



From: Jacob Felton, Director, Air Enforcement Division
To: Owners/operators of combustion emission units that utilize CEMS to demonstrate compliance with RACT emission limitations under RCSA § 22a-174-22e
Date: December 12, 2023

Re: Acceptable use of diluent cap in reducing gaseous and/or liquid fuel-fired combustion turbine and boiler CEMS data to demonstrate compliance with RACT emission limitations under RCSA § 22a-174-22e

I. BACKGROUND

This guidance memorandum establishes the Department of Energy and Environmental Protection's ("Department") position on the limited use of a diluent cap to reduce continuous emission monitoring system ("CEMS") data in accordance with Regulations of Connecticut State Agencies ("RCSA") § 22a-174-22e, the Department's reasonably available control technology ("RACT") rule for nitrogen oxides ("NOx") emissions.

This guidance is intended to offer a consistent, predictable framework for the limited use of a diluent cap,¹ in a manner that does not undermine the stringency of the applicable RACT limitation(s), for gaseous and/or liquid fuel-fired combustion turbines (both simple and combined cycle) and gaseous and/or liquid fuel-fired boilers (both industrial/commercial/institutional ["ICI"] and those serving electric generating units ["EGUs"]). This guidance applies when it is necessary to demonstrate compliance with the applicable RACT limitation(s) at RCSA § 22a-174-22e(d)² by utilizing CEMS to determine emissions in units of mass per unit heat input,³ calculated according to the U.S. Environmental Protection Agency's ("EPA") F factor equations,⁴ or concentration by volume.⁵ The Department's intent is to offer guidance on the acceptable use of a diluent cap for RACT compliance purposes only in the context of the aforementioned categories of emission units; CEMS data reduction for RACT compliance purposes for other categories of emission units is subject to case-by-case review.

¹ Emission units subject to RACT limitations may also be subject to one or more federal regulations and/or to New Source Review or Title V permit conditions that allow for the use of a diluent cap in reducing CEMS data to demonstrate compliance with the emission limitations contained therein. Any such diluent cap regime should not be applied for the purposes of reducing CEMS data to demonstrate compliance with RACT limitations under RCSA § 22a-174-22e, except as provided for in this guidance memorandum or as specifically authorized by state or federal statute, regulation, permit, or order.

² This guidance does not apply to all categories of emission units subject to RCSA § 22a-174-22e, nor does it apply to RACT limitations for existing municipal waste combustors under RCSA § 22a-174-38, which separately provides for the limited use of a diluent cap.

³ E.g., pounds per million British thermal units

⁴ E.g., equations 19-1 through 19-9 of appendix A-7 to title 40, Code of Federal Regulations ("CFR"), part 60; equations F-5 and F-6 of appendix F to 40 CFR part 75

⁵ E.g., parts per million by volume

Nothing in this guidance memorandum shall be construed to supersede the requirements of any state or federal statute, regulation, permit, or order.

II. GUIDANCE

Connecticut's NO_x RACT rule establishes, among other emission standards, "daily block average" NO_x limitations applicable to certain combustion units, including gaseous and/or liquid fuel-fired simple- and combined-cycle combustion turbines, ICI boilers, and boilers serving EGUs.⁶

The rule allows and, in certain cases, requires that owners/operators utilize CEMS to demonstrate compliance with such daily-block-average emission limitations.⁷ "Daily block average" is defined as "the arithmetic mean of all hourly emission concentrations or rates recorded when an emission unit is operating measured over the 24-hour period from 12 a.m. (midnight) to 12 a.m. (midnight)."⁸ Such emission averages are to include "all periods of operation, except as provided in subsection (m)(3)."⁹ Emission data are generally excluded from compliance averages during out-of-control periods; quality-assurance and quality-control activities; maintenance or repair of the monitoring system "to prevent or correct a malfunction"; and instances of emission unit nonoperation."¹⁰

Barring these narrowly defined data exclusions, daily block averages and other compliance averages computed pursuant to RCSA § 22a-174-22e encompass all periods of emission unit operation; consequently, periods of near-atmospheric operation – such as emission unit startup and shutdown, when the stack oxygen ("O₂") concentration approaches 20.9 percent by volume and the stack carbon dioxide ("CO₂") concentration approaches 0.0 percent by volume – are included in emission calculations. At near-atmospheric conditions, such emission calculations may yield a heat input-based mass pollutant emission rate or excess air-corrected volumetric pollutant concentration that is mathematically inflated, even when actual mass emissions are very low. Consistent with federal and state precedent, the Department believes that it is reasonable to apply a diluent cap¹¹ in calculating the heat input-based mass pollutant emission rate, using EPA's F factor equations, or the diluent-corrected volumetric pollutant concentration provided that the NO_x and diluent monitors are quality-assured and are not out-of-control.

- Owners/operators of gaseous and/or liquid fuel-fired combustion turbines (simple and combined cycle) may use a diluent cap of 1.0 percent CO₂ or 19.0 percent O₂ by volume

⁶ See: RCSA § 22a-174-22e(d)

⁷ See: RCSA §§ 22a-174-22e(l) and (m)

⁸ See: RCSA § 22a-174-22e(a)(7)

⁹ See: RCSA § 22a-174-22e(d)(11)(C)

¹⁰ See: RCSA § 22a-174-22e(m)(3)

¹¹ A diluent cap is a default CO₂ or O₂ volumetric concentration that may be used to calculate the diluent-corrected pollutant concentration or the heat input-based mass pollutant emission rate when the measured CO₂ concentration is below the cap value or the measured O₂ concentration is above the cap value. A diluent cap effectively freezes the measured diluent concentration in specific instances when the stack O₂ concentration climbs – or stack CO₂ concentration drops – to a designated threshold.

during any startup or shutdown hour¹² in which the measured/raw stack CO₂ or O₂ concentration is below or above the designated cap value, respectively.

- Owners/operators of gaseous and/or liquid fuel-fired boilers (ICI and those serving EGUs) may use a diluent cap of 5.0 percent CO₂ or 14.0 percent O₂ by volume during any startup or shutdown hour in which the measured/raw stack CO₂ or O₂ concentration is below or above the designated cap value, respectively.

The diluent caps outlined in this memorandum apply only during startup and shutdown events. The Department expects that, within the gaseous and/or liquid fuel-fired combustion turbine and boiler universe, any other instances of near-atmospheric operation occur infrequently and likely not in a manner that would substantially affect the daily-block-average volumetric pollutant concentration or heat input-based mass pollutant emission rate. Therefore, CEMS data reduction for RACT compliance purposes during other (non-startup/shutdown) instances of near-atmospheric operation, including equipment malfunction, is subject to case-by-case review.

The measured diluent concentration should only be capped on an hourly average basis and only if the measured diluent concentration averaged over any startup or shutdown hour triggers any diluent cap applicability threshold identified in this memorandum.

Any CEMS data to which a diluent cap is applied pursuant to this guidance must be flagged in the data acquisition and handling system and must be included in the next quarterly report pursuant to RCSA § 22a-174-4a(h)(4).

¹² For the purposes of this guidance, a startup or shutdown hour is any operating hour, as described in 40 CFR § 60.13(h) and inclusive of partial operating hours, in which the emission unit is in a startup or shutdown condition in at least one data point in at least one quadrant of that hour. “Startup” and “shutdown” are not defined in this guidance memorandum. Owners/operators of emission units subject to this guidance are encouraged to review their New Source Review or Title V permits, applicable New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants, and applicable state regulations in determining whether an emission unit is in a startup or shutdown condition. Often, indicia of startup and shutdown include unit temperature and/or pressure, and/or control device operability. In some cases, startups and/or shutdowns are limited by permit or regulation to a certain duration of time. Simply because an emission unit is operating within this window of time does not imply that the emission unit is in a startup or shutdown condition for the purposes of this guidance.