NORTHEAST STATES FOR COORDINATED AIR USE MANAGEMENT (NESCAUM)

NESCAUM STATIONARY SOURCE COMMITTEE RECOMMENDATION FOR PERMITTING OF SIMPLE CYCLE GAS TURBINES

June 1990

The NESCAUM Stationary Source Review Committee is one of eight technical committees established by the NESCAUM Board of Directors. The purpose of this Committee is to provide an opportunity for engineers who review permits for new and existing sources to discuss common technical issues and provide some measure of consistency in the review of permits in the region. However, each agency conducts permit review within the existing structure of their state regulations. This recommendation was developed by the committee in response to a high level of interest in permitting simple cycle gas turbines to be used as peaking units in the region. This recommendation does NOT establish a BACT limit for peaking units.

I. Hours of Operation

Electrical power generated by simple cycle gas turbines tends to be the most expensive power (in terms of $/kWh). Since power generation in the NESCAUM region is based on economic dispatch, simple cycle gas turbines tend to operate for a limited number of hours. Historically, simple cycle gas turbines used in peaking service have operated, on the average, less than 1500 hours per year. However, actual hours or operation in any given year can vary substantially and could easily exceed 1500 hours per year. Factors influencing hours of operation include weather, unit outage within the system, and availability of less expensive intermediate and base load generation sources.

Applicants and/or states may find it desirable to limit the hours of operation of simple cycle gas turbines. The specific limit can vary from state to state or on a case by case basis. The Committee recommends that all simple cycle gas turbines be equipped with an elapsed time meter and recorder that indicates, in cumulative hours, the amount of time the turbine has operated.

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II. Emission Limitations

The Committee recommends that the following emission limitations be considered for units with a heat input capacity greater than 100 MMBtu/hr and,

A. The facility is *not a major source* and will limit hours of operation to 2500 hours or less in any consecutive 12-month period; *or*

B. The facility has demonstrated to the reviewing authority that post combustion controls such as SCR for NO_x or oxidation catalysts for CO are either technologically or economically infeasible.

1. Nitrogen Oxides

   Gas use: 25 ppmvd corrected to 15% O_2

   Oil use: 55 ppmvd + F* corrected to 15% O_2 or

   75 ppmvd corrected to 15% O_2 whichever is more stringent

   *F=NOx emission allowance for fuel bound nitrogen which shall be calculated as follows:

   - F=O if the fuel bound nitrogen is less than 0.015 percent by weight.
   - F=(400)(N) if the fuel bound nitrogen is less than or equal to 0.1 percent by weight but greater than 0.015 by weight.
   - N=percent by weight of fuel bound nitrogen

2. Carbon Monoxide

   Gas or oil use: 50 ppmvd corrected to 15% O_2

   The Committee notes that larger turbines have been permitted at less than 50 ppmvd and some states may require a more stringent CO emission limit.

3. Visible Emissions

   Gas or oil Use: Visible emissions shall not exceed 10% opacity.

The Committee finds that the above emission limitations are achievable by several make and size turbines within this category. However, permit review engineers should be aware that these limits are not necessarily achievable by all turbines in this category and should give this factor the appropriate weight in a BACT determination.

The Committee also finds that distillate fuel oil in the NESCAUM region can have fuel bound nitrogen contents in excess of 0.015% by weight. Given that wet controls, such as water and steam injection, are not effective for reducing NO_x formed by the combination of fuel bound nitrogen with oxygen during combustion, this recommendation contains a fuel bound nitrogen emission allowance.

The recommended nitrogen oxide emission limit for oil use would require the use of oil with a fuel bound nitrogen content less than 0.05% by weight if thermal NO_X emissions were controlled by 55 ppmvd. Fuel oils with a fuel bound nitrogen content greater than 0.05% by weight could be used if thermal NO_X emissions were reduced below 55 ppmvd.

The Committee found that the available data on the nitrogen content of distillate fuel oils marketed in the NESCAUM region was limited. The Committee believes, however, based on this limited data, that the above restrictions on the fuel bound nitrogen content of distillate oils will allow the use of most distillate fuel oils routinely marketed in the NESCAUM region without major disruptions in the marketplace. Permit review engineers should be aware that this determination is based on limited data.

NOTES:

1. The 100 MMBtu/hr size cutoff is based on the total heat input to the gas turbine on a per unit basis using lower heating values and ISO (International Standards Organization) conditions on a dry basis (without water or steam injection). ISO conditions are 288°K, 60%RH and 101.3 kPa. MMBtu/hr refers to the heat input rate to the turbine in millions of British Thermal Units per hour.

2. Installations of multiple units, each less than 100 MMBtu/hr, may be required to meet the emission standards listed here. Installations of multiple units greater than 100 MMBtu/hr may be subject to more stringent emission limits than this guideline. This determination will be made on a case by case basis in each state.

3. Nitrogen oxide and carbon monoxide emission limitations are one hour averages.

4. Compliance with NOx emission limits should be determined using EPA Reference Method 20 (40 CFR 60, Appendix A).

III. Monitoring

The Committee recommends that for facilities restricting hours of operation to less than 2500 hours in any consecutive 12-month period, that compliance with the NO_X emission limits be monitored by the installation and operation of a system to continuously monitor and record the fuel consumption and the ratio of water and steam to fuel being fired in the turbine.

For all other facilities, each NESCAUM state may require continuous emission monitors to measure emission directly. The pollutants covered and monitoring requirements will vary from state to state.

IV. Clean Fuel Incentives

For facilities restricting hours of operation through enforceable permit conditions, the Committee recommends that permits contain restrictions that would encourage the use of cleaner, less polluting fuels. For example, operating hour restrictions or fuel use restrictions written in terms of oil equivalent hours or operation or oil equivalent fuel use (see Attachment A) may be considered.

V. State and Federal Contacts

CT	Mark Hultman	203/566-8230
ME	Marc Cone	207/289-2437
MA	Don Squires	617/292-5618
NH	Andy Bodnarik	603/271-1370
NJ	Bill Keuhne (minor sources)	609/633-8247
NY	Jim Harrington	518/457-2044
RI	Doug McVay	401/277-2808
VT	John Perreault	802/244-8731
EPA I	Lynne Hamjiam	617/565-3250
	John Courcier	617/565-3260
EPA II	Karl Mangels	212/264-2517

VI. NESCAUM's Purpose

The members of NESCAUM include the air pollution control agencies in eight Northeast states: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont. NESCAUM's purpose is to promote cooperation and coordination of technical and policy questions among its member states. For further information on NESCAUM, contact the office at 617/367-8540.

This recommendation was approved by the NESCAUM Board of Directors on June 12, 1990. This recommendation will be reviewed every two years and revised where appropriate.

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ATTACHMENT A

EXAMPLE OF CLEAN FUELS INCENTIVE

Proposed: A simple cycle gas turbine proposed for an attainment area to be used as a peaking station with the following emission limits.

Natural Gas Firing

NO_x: 45 lbs. per hour (@25 ppm)
CO: 10 lbs. per hour
SO_2: 3.2 lbs. per hour
NMHC: 11.4 lbs. per hour
Particulates: 2.5 lbs. per hour

Oil Firing

NO_x: 149 lbs. per hour (@75 ppm)
CO: 10 lbs. per hour
SO_2: 154 lbs. per hour
Particulates: 17 lbs. per hour

Objective: To limit annual emissions of any pollutant to less than 250 tons per year for a new turbine proposed for an attainment area.

Using a worst case analysis, SO_2 emissions during oil firing is the highest hourly emission rate and is therefore the most restrictive. As a result, annual hours of operation would be limited to:

(250 tons/yr x 2000 lbs/ton) ÷ 154 lbs/hour = 3245 hrs/yr regardless of the fuel being fired.

However, to provide an incentive to the facility to burn natural gas as opposed to oil, one could write this restriction in terms of "oil equivalent hours of operation." The 3246 hours restriction is based on an hourly emission rate of 154 lbs. During natural gas firing, worst case hourly emissions are 45 lbs. Therefore, an hour of operation firing natural gas is equivalent to 45/154 or 0.29 hours of oil operation. Compliance with the 3246 restriction on hours would be determined by summing the hours of operation on each fuel as follows.

Hours of oil operation + (0.29)(hours of gas operation) $\leq$3246

To ensure that such a restriction is enforceable, specific monitoring and record keeping requirements should be a part of any permit. These requirements could include use of elapsed time meters/recorders to monitor hours of operation, fuel flow meters to monitor fuel flow, etc.