Solar® Turbines
A Caterpillar Company

Solar Turbines Incorporated

9330 Sky Park Court
San Diego, CA 92123
Tel: (858) 694-1616

September 23, 2011

RE: GTA Comments on the OTC Model Rule for Control of NOx Emissions From Natural Gas Pipeline Compressor Fuel-Fired Prime Movers

To: Alex Ryan-Bond
Ozone Transport Commission
arbond@otcair.org

Cc: Ali Mirzakhalili
DNREC
ali.mirzakhalili@state.de.us

Robert Clausen
DNREC
robert.clausen@state.de.us

From: Leslie Witherspoon
Solar Turbines, Incorporated
witherspoon_leslie_h@solarturbines.com

Solar Turbines Incorporated (Solar) appreciates the opportunity to comment on the proposed 2014 OTC Model Rule for Control of NOx Emissions From Natural Gas Pipeline Compressor Fuel-Fired Prime Movers (Draft Model Rule).

Solar is a manufacturer of industrial combustion turbines (1-22 MW). Solar's fleet includes more than 13,900 combustion turbines in 98 countries. Our domestic fleet consists of approximately 7000 combustion turbines in power generation, pipeline compressor, and mechanical drive applications. Solar estimates approximately 200 of our turbines are in pipeline compressor applications in the ozone transport region (OTR).

Solar's comments follow. Solar encourages the Ozone Transport Commission (OTC) to contact Solar if supporting data or further explanation of any of our concerns is warranted.

2.0 Definitions

2.4 Natural Gas

For consistency, Solar recommends that OTC adopt the definition of natural gas found in 40 CFR 60 Subpart KKKK (Subpart KKKK).

> *Natural gas means a naturally occurring fluid mixture of hydrocarbons produced in geological formations beneath the Earth's surface that maintains a gaseous state at standard atmospheric temperature and*

pressure under ordinary conditions. Additionally, natural gas must either be composed of at least 70 percent methane by volume or have a gross calorific value between 950 and 1100 Btu/scf. Natural gas does not include the following gaseous fuels: landfill gas, digester gas, refinery gas, sour gas, blast furnace gas, coal-derived gas, producer gas, coke oven gas, or any gaseous fuel produced in a process which might result in a highly variable sulfur content or heating value.

2.18 Shutdown

Solar asks that the OTC provide a more precise definition of the term "minimum load" in the "Shutdown" definition. We understand that the intent of the term "minimum load" in the definition is to refer to the load during a shutdown event at which the unit is no longer in low emissions mode or at the lower end of the emissions warranty load range as specified by the OEM.

2.19 Start-up

Solar asks that the OTC provide a more precise definition of the term "minimum load" in the "Start-up" definition. We understand that the intent of the term "minimum load" in the definition is to refer to the load during a start-up at which the unit enters low emissions mode or reaches the lower end of the emissions warranty load range as specified by the OEM.

4.4 Combustion Turbines Emissions Limitations

Category Size Cut-off

It is Solar's understanding that the 4000 hp cut-off for combustion turbines was selected due to a natural break in the inventory data that was used in the Draft Model Rule development. Solar recommends exemption units smaller than 50 MMBtu/hr from the Draft Model Rule. Short of exemption, Solar suggests the OTC consider a 50 MMBtu/hr (HHV) or a 5000-6000 hp level as alternatives to the proposed 4000 hp level.

Solar has a *Centaur® 40* turbine model that has been available at the ISO ratings of 3000, 3550, 4000, 4500, and 4700 hp. Either of the alternative cut-offs mentioned above would keep all Centaur 40 models in the same category.

4.4.1 Emissions Limitations

Solar recommends the Draft Model Rule reference an emissions level that is commercially available for the size, class, and category of combustion turbine. In establishing a RACT-like standard, the emission limits selected should be able to be reasonably met by existing sources in an industrial category. With respect to the proposed emissions levels for the smaller turbines in the Draft Model Rule, please consider technology limitation for retrofit of existing equipment.

When Subpart KKKK was developed in the 2003-05 timeframe much discussion and data collection centered on what smaller combustion turbines [e.g. <50 MMBtu/hr

(HHV)] could meet on a retrofit basis. If the OTC does not exempt smaller gas turbines, then based on data analyzed for Subpart KKKK development coupled with the fact that technology has not changed, Solar recommends the emissions level in the Draft Model Rule match Subpart KKKK levels at 150 ppmvd @ 15% O2 NOx.

The proposed emission limit of 50 ppmvd @ 15% O2 is only achievable on smaller combustion turbines with selective catalytic reduction (SCR). To date, no small compressor pipeline combustion turbine is in operation that has been retrofit with SCR. Solar estimates a RACT cost effectiveness analysis would come in between $60-$80K/ton NOx removed; well over any acceptable RACT cost threshold. This cost estimate may be low as a "new equipment" cost model was used. We are told that retrofit SCR systems could cost 2-3 times as much as a new installation depending on the complexity of integrating an SCR into the existing site. Solar does not believe it is the intent of the OTC and Draft Model Rule to saddle very small combustion units with expensive add-on NOx control.

The preamble to proposed subpart KKKK notes that EPA considered requiring the use of SCR in setting the NOx limit, but determined the costs were too high and that there may be implementation issues for combustion turbines operating under variable load. The subpart KKKK preamble states:

> *"We considered requiring the use of SCR in setting the limit for NOx. However, we determined that the costs for SCR were high compared to the incremental difference in emission concentration…. In addition, SCR may be difficult to implement for turbines operating under variable loads. We determined that the incremental benefit in emissions reductions did not justify the costs and technical challenges associated with the addition and operation of SCR."*

New York has a RACT that sets a level of 50 ppm NOx for units larger than10 MMBtu/hr. The New York 50 ppm NOx level is unattainable by smaller (<4500 hp) pipeline compressor combustion turbines. Note that, in New York, the RACT applies to major sources. The proposed Draft Model Rule does not have the major source distinction. Thus, while it may appear that smaller combustion turbines in NY are complying with a 50 ppm NOx RACT, in reality, the smaller pipeline compressor turbines aren't subject.

4.4.2 Emissions Level

Solar recommends the Draft Model Rule reference an emissions level that is commercially available across combustion turbine OEMs for the size class and category of combustion turbine.

As with the smaller combustion turbines in Section 4.4.1, much data collection and discussion took place when Subpart KKKK was developed as to the appropriate/achievable emissions level for existing combustion turbines. While 25 ppm is available for many models, a 42 ppm level, as in Subpart KKKK, better matches the market availability of dry low NOx retrofit capability.

Solar recommends the OTC consider 42 ppm NOx for this category.

4.5 Emission Level Applicability

Solar asks that the Draft Model Rule adopt similar exemptions to the emission levels as found in Subpart KKKK. Please consider adding malfunctions, operation at ambient temperatures <0°F, and part-load operation (e.g.<75% load as in Subpart KKKK) to the text.

> *"… except periods of start-up, shut down, **malfunctions, at ambient temperatures <0°F and operation at <75% load**."*

4.6 New Section for Phased in Compliance Schedule

The Draft Model Rule states that subject units must comply with emissions limits no later than 1/1/15. Solar feels the proposed timeline is too aggressive. Compliance dates of 2017 or 2018 are more reasonable. Solar suggests the OTC adopt a compliance schedule that takes into account an OEMs recommended maintenance schedule, the number of impacted units, and an appropriate phase-in period.

Solar recommends something similar to the following language be inserted.

4.6 Compliance Schedule

4.6.1 Operators with no more than two (2) existing units subject to Section 4.0 shall demonstrate and maintain compliance by the earlier of the following dates.

4.6.1.1 January 1, 20XX (The date should be 5 years after the rule is finalized in any particular state.)

4.6.1.2 Within 90 days following the next major overhaul on or after January 1, 20XX (Note: the date should be one to two years after the rule is finalized.)

4.6.2 Operators with more than two (2) units subject to Section 4.0 shall demonstrate and maintain compliance in accordance with the following schedule.

4.6.2.1 Within 90 days following the next major overhaul or after January 1, 20XX. (Note: the date should be a year, 18 months, or two years after the rule is finalized.)

4.6.2.2 By 1/1/XX, at least 25% of the total number of units subject, and

4.6.2.3 By 1/1/XX, at least 60% of the total number of units subject, and

4.6.2.4 By 1/1/XX, 100% of the total number of units subject.

5. Alternative RACT Emissions Limitation Determination

Solar supports the inclusion of Section 5. If the OTC incorporates Solar's comments found in this letter, Section 5 will get limited use for "one-off" type applications. If the OTC does not adopt Solar's recommendations, Section 5 will get significant use and significantly increase staff burden in the OTR sates. ,Looking at Solar's installed fleet, we estimate 80-90 units will have to use Section 5 as proposed because there is no combustion solution to meet the proposed emissions level in 4.4.1.

6.3 Test Frequency

Twice annual source testing is excessive. Solar suggests annual testing with an option for testing every two years if the NOx emissions level from the performance test is less than or equal to 75% of the NOx emission limit for the unit.

8.3 Major Maintenance

Per discussion with the Draft Model Rule author, the inclusion of Section 8.3 is intended to address major malfunctions of smaller end (300-500 hp) reciprocating engines. Solar requests that the Draft Model Rule include language that states Section 8.3 does not apply to routine overhauls (via industry standard combustion turbine engine exchange programs).