

UNC Modification 0714 - Amendment to Network Entry Provision at Perenco Bacton terminal

Potential Impact on Gas Turbines of proposed lower Wobbe Index Gas

A representation by Uniper UK

Lower WI fuels tend to be lower reactivity than higher WI fuels, potentially causing several problems for gas turbines, as follows:

1. As the WI reduces the part load CO tends to increase. For most gas turbines it the CO emissions limit that determines what their minimum export load is, thus part load CO issues can limit part load operation when operating on low WI fuels.
2. The reduced reactivity of low WI fuels changes the flame structure and position which tends to have an adverse impact on combustion dynamics (pulsations). This can lead to increased pressure oscillations in the combustion chamber which in turn cause vibration in the combustor components. This can lead to increased wear and damage to components and reduced component life. If dynamics reach alarm/action levels de-loads or trips will occur.
3. Reduced reactivity can result in the flames of some burners lifting resulting in trips due to unacceptable exhaust temperature distributions.
4. Ignition of low WI fuels is more difficult due to the reduced reactivity and this can lead to starting problems.

These issues can be, to a large extent, mitigated by tuning the gas turbine on a low WI fuel. However, gas turbines can only accommodate a limited variation from the fuel on which it was tuned. Because of this the range of WI delivered to gas turbines is important. Typically gas turbines can accommodate a WI range of $\pm 5\%$ of the WI on which the gas turbine was tuned to ensure that the control system can deal with any changes that occur and that there is sufficient margin to allow for variation in emissions and dynamics behaviour. The proposed UNC 0714 change, allowing gas with a WI of 46.5 MJ/m^3 to enter (and leave) the system, would increase the range to almost $\pm 6\%$. **Thus it would be impossible to tune a typical gas turbine to accommodate all possible delivered fuels. If tuned on a low WI gas to accommodate the reduced WI, issues due to NOx emissions, dynamics and possibly flashback would occur when operated on a high WI fuel.**

A more difficult issue to address is the rate of change of WI, the greater range of possible fuels in the system increases the risk of issues due to the gas turbine control system not being able to adjust sufficiently quickly to the changes in fuel properties. The larger the potential range of WI the greater the risk. Unfortunately there is no reliable information about rate of change of WI within the gas network and only limited information about the capability of gas turbines to deal with the such changes, thus it is not possible to quantify the risk.

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