

Brussels, 30 April 2012

Dear Mr. Lecomte,

The European Turbine Network (ETN) appreciates the opportunity to submit comment to the LCD BREF Review Team of the Joint Research Center of the European Commission, regarding Directive 2010/75/EU. The focus of this comment will be related to the requirement that gas turbines permitted after 2012 meet a NO<sub>x</sub> limit of 50 mg/Nm<sup>3</sup> when operating on liquid fuel for more than 500 hours per year.

**ETN requests that this rule be stayed and held in abeyance, for a period of ten years, for simple cycle gas turbines operating on liquid fuel for more than 500 hours per year.** This would allow gas turbine manufacturers time to do the very challenging research and development needed to make commercially available products that can achieve 50 mg/Nm<sup>3</sup> while operating on liquid fuel. The technical reasons are described below.

There are no gas turbines commercially available, either simple cycle or combined cycle, that offer NO<sub>x</sub> emissions less than approximately **86 mg/Nm<sup>3</sup>** when operating on liquid fuel. The reason for this is that after massive investment in research and development over the past two decades, gas turbine manufacturers have been unable to reach lower emission levels on liquid fuel without encountering thermo-acoustic combustion dynamics in the gas turbine combustion chamber. Gas turbines, if allowed to operate in the presence of combustion dynamics, which produce large and rapid internal pressure oscillations, will experience premature failure often with serious consequences. This phenomenon is very similar to the combustion dynamics encountered in dry low NO<sub>x</sub> (DLN) combustion systems firing natural gas which took manufacturers two decades to solve. The problem has not yet been solved for liquid fuels.

While we are aware that this rule has a provision to raise the 50 mg/Nm<sup>3</sup> NO<sub>x</sub> limit to a higher level based on the efficiency of the generating station (using a limit-multiplier of installed efficiency divided by 35), we note that this will be of very marginal benefit to simple cycle gas turbines. For simple cycle gas turbines, this provision in the rule would allow the limit to be raised to approximately 55 to 60 mg/Nm<sup>3</sup>, well short of the current 86 mg/Nm<sup>3</sup> capability of commercially available units. We also note that this limit-multiplier will allow most large combined cycle gas turbines to meet the rule, in contrast to simple cycle gas turbines.

The importance of simple cycle gas turbines in the overall mix of generation assets is perhaps not well understood. For peak shaving they are the gas turbines of choice because of their low capital cost and ability to start and reach maximum load in a very short amount of time. In addition, because renewable generation assets are being added to grids in large numbers, simple cycle gas turbines are very important for their ability to provide grid stability through their ultra-fast start and loading capabilities, their rapid ramp rate and load following ability, and the fact that they are uniquely suited to the operational flexibility of high cyclic duty.

Operation on liquid fuel is important for two major reasons. For large portions of Europe, gas supplies are interruptible (particularly during periods of extended weather extremes or geo-political tension). For these regions, the ability to operate on a liquid backup fuel is crucial. Other areas of Europe simply do not have a natural gas supply, reliable or otherwise. Operation of gas turbines on liquid fuels for more than 500 hours per year is very important in these areas.

Finally, we note that holding this rule in abeyance for ten years -- for simple cycle gas turbines operating for more than 500 hours per year -- will in no way encourage or advantage their installation over combined cycle gas turbines. The choice between simple cycle and combined cycle is governed by capital cost, efficiency, and operational flexibility. These critical parameters are so different between the two cycle choices that it would be unimaginable that this rule would have any effect - unless of course, it is allowed to take effect immediately. The consequence of that latter scenario would be to ban simple cycle gas turbines that need, for very legitimate reasons, to operate for more than 500 hours per year on liquid fuel.

In conclusion, ETN requests that this rule be held in abeyance for a period of ten years for simple cycle gas turbines operating on liquid fuels for more than 500 hours per year to allow manufacturers the time to complete the critical research and development needed.

On behalf of ETN

Christer Björkqvist  
Managing Director