

Proposed Standards for Distributed Generation Sources

I - Microturbines

Standard	Pollutant		
	NO _x (lb/MWh)	PM (lb/MMBTU)	CO (lb/MWh)
Part 222 - New DG	1.30¹	NA³	1.70
Part 222 - Existing DG	1.30²	NA	NA
Current 227	50 ppmv@ 15% O ₂ ⁴	NA	NA
Proposed 227	50 ppmv@ 15% O ₂	NA	NA

Notes:

1. Based upon the data supplied by Energy and Environmental Analysis (through NYSERDA), the 1.30 lb/MWh proposed standard corresponds to a concentration of approximately 25 ppmv @ 15% O₂.
2. Microturbines are a new technology. It is anticipated that existing units would be compliant with the proposed standard for new units.
3. Microturbines on the U.S. market are natural gas-fired units only. Therefore, no PM standard would apply.
4. There is no NO_x standard set forth in Subpart 227-2 for microturbines. The standard presented in the table is that set for natural gas-fired combustion turbines located at major sources of NO_x.

Bases of Standards:

The basis of the NO_x emission standard was the 95% upper confidence limit based upon data supplied by NYSERDA. These data were deemed to be normally distributed (Lilliefors Test for Normality).

The CO data were not deemed to be normally distributed. These data ranged from 0.3 lb/MWh to 14.3 lb/MWh. The second and third highest values in the set (n=7) were 1.7 lb/MWh and 1.74 lb/MWh. These two values are essentially identical. The CO standard was based upon these data points.

NOTE: In this and the following tables, the references to Part 227 are more specifically to Subpart 227-1 (particulate emissions) and Subpart 227-2 (major facility NO_x RACT). In addition, there is no CO standard set forth in NYSDEC regulations.

II - Natural Gas-fired Turbines

Standard	Pollutant		
	NO _x	PM	CO
Part 222 - New DG	2.20 lb/MWh¹	NA²	1.70 lb/MWh
Part 222 - Existing DG	annual tune-up³	NA	NA
Current 227	50 ppmv@ 15% O ₂ ⁴	NA	NA
Proposed 227	50 ppmv@ 15% O ₂	NA	NA

Notes:

1. Based upon the data supplied by Energy and Environmental Analysis (through NYSERDA), the 2.20 lb/MWh proposed standard corresponds to a concentration of approximately 41 ppmv @ 15% O₂. Further, this proposed standard corresponds to an emission rate of approximately 0.15 lb/MMBTU.
2. No PM standard is required for natural-gas fired units.
3. Existing sources would be required to meet the NO_x standard for new sources as of January 1, 2008.
4. Emission limit is for natural gas-fired combustion turbines.

Bases of Standards:

The proposed standards are based upon data submitted by Solar Turbines, Inc., Kawasaki Turbines, and Energy and Environmental Analysis (through NYSERDA).

The proposed NO_x standard is based upon a regression analysis comparing the NO_x emission rates expressed in lb/MWh vs. lb/MMBTU. An equation was developed incorporating the NO_x emission rate in these units. By then setting the NO_x rate at 0.15 lb/MMBTU (limit for central station power), the corresponding output based rate was determined to be 2.20 lb/MWh.

Although the CO data are not normally distributed, the 95% upper confidence limit (UCL) was determined. On an output basis, the 95% UCL is 1.659 lb/MWh. This is analogous to the CO limit for microturbines (1.70 lb/MWh).

III - Oil-fired Turbines

Standard	Pollutant		
	NO _x	PM	CO
Part 222 - New DG	4.40 lb/MWh¹	0.10 lb/MMBTU	1.60 lb/MWh
Part 222 - Existing DG	annual tune-up²	0.10 lb/MMBTU or particulate trap^{3,4,5}	NA
Current 227	100 ppmv@ 15% O ₂ ⁶	0.10 lb/MMBTU	NA
Proposed 227	100 ppmv@ 15% O ₂	0.10 lb/MMBTU	NA

Notes:

1. At this point in time, there are insufficient data available to compare the proposed standard with the existing NO_x RACT standard.
2. Existing sources would be required to meet the NO_x standard for new sources as of January 1, 2008.
3. Existing sources would be required to meet the PM standard for new sources as of January 1, 2007.
4. A performance standard of 90% reduction of total PM must be achieved.
5. Highway diesel fuel must be used.
6. Emission limit is for oil-fired combustion turbines.

Bases of Standards:

The NO_x and CO standards were based upon data supplied by Solar Turbines, Inc. The particulate standard is set forth in the New York State Implementation Plan.

The PM standard is based upon the requirements for oil-fired stationary sources that is set forth in the State Implementation Plan.

IV - Natural Gas Lean-burn Engines

Standard	Pollutant		
	NO _x	PM	CO
Part 222 - New DG	4.40 lb/MWh	NA¹	6.50 lb/MWh
Part 222 - Existing DG	annual tune-up²	NA	NA
Current 227	8.9 lb/MWh	NA	NA
Proposed 227	4.4 lb/MWh	NA	NA

Notes:

1. No PM standard is required for natural gas-fired units.
2. Existing sources would be required to meet the NO_x standard for new sources as of January 1, 2008.

Bases of Standards:

In response to DEC's emissions survey, the Engine Manufacturer's Association (EMA) provided ranges for NO_x and CO emissions from natural gas-fired rich burn engines. NO_x emissions ranged from 0.7-2.6 g/bhp-hr (2.1 to 7.7 lb/MWh) for model year 2003 engines. The midpoint of the range is 1.7 g/bhp-hr (5.0 lb/MWh). The proposed standard is the same as that in the proposed revisions for Subpart 227-2.

The CO standard is based upon the midpoint of the data submitted by the EMA.

V - Natural Gas-fired Rich Burn Engines

Standard	Pollutant		
	NO _x	PM	CO
Part 222 - New DG	4.40 lb/MWh (w/o controls)	NA²	6.50 lb/MWh (w/o controls)
	0.890 lb/MWh¹		3.6 lb/MWh¹
Part 222 - Existing DG	annual tune-up³	NA	NA
Current 227	5.9 lb/MWh	NA	NA
Proposed 227	4.4 lb/MWh	NA	NA

Notes:

1. Based upon the use of a 3-way catalyst (non-selective catalytic reduction).
2. No PM standard is required for natural-gas fired units.
3. Existing sources would be required to meet the NO_x standard for new sources as of January 1, 2008.

Bases of Standards:

In response to DEC's emissions survey, the Engine Manufacturer's Association (EMA) provided ranges for NO_x and CO emissions from natural gas-fired rich burn engines. NO_x emissions ranged from 11-18 g/bhp-hr (32.5 to 53.3 lb/MWh) for model year 2003 engines. Since these emission rates are significantly higher than those for other source types, an analysis of the cost-effectiveness of adding a non-selective catalytic reduction system (also referred to as a 3-way catalyst) was conducted. Capital cost data were obtained from multiple sources. Operational data were obtained from NRDC. The cost estimates ranged from \$860 to \$5,040 per ton of NO_x reduction. As part of this analysis, it was assumed that 3-way catalysts can reduce NO_x emissions by 98% from an uncontrolled emission rate of 44.3 lb/MWh.

The CO emissions from model year 2003 rich burn engines range from 9-15 g/bhp-hr (26.6 to 44.3 lb/MWh). 3-way catalysts are also effective in reducing CO emissions. As part of this analysis, it was assumed that 3-way catalysts can reduce CO emissions by 90% from an uncontrolled emission rate of 36.0 lb/MWh.

The combined estimated cost/ton of NO_x and CO emission reductions ranged from \$492 for a unit operating 8,600 hours per year to \$2,875 for a unit operating 500 hours per year.

VI - Diesel-fired Compression Engines

Standard	Pollutant		
	NO _x	PM	CO
Part 222 - New DG	Peaking Units: 16.0 lb/MWh	0.10 lb/MMBTU	6.50 lb/MWh (for units rated less than 75 KW) 2.20 lb/MWh (for all other diesel-fired compression engines)
	Baseload Units: 6.80 lb/MWh (w/o controls) else 1.60 lb/MWh¹		
Part 222 - Existing DG	annual tune-up²	0.10 lb/MMBTU or particulate trap^{3,4,5}	NA
Current 227	26.6 lb/MWh	0.10 lb/MMBTU	NA
Proposed 227	7.4 lb/MWh	0.10 lb/MMBTU	NA

Notes:

1. Based upon use of a Selective Catalytic Reduction emission control system.
2. Existing sources would be required to meet the NO_x standard for new sources as of January 1, 2008.
3. Existing sources would be required to meet the PM standard for new sources as of January 1, 2007.
4. A performance standard of 90% reduction of total PM must be achieved.
5. Highway diesel fuel must be used.

Bases of Standards:

In response to DEC's emissions survey, the Engine Manufacturer's Association (EMA) provided ranges for NO_x and CO emissions from diesel-fired compression engines. NO_x emissions ranged from 4.0 - 6.5 g/bhp-hr (11.8 to 19.2 lb/MWh) for model year 2003 engines. An evaluation of the cost effectiveness of requiring that a selective catalytic reduction (SCR) system be added to new diesel-fired engines was conducted. The estimated costs per ton of NO_x reductions ranged from \$4,100 for a unit operating 8,600 hours per year to \$56,400 for a unit operating 500 hours per year. The costs for operating a SCR on a peak load unit is not cost-

effective; however, the costs for operating a SCR is cost effective for baseload units. Therefore, separate standards are proposed. An alternative standard is also proposed for baseload units. The proposed standard for units without NO_x control (6.80 lb/MWh) is the same as that in the proposed revisions for Subpart 227-2.

The PM standard is based upon the requirements for oil-fired stationary sources that is set forth in the State Implementation Plan.

The CO limits are based upon the emission rates from model year 2003 engines. Based upon the data supplied by the EMA, CO emissions from engines rated less than 75 KW ranged from 4.4 to 8.6 lb/MWh. For units rated 75 KW and larger, the CO emission rates ranged from 1.18 to 3.8 lb/MWh. Therefore, separate CO emission standards are recommended for the two size ranges. The standards are the midpoint CO emission rates for each engine size range.