the Sim Gideon CEMS measurements are performed on a wet basis (inclusive of stack moisture) while the reference method measurements are performed on a dry basis (exclusive of stack moisture). However, measurement discrepancies attributable to wet-dry basis differences would be limited to the stack moisture percentage – which the petition states would be approximately 15% at Sim Gideon – indicating that there was an unexplained discrepancy between the CEMS and reference method measurements of at least 10%.

<sup>6</sup> October 17, 2011, hour 2000, was the last hour Unit 2 operated in that year.

method and the concentrations measured by the CEMS.<sup>7</sup> In the discussion of these disparities, LCRA points out that the reference method used for the RATAs measures concentrations on a dry basis, excluding stack moisture, whereas the Sim Gideon CEMS measure concentrations on a wet basis, including stack moisture, and that the presence of moisture in the flue gas (which is estimated to be about 15% H<sub>2</sub>O) will always cause a difference between measured NO<sub>x</sub> and CO<sub>2</sub> concentrations obtained using dry-basis and wet-basis methodologies. However, the petition also acknowledges that the differences in the measured concentrations seen in these RATAs were too large to be explained solely by differences between dry-basis and wet-basis measurement methodologies.

Based on its investigation of the Unit 3 dilution probe problems, LCRA concluded that the CO<sub>2</sub> concentration data and NO<sub>x</sub> concentration data measured using the faulty dilution probe, and therefore the NO<sub>x</sub> emission rate and NO<sub>x</sub> mass emissions data computed based on those concentration data, should be invalidated for the period from August 21, 2009, hour 22, through December 6, 2011, hour 23 (when the probe stinger was replaced).

#### LCRA's proposed alternative data substitution methodologies

Under the standard missing data substitution procedures specified in §75.33, the conservatism of the substitute data increases when the percent monitor data availability (PMA) falls below certain thresholds. When a NO<sub>x</sub>-diluent CEMS experiences an extended failure causing the PMA to decline below 80%, standard substitute data generally reflect the unit's maximum potential NO<sub>x</sub> emission rate (MER) as defined in the unit's monitoring plan. Under §75.33(c)(7) and (8), the MER can be determined on a fuel-specific basis using recent historical data. However, in the 2009-2011 period, LCRA's monitoring plans for both units included non-fuel-specific MER values of 0.99 lb NO<sub>x</sub>/mmBtu based on older or default inputs.<sup>8</sup> LCRA claims that using this MER value to substitute for the missing data at Units 2 and 3 under the standard missing data substitution procedures would grossly overstate the units' actual emissions and would be unnecessarily conservative. In the May 30, 2014 petition, LCRA therefore requests permission to use one of two proposed alternative data substitution methodologies.<sup>9</sup>

LCRA's first proposed alternative is to continue to use standard missing data substitution, but with fuel-specific MER values instead of the MER value of 0.99 lb NO<sub>x</sub>/mmBtu that was reflected in the units' monitoring plans during the missing data periods. The proposed fuel-specific MER values would be determined based on recent historical CEMS data and would be

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<sup>7</sup> EPA notes that, in fact, some of the CEMS measurements were more than 80% below the corresponding reference method measurements. As noted earlier, the maximum discrepancy between the two sets of measurements explainable by wet-dry basis differences would be approximately 15%, indicating that there was an unexplained discrepancy of at least 65%.

<sup>8</sup> For each unit, LCRA computed the MER of 0.99 lb NO<sub>x</sub>/mmBtu using a value of 400 ppm for the maximum potential concentration (MPC) of NO<sub>x</sub>, the 5.0% CO<sub>2</sub> diluent cap value for boilers, and the F<sub>c</sub> factor of 1040 scf CO<sub>2</sub>/mmBtu for natural gas combustion. In the case of Unit 2, the 400 ppm value was based on historical data from 2000, adjusted upwards for conservatism, and in the case of Unit 3, the 400 ppm value was based on a default value of 380 ppm from Table 2.2 in section 2.1.2.1 of Appendix A to Part 75, also adjusted upwards for conservatism.

<sup>9</sup> LCRA also considered the possibility of using the data measured during the periods of the dilution probe problems in combination with quality-assured historical data to develop appropriate bias correction factors, but concluded that this approach was not viable because of insufficient data.

computed according to the procedures for determination of fuel-specific MER values set forth in §75.33(c)(7) and (8) and section 2.1.2.1 of Appendix A to Part 75. Specifically, for Unit 2 LCRA proposes to use a fuel-specific MER value of 0.346 lb NO<sub>x</sub>/mmBtu for hours of natural gas combustion (which was all operating hours in the missing data period)<sup>10</sup> and the previous MER value of 0.99 lb NO<sub>x</sub>/mmBtu for (zero) hours of oil combustion. For Unit 3 LCRA proposes to use a fuel-specific MER value of 0.361 lb NO<sub>x</sub>/mmBtu for hours of natural gas combustion<sup>11</sup> and a fuel-specific MER value of 0.687 lb NO<sub>x</sub>/mmBtu for hours of oil combustion.<sup>12</sup>

LCRA's second, and preferred, proposed alternative is to substitute, for each hour when a unit operated in a particular load bin during its missing data period, the 99<sup>th</sup>-percentile quality-assured NO<sub>x</sub> emission rate reported for the unit in recent past hours when the unit operated in that load bin. For Unit 2 LCRA proposed to use historical data from the period from January 1, 2009 through March 31, 2010, and for Unit 3 LCRA proposed to use historical data from the period from January 1, 2007 through August 21, 2009. LCRA also requested permission to continue to use this alternative data substitution approach after the missing data period until the units' respective PMAs rise above 80%.

Table 1 below shows a comparison of NO<sub>x</sub> mass emissions as originally reported by LCRA for Unit 2 during its missing data period to EPA's estimates of the NO<sub>x</sub> mass emissions that would be reported using the standard missing data substitution procedures under §75.33(c) and using LCRA's first proposed alternative methodology,<sup>13</sup> as well as LCRA's estimates of the NO<sub>x</sub> mass emissions that would be reported using LCRA's second proposed alternative methodology. Table 2 below shows the analogous comparisons for Unit 3 during its missing data period.

**Table 1. Sim Gideon Unit 2, Comparison of Standard Substitute Data vs Proposed Alternative Substitute Data.**

Year of Missing Data	Reported NO <sub>x</sub> Mass Emissions (tons)	NO <sub>x</sub> Mass Emissions Using Standard Missing Data Substitution with a MER of 0.99 lb/mmBtu (tons)	NO <sub>x</sub> Mass Emissions Using Standard Missing Data Substitution with Fuel-specific MER Values (tons)	NO <sub>x</sub> Mass Emissions Using 99 <sup>th</sup> -Percentile Historical Values (tons)
2010	63	88	88	89
2011	33	328	118	66

<sup>10</sup> LCRA computed this MER value using a historical NO<sub>x</sub> MPC of 234.1 ppm (observed on December 21, 2009), the corresponding historical CO<sub>2</sub> concentration of 8.4% CO<sub>2</sub>, and the F<sub>c</sub> factor of 1040 scf CO<sub>2</sub>/mmBtu for natural gas combustion.

<sup>11</sup> LCRA computed this MER value using a historical NO<sub>x</sub> MPC of 203.4 ppm (observed on January 18, 2007), the corresponding historical CO<sub>2</sub> concentration of 7.0% CO<sub>2</sub>, and the F<sub>c</sub> factor of 1040 scf CO<sub>2</sub>/mmBtu for natural gas combustion.

<sup>12</sup> LCRA computed this MER value using the same historical NO<sub>x</sub> MPC of 203.4 ppm, the 5.0% CO<sub>2</sub> diluent cap for boilers, and the F<sub>c</sub> factor of 1420 scf CO<sub>2</sub>/mmBtu for oil combustion.

<sup>13</sup> EPA's estimates differ slightly from the estimates included in LCRA's petition.

**Table 2. Sim Gideon Unit 3, Comparison of Standard Substitute Data vs Proposed Alternative Substitute Data.**

Year of Missing Data	Reported NO <sub>x</sub> Mass Emissions (tons)	NO <sub>x</sub> Mass Emissions Using Standard Missing Data Substitution with a MER of 0.99 lb/mmBtu (tons)	NO <sub>x</sub> Mass Emissions Using Standard Missing Data Substitution with Fuel-specific MER Values (tons)	NO <sub>x</sub> Mass Emissions Using 99 <sup>th</sup> -Percentile Historical Values (tons)
2009	340	847	539	495
2010	159	4099	1496	757
2011	109	2362	888	412

EPA's Determination

EPA agrees with LCRA that the NO<sub>x</sub> emission rate and NO<sub>x</sub> mass emissions data previously reported for Units 2 and 3 for the time periods in question are not valid and must be replaced with substitute data. Further, the Agency agrees that use of the standard missing data procedures in §75.33(c) with a MER value of 0.99 lb NO<sub>x</sub>/mmBtu, pursuant to the units' monitoring plans as in effect during the missing data periods, would unnecessarily overestimate the NO<sub>x</sub> mass emissions due to the high level of the 0.99 lb NO<sub>x</sub>/mmBtu MER value compared to alternative possible MER values generally available to LCRA under standard Part 75 procedures.

EPA approves LCRA's first proposed alternative data substitution methodology, as modified below. This methodology represents standard Part 75 missing data substitution for a unit whose monitoring plan includes fuel-specific MER values based on historical data, and LCRA would have been entitled to use this methodology under the Part 75 regulations without a petition if the appropriate fuel-specific MER values had been included in the units' monitoring plans before the occurrence of the probe problems. LCRA's approach to determining the proposed MER values applicable to hours of gas combustion appears reasonable, and EPA accordingly approves use of those values – i.e., 0.346 lb NO<sub>x</sub>/mmBtu for Unit 2 and 0.361 lb NO<sub>x</sub>/mmBtu for Unit 3 – as substitute data for hours of natural gas combustion during their respective missing data periods addressed by the petition.<sup>14</sup>

EPA's modification to LCRA's proposed methodology consists of a revision to the proposed MER values applicable to hours of oil combustion. Under Section 2.1.2.1(e) of Appendix A to Part 75, computation of a fuel-specific MER value from historical data requires a minimum of 720 hours of quality-assured data monitored while that fuel was being combusted, and according to LCRA neither Sim Gideon unit has combusted oil for a significant number of hours in recent years. Accordingly, the units must instead use fuel-specific MER values for oil combustion computed from default inputs. EPA determines that Units 2 and 3 may use fuel-

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<sup>14</sup> EPA notes that under sections 2.1.2.1(c) and 2.1.2.5 of Appendix A to Part 75, LCRA is required to review the data and assumptions underlying the MER values in the Sim Gideon units' monitoring plans at least annually and to update the MER values if necessary.

specific MER values of 2.035 lb NO<sub>x</sub>/mmBtu and 1.289 lb NO<sub>x</sub>/mmBtu, respectively, as substitute data for hours of oil combustion (if any).<sup>15</sup>

EPA rejects LCRA's second proposed alternative data substitution methodology. An important purpose of the standard missing data substitution procedures set forth in §75.33, in addition to ensuring that reasonable yet conservative data are reported when quality-assured monitored data are not available, is to provide incentives for good CEMS maintenance practices in order to ensure high CEMS availability. The fact that the missing data periods at Sim Gideon Units 2 and 3 were extensive means that the standard missing data substitution procedures will produce higher reported emission values than would have been the case if the dilution probe problems had been discovered and resolved promptly, but that outcome is consistent with the purpose of the procedures. EPA is not persuaded that the standard procedures, applied using fuel-specific MER values based on recent historical data as approved above, overstate emissions to such an extent as to merit an exception to the standard procedures in this instance.

Finally, in the May 30, 2014 petition, LCRA provided a "Plan of Action to Avoid Similar Issues in the Future." EPA is generally supportive of LCRA's plan, but encourages LCRA to add emphasis on the use of control charts and to more carefully evaluate RATA results, paying particular attention to any significant discrepancies between the NO<sub>x</sub> and CO<sub>2</sub> concentrations measured by the CEMS and by the reference methods. EPA believes that if processes of this nature had been in place at Sim Gideon at the time the probe problems developed, the dilution probe problems could have been discovered and resolved much sooner.

#### Conditions of Approval

The conditions of this approval are as follows:

1. For Sim Gideon Unit 2:
  - (a) LCRA shall provide substitute NO<sub>x</sub> emission rate (lb/mmBtu) data for each operating hour in the time period extending from April 1, 2010, hour 00 through October 17, 2011, hour 20. LCRA shall use the standard (non-fuel-specific) missing data routines in §75.33(c) until the percent monitor data availability drops below 80.0 percent, after which the approved fuel-specific MER values of 0.346 lb/mmBtu (for natural gas combustion) and 2.035 lb/mmBtu (for oil combustion) shall be reported for the remaining hours of the missing data period. For each hour in which the fuel-specific MER is reported, LCRA shall report a method of determination code (MODC) of "55" (i.e., other substitute data approved through petition).
  - (b) LCRA shall resubmit the second, third and fourth quarter electronic data reports (EDRs) for 2010 and all four quarterly EDRs for 2011.

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<sup>15</sup> EPA computed these MER values using default NO<sub>x</sub> MPC values of 600 ppm for Unit 2 (a wall-fired, dry bottom boiler) and 380 ppm for Unit 3 (a tangentially-fired boiler), respectively. See Table 2.2 in section 2.1.2.1 of Appendix A to Part 75. For both MER value computations, EPA also used the 5.0% CO<sub>2</sub> diluent cap value for boilers and the F<sub>c</sub> factor of 1420 scf CO<sub>2</sub>/mmBtu for oil combustion.

2. For Sim Gideon Unit 3:

- (a) LCRA shall provide substitute NO<sub>x</sub> emission rate (lb/mmBtu) data for each operating hour in the time period extending from August 21, 2009, hour 22 through December 6, 2011, hour 23. LCRA shall use the standard (non-fuel-specific) missing data routines in §75.33(c) until the percent monitor data availability drops below 80.0 percent, after which the approved fuel-specific MER values of 0.361 lb/mmBtu (for natural gas combustion) and 1.289 lb/mmBtu (for oil combustion) shall be reported for the remaining hours of the missing data period. For each hour in which the fuel-specific MER is reported, LCRA shall report a method of determination code (MODC) of “55” (i.e., other substitute data approved through petition).
- (b) LCRA shall resubmit the third and fourth quarter electronic data reports (EDRs) for 2009 and all four quarterly EDRs for both 2010 and 2011.

LCRA shall coordinate the resubmission of the EDRs with Mr. Craig Hillock, who may be reached at (202) 343-9105 or by email at [hillock.craig@epa.gov](mailto:hillock.craig@epa.gov). LCRA shall address any allowance accounting issues for Sim Gideon Units 2 and 3 with Mr. Kenon Smith, who may be reached at (202) 343-9164 or by email at [smith.kenon@epa.gov](mailto:smith.kenon@epa.gov).

EPA’s determination relies on the accuracy and completeness of the information provided by LCRA in the May 30, 2014 petition and the supplementary data provided to EPA via email on June 20, 2014, March 13, 2014, and May 13, 2013, and is appealable under 40 CFR Part 78. If you have any questions or concerns about this determination, please contact Jenny Jachim at (202) 343-9590 or by email at [jachim.jenny@epa.gov](mailto:jachim.jenny@epa.gov).

Sincerely,

/s/

Reid P. Harvey, Director  
Clean Air Markets Division

cc: Mr. Raymond Magyar, Air Enforcement Section, Region VI  
Mr. Sandy Simko, Texas Commission on Environmental Quality  
Jenny Jachim, CAMD  
Craig Hillock, CAMD  
Kenon Smith, CAMD  
Travis Johnson, CAMD