Technical Support Document: Part 75 Monitoring and Reporting Considerations

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Background

This document provides additional information relating to the proposed Emission Guidelines for Greenhouse Gas Emissions from Existing Stationary Sources: Electric Utility Generating Units. It is intended to discuss topics regarding the monitoring and reporting of net output energy and stack gas volumetric flow rate at electric generating units (EGUs) for which the agency is seeking comments, as stated in the preamble of the proposal.

As described in the preamble, the proposed emission guidelines would establish a rate-based emissions performance goal for each state on a net energy output basis. A state would have the option to translate the rate-based goal to a mass-based goal. Under either form of goal, CO_2 emissions for affected EGUs would need to be reported to the EPA. In the case of plans with rate-based goals, net energy output would also need to be reported. State plans would need to require affected EGUs to monitor CO_2 emissions, and net energy output if applicable, in accordance with 40 CFR Part 75. States would have the option of accomplishing the required reporting by requiring affected EGUs to report their hourly CO_2 emissions, and hourly net energy output if applicable, directly to the EPA on a quarterly basis via the agency's Emissions Collection and Monitoring Plan System (ECMPS).

Currently, 40 CFR Part 75 requires monitoring and reporting of gross load (either electric or steam) for the main purposes of apportioning emissions to units that are monitored at a common stack and establishing load bins for data substitution procedures. As mentioned in the preamble, the EPA is proposing and taking comment on requiring states to use net energy output as the measure for any rate based emission standards. Options for addressing considerations associated with monitoring of net output are also discussed below.

Part 75 does not currently include quality assurance requirements for monitoring and reporting of output (gross load or steam load) because it is presumed that the operator of an EGU would have the accurate monitoring of generation in its best interest and because the Acid Rain Program and other cap and trade programs require compliance on a mass basis and not a rate basis, so generation data is not necessary for compliance purposes. Under the proposed emission guidelines, reported energy output data would be used for compliance purposes. Therefore, quality assurance of output data is as important as quality assurance of emissions data. Options for quality assurance of these data are discussed below.

Additionally, the EPA is considering two approaches to improve the accuracy and consistency of stack gas volumetric flow measurements. Part 75 requires units that are not using Appendix D to report hourly stack gas volumetric flow data for the purpose of determining heat input and mass emissions. The associated quality assurance requirements include performance of Relative Accuracy Testing Audit (RATA) testing for stack gas flow meters, generally using standard Reference Method 2. Part 75 also provides alternative reference methods that are designed to reduce or remove over-reporting of gas flow by accounting for cyclonic flow and wall effects in stacks for units for which these conditions are present. The alternative methods are currently optional, but as noted in the preamble, the agency is considering whether they should be required.

Monitoring of Electric Generation

Electricity is used at power plants for a variety of purposes and this usage is commonly described as auxiliary or parasitic load. The EPA understands that electric generation and parasitic loads are universally measured at EGUs. The parasitic loads can include any of the following: electric motors used for pumps, fans, air compressors, coal handing equipment (such as conveyor belts and pulverizers), gas turbine starters, air pollution control equipment (such as electrostatic precipitators), and building use (such as lighting, air conditioning, computer systems, etc.). Gross generation is measured at the generator terminals (via current and potential transformers) enroute to the unit high voltage step up transformer, plant HV switchyard, and transmission into the electric grid. A unit auxiliary transformer typically steps down generator voltage to provide separately measured medium voltage electricity to in plant auxiliary/parasitic loads. Station service transformers typically provide separately measured electricity from the grid to plant auxiliary loads when the EGU is not in operation or is starting up. The EPA understands that steam boiler based plants typically have station service transformers, while combustion turbine based plants commonly do not have separate station service transformers and back-feed through unit and unit auxiliary transformers to measured auxiliary loads when the EGU is not operating or is starting up. Given that these measurements commonly occur at EGUs, the EPA understands that the equipment needed to convert gross generation to net generation on an hourly basis exists at all EGUs.

Equipment standards

The EPA understands that there are several equipment standards including those that require 0.2 accuracy meters and 0.5 accuracy meters. The American National Standards Institute (ANSI) has published an American National Standard for Electricity Meters – 0.2 and 0.5 Accuracy Classes (ANSI C12.20-2010) as well as a Code for Electricity Metering: ANSI C12.1-2008. The EPA is considering a specification of 0.2 accuracy class meters to determine net electric output (or gross electric output). Specification of certain equipment standards would ensure a level playing field regarding the minimum acceptable accuracy of equipment used to measure net electric generation while minimizing any additional burden of upgrading equipment used to measure net electric generation. ANSI C12.20 is one equipment standard the agency is considering.

Specification and frequency of quality assurance testing

The EPA understands that, on a regular basis, EGUs typically perform checks on their electricity meters to ensure that the equipment is operating as designed. The EPA is considering the specification of such checks and the frequency at which they are typically performed in order to ensure adequate net electricity measurement accuracy while minimizing additional burden of quality assurance testing procedures.

Proposed definition of net electric output

Under EPA's proposed definition of net electric generation, the EPA is considering to treat grid supplied electricity (or other externally provided electricity) in a certain way that may be different from other definitions of net electricity. Specifically, the EPA is considering that grid supplied electricity (or other externally provided electricity) that is used at the station when the EGU has no gross generation (such as when the EGU is not operating or when the EGU is beginning to start up) would not be subtracted from the zero gross generation, which would prevent net generation from being negative at any given hour. This would effectively only subtract electricity that is used by the plant and that is derived from unit from gross generation.

Default apportionment of parasitic loads to multiple units

For plants that have more than one unit, apportionment of parasitic loads that share common auxiliary transformers would be necessary. As mentioned in the preamble, the EPA is proposing a default system of apportioning parasitic loads among multiple EGUs. The proposed

default apportionment would be to apportion net generation to each unit at a facility that shares common auxiliary transformers or a common bus to the grid by the gross generation of each of the generators. For combined cycle units, the gross generation of the steam turbine would be apportioned to each combustion turbine by the gross load of each combustion turbine, as currently described in the Part 75 Emissions Monitoring Policy Manual, question 17.2. There may be unique transformer and parasitic load configurations at a plant with multiple units where alternatives to the default apportionment procedure may be appropriate. For example, if two units share a common steam header and a common generator, there are not two gross generation values to apportion the net electric generation. Also, for example, if two units that share an auxiliary transformer have materially different equipment configurations, so that one unit has greater parasitic load than the other unit as a proportion of its gross generation, then the default apportionment of electricity usage based on gross generation to each of the units might not be appropriate. Therefore, as stated in the preamble to the proposal, the EPA intends to allow owners and operators of affected EGUs to propose alternative apportionment procedures for EPA approval given unique plant configurations.

Monitoring of Non-electric Output at CHP units

For affected EGUs that are combined heat and power (CHP) units (also known as cogeneration units), the combustion of fuel is used to provide both electric generation and other useful energy. Commonly, waste heat is captured and useful thermal output is provided for on-site use or sale. Thermal energy from CHP units can be used in direct process applications or indirectly to produce steam, hot water, hot air for drying, or chilled water for process cooling. Under the proposed rule, a CHP unit subject to a rate based standard would demonstrate compliance on a net energy output basis: net electric output and useful thermal output (converted into MWh equivalent) would be combined into net energy output. Therefore, for CHP units to demonstrate compliance with a rate based standard, the measurement of both net electric output and useful thermal output would be required.

Mechanical energy from turbines can be used to drive rotating equipment, such as compressors, pumps and fans, and the exhaust of which may be routed through a heat recovery steam generator to generate electricity. Combustion turbines used for mechanical drive applications are typically used in the oil and gas industry. There may be a few such systems that

meet the applicability requirements of the rule that would need to measure mechanical energy produced for net energy output. The EPA is considering specification of equipment and equipment standards used to measure and record mechanical output on an hourly basis for reporting purposes.

The measurement of useful thermal output in the form of steam involves the monitoring of steam pressure and steam flow (and in the case of superheated steam, steam temperature). However, there are several potential methods depending on whether the heat content of condensate or steam return is measured and other considerations. Please refer to "Developing and Updating Output-Based NO_x Allowance Allocations: Guidance for States Joining the NO_x Budget Trading Program under the NOx SIP Call"[1] for more details, specifically section VI, *Monitoring locations: Where could facilities monitor electric and thermal output* and subsection D, *How could sources monitor electric and thermal output at a cogeneration facility*. The EPA presumes that a CHP unit that sells useful thermal output would already be using equipment to measure the saleable product. The operation and calibration of equipment that measures pressure, temperature and steam flow leaving the unit and that measures the temperature and flow of returning condensate, or the pressure, temperature and steam flow of returning steam would be needed. The EPA is considering specification of best practices for the measurement and recording of useful thermal output and best practices regarding quality assurance protocols for such equipment to ensure consistent and accuracy reporting of useful thermal output while minimizing additional burden.

Reporting of Net Electric Generation and CHP Net Energy Output

In order to facilitate compliance with a rate based standard, the EPA is proposing that an affected EGU could report hourly net electric generation under 40 CFR Part 75 via ECMPS, which would be included in emissions reports submitted quarterly. A CHP unit would additionally report net energy output as calculated from net electric generation, useful thermal output and any other useful mechanical output. If a rate-based standard is based on gross energy output (rather than net), then an affected EGU would need to report gross electric output, and if a CHP unit, would need to also report energy output that includes useful thermal output.

[1] http://www.epa.gov/airmarkets/progsregs/nox/docs/finaloutputguidanc.pdf

Reporting of Monitoring Plan Data and Quality Assurance Testing Data

The EPA is considering including the reporting of equipment used to measure net electric output (and net energy output for CHP units) in an EGU's monitoring plan under 40 CFR Part 75. The current system for reporting monitoring plan data under 40 CFR Part 75 is ECMPS. The EPA is also considering including the reporting of the performance of tests on equipment used to measure net electric generation and net energy output for the purpose of determining whether the equipment is accurate or is operating as designed. If a rate-based standard is based on gross electric output (rather than net), then monitoring plan and quality assurance information pertaining to the measurement of gross generation would be considered.

Monitoring of Stack Gas Volumetric Flow Rate

Currently, under the Acid Rain Program, 40 CFR Part 75 requires units that are not using Appendix D to report hourly stack gas volumetric flow data for the purpose of determining heat input and mass emissions. During Relative Accuracy Testing Audits (RATA) testing for stack gas flow meters, Part 75 allows units to use either the standard Reference Method 2 or an optional method in order to increase the accuracy of and to minimize over reporting of CEMS stack gas volumetric flow data. EPA Reference Method 2 specifies the normal procedure for measuring stack gas volumetric flow rate during a flow RATA. Methods 2F, 2G, 2H and CTM-041 are approved alternatives. Methods 2F and 2G correct measured flow rates for angular (non-axial) flow, Method 2H (for circular stacks) and conditional test method CTM-041 (method J, for rectangular stacks and ducts) are used to correct measured flow rates for velocity decay near the stack wall, using a "wall effects adjustment factor". 40 CFR Part 75 specifies that these alternative methodologies are optional. Therefore, there may be inconsistencies between emissions or heat input values when a unit changes the reference method used during flow RATAs, which could impact comparisons between emissions and heat input between time periods under which different reference methods are used.

Because of these flexibilities regarding use of optional reference methods used in flow RATAs, the EPA is considering two approaches to ensure consistent and accurate accounting of stack gas volumetric flow measurements. The first approach the EPA is considering is the

development of adjustment factors for normalizing data when the reference methods change. For example, if a unit transitions from Method 2 to Method 2H when performing flow RATAs, a percentage reduction of baseline data could be applied. The second approach that the EPA is considering is requiring the use of the most accurate reference method taking into account the specific configuration of the stack.