May 2, 2006
Contact – Yogesh Doshi

Workgroup Recommendations and Other Potential Control Measures
Stationary Combustion Sources Workgroup

SCS 001 – Electric Generating Peaking Units

Control Measure Summary: Revise Subchapter – 19 emission limits for simple cycle turbines.	**Emissions (tons/year) in New Jersey**	
2002/2009 existing measures: Peaking units are generally defined as electric generating units which operate only during the peak energy demand. Peaking units operate during the hot summer days and generally operate for less than 500 hours per year and less than 10 hours per day; or less than 10% annual capacity factor. Existing peaking units are mostly simple cycle frame or aeroderivative turbines. Most existing peaking units do not have any NOx control device.	**NOx in 2002**:	4860
	SO2 in 2002:	N/A
	PM in 2002:	N/A
Candidate measure 1: Install water injection technology (short term) *Measure ID:* **Water Injection** *Emission Reductions*: EPA estimates a 55% reduction in NOx emissions. *Control Cost*: Reductions can be achieved at a reasonable initial cost, but due to low annual capacity utilization, the incremental cost is approximately $44,000 per ton of mostly ozone day NOx reduction, equivalent to about $4400 per ton for calendar year reductions. Dividing by a factor of 10 approximates the cost effectiveness of continuous operation, assuming 36 days per year of ozone season operation. Note that annualized $/ton is not an appropriate cost effectiveness metric for peaking units used disproportionately on high ozone days. More appropriate metrics are the capital cost of control compared to the capital cost of the unit in $/MW, and the operating cost compared to the price of electricity in $/MW-hr. The cost of retrofitting a 25 MW turbine with water injection technology is less than $40,000 per MW compared to about $600,000 per MW cost of the turbine. The cost of operating water injection is about ___ $/MW-hr. During the peak energy demand, the market price of electricity is over $700 per MW-hr, compared to a base rate of $40-$70/MW-hr. *Timing of Implementation*: Assume full implementation by 2009. *Implementation Area*: Entire State.	NOx 2009 Reduction: 2009 Remaining:	2673 2187
	SO2 2009 Reduction: 2009 Remaining:	N/A
	PM 2009 Reduction: 2009 Remaining:	N/A

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Candidate measure 2: Replace all existing aeroderivative turbines with newer Dry-Lo NOx (DLN) based simple cycle turbines *Measure ID:* **DLN technology** *Emission Reductions*: DLN technology based simple cycle turbine can represent over 90% reduction in NOx, compared to existing aero-derivative turbines. C*ontrol Cost*: Total replacement cost. It ranges from $0.5-0.8 Million per MW. (Ref. Gas Turbine World – 2004) *Timing of Implementation*: Phase in from 2012 to 2015. *Implementation Area: Entire state.*	NOx 2012 Reduction: 2012 Remaining:	 4374 486
	SO2 2009 Reduction: 2009 Remaining:	 N/A
	PM 2009 Reduction: 2009 Remaining:	 N/A

Policy Recommendation of State/Workgroup Lead:
Adopt rules requiring water injection on all peaking units on short term basis (55% NOx reduction by 2009) and replacing all existing peaking units with DLN technology based simple cycle turbines or equivalent (>90% NOx reduction by 2015, phasing in from 2012 to 2015.

Brief Rationale for Recommended Strategy:
Peaking units are generally the last units dispatched during periods of peak load when electrical demand is the highest. The quick start capability of these peaking units assists in grid stabilization and helps address local electrical demand. The operation of older simple cycle turbines is less efficient and, therefore, produces higher rates of pollutant emissions per unit of energy produced. Simple cycle peaking units operate primarily on hot summer days when exceedances of the ozone NAAQS also occur. On such days, these units may account for a substantial fraction of stationary combustion NOx emissions. Due to their significant potential for NOx reduction and corresponding effect on ozone non-attainment, this short term and long term strategy is strongly recommended.

According to NJ's estimate, water injection has the promise of reducing 40 tons of NOx per ozone season day in NJ alone. Please note that NJ has over 40 simple cycle aeroderivative turbines, equipped with water injection technology. There are about 80 more simple cycle turbines, which are not equipped with water injection technology. A downside of this method of NOx reduction is the equivalent amount of higher CO emissions produced.