UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

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MEMORANDUM

SUBJECT: Policy on Overlapping or Staggered Stack Test Runs

FROM: Richard A. Wayland, Director Richard A. Wayland
Air Quality Assessment Division (C304-02)

TO: Air Division Directors
Phillip Brooks, Office of Enforcement and Compliance Assurance
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Recently, the Office of Air Quality Planning & Standard's Measurement Technology Group (MTG) has received multiple inquiries regarding the use of overlapping (or staggered) stack test runs while conducting performance tests for compliance or certification/quality assurance tests for continuous emission monitoring systems (CEMS) required under 40 CFR parts 51, 59, 60, 61 and 63, including 40 CFR part 60, Appendix B, Performance Specifications and Appendix F, Quality Assurance Procedures. We now understand that these inquiries may, in part, be due to a letter issued on February 27, 2008, by Conniesue Oldham, formerly of my staff, to Ms. JoAnne Rau of Dayton Power and Light, which allowed the use of overlapping test runs during an upcoming Performance Specification 11 (40 CFR part 60, Appendix B) correlation test at that facility only. The letter notes that at the time it was written there were no Federal standards requiring the use of particulate matter (PM) CEMS to demonstrate compliance. We now understand that this letter has been misinterpreted to allow much wider use of overlapping test runs for other facilities who are using PM CEMS to meet regulatory requirements. We believe it timely to clarify why the prior letter should not be applied, especially for regulatory and compliance purposes, and that overlapping (or staggered) runs should not be allowed.

Overlapping or staggered test runs occur when a new test run is begun before the previous test run is complete. While such an approach may save time and resources associated with testing, there are both scientific and regulatory reasons to disallow this practice for all emission testing. For example, the statistics used in the CEMS performance specifications require a minimum number of data points to determine relative accuracy or to develop and quality assure the

correlation curve necessary for a PM CEMS. See 40 CFR part 60, Appendix B, Performance Specification 2 (PS-2) and 40 CFR part 60, Appendix B, Performance Specification 11 (PS-11). Each data point is considered an observation of an event or process occurring over a time period (i.e., reference method value vs. CEMS response). When test runs used to determine and quality assure these observations overlap, the result is a loss of information regarding the temporal variability in the data set then used to determine relative accuracy or to develop a correlation. In addition, when test runs overlap in time, they are no longer distinctly independent and this overlap forces a relationship between the data points that may create a false indication of overall measurement variability and statistical correlation. Overlapping measurements are not independent and can induce autocorrelation in observations.[1] Loss of independent observations can result in an effective sample size which is less than the required sample size.[2] Thus overlapping measurements can lead to biased hypothesis testing, inefficient estimators, and incorrect calculations of correlation.[3] The acceptable statistical practice used to determine relative accuracy under PS-2 or to develop a correlation under PS-11 are based on the assumption that the test runs that define the relationship between the reference method and the CEMS results (or observations) provide completely independent measurements and an appropriate representation of the temporal variability in source operations. Thus, the use of overlapping test runs could lead to an inappropriately certified CEMS that generates data that is not reflective of a source's actual emissions. Such errors would then be used to evaluate compliance with the relevant standards and could also lead to unnecessary uncertainty in analyses such as risk assessments, emissions factors, or future standard setting decisions.

In addition to the technical concerns associated with staggered test runs, the EPA believes the 2008 letter allowing the use of overlapping test runs is in fact inconsistent with several EPA regulations. For example, the EPA has defined a performance test to "*…consist of three separate runs using the applicable test method. Each run shall be conducted for the time and under the conditions specified in the relevant standard" (*§63.7(e)(3)). EPA considers a test run to be "*…one of a series of emission or other measurements needed to determine emissions for a representative operating period... " (§63.2).* Subsequent rulemakings have similarly included language indicating that stack test runs may not to be conducted in a staggered or overlapping fashion, for example section 3.6 of Method 30B and section 3.15 Method 7E (40 CFR part 60, Appendix A) which both define a test run as "*…a series of gas samples taken successively from the stack or duct."* For those EPA regulations that specifically require separate runs, the EPA concludes that such regulations should be interpreted prospectively to require each test run to be consecutive and temporally distinct when used to determine compliance with an applicable standard or to certify a continuous emissions monitoring system (CEMS) used to determine compliance.

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[1]Britten-Jones, Mark, Neuberger, Anthony and Nolte, Ingmar. (2011) *Improved inference and estimation in regression with overlapping observations.* Journal of Business Finance & Accounting, Vol.38 (No.5-6). pp. 657-683. ISSN 0306-686X

[2]Ibid

[3]Ibid

Furthermore, the EPA uses data collected by and from industry when establishing emission limits and such limits are generally based on averages calculated from distinct test runs. For this reason, test data generated in response to a section 114 information collection request should also be distinct so that the EPA has the data necessary to establish emission standards, and the agency will consider clarifying this requirement in future information collection requests so that approval authorities can ensure that facility test plans include independent runs. To align with the data used to establish the standards, the EPA finds that performance test runs and test runs used during a performance evaluation conducted to certify a CEMS should also be distinct and separate and should not overlap. The Agency believes that the collection of accurate and consistent data is critical to ensuring compliance with Federal standards and the ongoing evaluation of emissions from sources.

The EPA concludes that the use of staggered or overlapping emission test runs is contrary to sound statistical principles and inconsistent with several EPA regulations. For this reason, we find that the prior allowance of the use of overlapping test runs was in error and that prospectively the use of overlapping or staggered test runs is not appropriate for source emission measurements conducted pursuant to any Federal requirement.

If you or your state and local agencies should have any questions regarding this memo or need assistance with a related issue, please contact Kim Garnett of my staff at 919-541-1158 or garnett.kim@epa.gov.

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