To: Climate Action Reserve Offset Project Protocol Team

From: Dr. Edward Bentz

RE: Comments & Feedback: Nitric Acid Production Project Protocol Version 1.0 (October 14,2009)

November 10, 2009

Following up on the Webinar on Tuesday, November 3:

SUGGESTIONS for Consideration:

Section 2.1, pp 9: May wish to insert: With current catalyst technology, Non Selective Catalytic Reduction (NSCR) is more efficient at reducing N2O, but entails a penalty of higher capital and operating costs. This is due to: the need to add fuel in the intake process; the need to have more expensive materials to support the higher stack gas temperatures (1,000-1,100 degrees F); and the associated need for higher maintenance costs. NSCR, however, can achieve reductions of 80-90 % of N2O. *(Note: Some of these considerations have been identified in Appendix A, pp 61)*

Section 5.1.1.1,pp 21: May wish to add to the permitted operating conditions (1) and (2), a determination of maximum age (useful life), and condition of catalyst. Reactor yields are very dependent on catalyst efficiency, which , in turn, is affected by the operating parameters identified, and catalyst condition.

Section 5.1.1.1, pp22: Regarding statistical analysis of historical data: For many catalytic oxidation processes, the time series data for temperature, and pressure may not be totally stochastic. The time series distributions may be skewed (non normal) reflecting the way the operator has run the plant to achieve high yields, within plant -specific operating restrictions (*reflecting in some part the age of the plant, and the desire by the plant operator to make cost effective tradeoffs of feedstock costs , and HNO3 yields*). In these cases, the protocol may wish to consider different "normalized" percentiles to reflect outlier behavior to determine minimum and maximum operating conditions (the "typical" operating data may be skewed both high and low , and does not resemble a Gaussian distribution). A preliminary accompanying statistical confirmatory sensitivity analyses can be used to reveal parameter (temperature, pressure) dependences, and correlations in the above that affect the shape of the distribution at the resulting determination of maxima, and minima end points within the confidence intervals. Since your crediting period is restricted to 10 years (plus a renewal), and most equipment life is greater than 10 years (exception of catalyst), there should be little error introduced in determining the confidence interval end points once the distribution is known.

Section 5.1.2 , pp 23: Same type of considerations as above for the statistical analysis for the flow rates (the 95% confidence interval may not be at 1.96 times the standard deviation if the distribution is not gaussian).

Section 5.2.1, Equation 5.7 pp 27, Equation 5.9 pp 30, and Section 6.4 pages 40, and 43: Same consideration as above applies. The length of the interval i (and the calibration of the N2O instrument which is using a continuous batch process) should be selected to match the behavior of the stack gas flows so that excessive highs and lows are not "washed out" in the data reporting cycle. **Section 6.4 Table pp 40 (for Equation 5.3)** designates the measurement frequency as *"every one minute"*, whereas **Section 6.4, Table pp 43 (for Equation 5.7)**, and **Table pp**

Dr. Ed Bentz
ejbaejb@aol.com
703-455-7469

44 (for Equation 5.9) designates the measurement frequency as *"continuous, and summed over interval i."*

OTHER: As identified during the Webinar on November 3, the technology is changing rapidly due to energy efficiency concerns, global competitive factors, and government policy initiatives (US, and other). A "technology watch" may suggest future candidates for protocol revision and update.

Dr. Ed Bentz
ejbaejb@aol.com
703-455-7469