UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Natural Gas Quality, LNG,	**)**	**Docket No. PL04-3-000**
And Interchangeability	**)**	
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Comments of Bruce Rising on behalf of Siemens Westinghouse.

In the past 18 months there has been considerable effort expended by the technical committees and the gas turbine industry to gain better understanding of the role of interchangeability and the impact to the end user, with a strong emphasis on gas turbines. Gas turbines use approximately 20% of the natural gas supply in the United States is used to produce electricity, however they account for less than 2% of emissions from stationary sources. Gas turbines also played a major role in restarting the power grid in the August 2003 blackout. It is also known that gas turbines operating in countries which are substantial LNG importers have experienced some unusual, and unexpected, air quality issues; issues that are not readily predictable with the current inventory of combustion interchangeability parameters. A key issue which surfaced in the interchangeability committee was the range of gas composition variation (most commonly describe by the Wobbe Index or equivalent term) and its rate of change. Gas turbines can—and do--operate on LNG—and LNG is natural gas—but these definitions are too broad, and insufficiently precise to predict how the end-users equipment will respond to rapid changes in gas properties. New gas turbine installations typically go through a tuning process during the commissioning phase to demonstrate equipment operability, availability, and emission compliance. The gas composition is integral to this process because gas characteristics affect each of these contract requirements.

The basic combustion interchangeability parameters widely used today were developed from diffusion flame combustion systems that were dominant in almost every combustion device manufactured prior to 1990. There has been little additional research since the significant work carried out by the Bureau of Mines, work that concluded in the early

1980's. Almost at the same time, a major shift in combustor design began in the early 1990's, when environmental pressures pushed equipment manufacturers to design combustion systems with an enhanced NO_x reduction capability—the premixed DLN combustor. While premixed combustion systems produce less NO_x, they are more complex and require sophisticated engine controls. The diffusion combustors they replaced were inherently more fuel flexible, capable of operating on natural gas (including regasified LNG), landfill gas, refinery gas, crude oil, methanol, and IGCC syn-gas. Most DLN combustors do not exhibit such wide ranging fuel capabilities compared to the equivalent diffusion combustors.

The committee on which I served put in many long hours reviewing, writing, and analyzing data related to gas interchangeability and LNG. Each individual is to be commended for his commitment and participation. Within the schedule, we made great progress. It is worth noting however, that there is a wealth of technical expertise available, but timing and lack of funding did not make it accessible to either committees. For example, combustion researchers at some of the most prestigious universities were unaware that this was an issue, although researchers at these universities retain significant expertise in this area. And only recently have the national laboratories expressed interest in involvement. Private non-governmental laboratories and research organizations did review their experience with residential and industrial burners. But empirical studies of LNG interchangeability in gas turbines are beyond the capabilities of all but a few, and the number of different turbine designs and DLN configurations to be evaluated is considerable. Development of a better set of interchangeability parameters might reduce the need for extensive and expensive empirical evaluation, although some field tests must be undertaken.

Finally, environmental requirements are the reason that the basic hardware designs were changed to pre-mixed combustion. Yet there was no input from the environmental regulatory side to weigh the issues of fuel flexibility and air quality. The recent proposed New Source Performance Standards for gas turbines is an example. All gas turbines fail to comply with one or more of the proposed NSPS emission levels. From that perspective, air quality and emission requirements are now driving fuel requirements. It is important that the missing components, researchers and regulators, be included in the final analysis of developing a natural gas strategy for the United States.