

Natural Gas (Compressed and Liquefied)

Natural gas for transport is available in two forms, compressed natural gas (CNG) and liquefied natural gas (LNG). The use of natural gas (mainly methane) as an abatement strategy over diesel is considered as it produces fewer emissions than diesel.

Furthermore, CNG and LNG combustion characteristics are appropriate for spark ignition engines. Their high octane rating, about 120, allows a higher compression ratio than is possible with petrol which can increase engine efficiency (Kahn Ribeiro, S., et al 2007 p.345).

Natural Gas' appeal within Australia is growing due to Australia's large domestic reserves as well as a generally more stable market price than diesel.

Each form of gas has its own advantages. Despite CNG being cheaper than LNG, LNG is easier to store and transport which makes it the dominant fuel type for heavy trucks that do use natural gas at present.

Compressed Natural Gas

Notwithstanding its present disadvantages CNG is an increasingly popular emerging substitute fuel for heavy vehicles. CNG is economically very attractive with much lower refuelling costs and delivers superior environmental performance with lower greenhouse gas emissions (estimated to be in the order of 30%), quieter operation and reduced air pollution (Veolia Environmental Services, 2011). A 2008 study found CO₂ emissions from diesels on par with CNG at idle but about 20% - 30% higher at full load (Jayaratne, E., et al, 2008). It has been estimated in the US that the substitution of a diesel truck for a CNG truck delivers a greenhouse gas reduction equivalent to taking 325 cars off the road (Veolia Environmental Services, 2011).

The use of CNG brings challenges and limitations. The lower energy density makes it better suited to vehicles with limited range requirements. Refuelling infrastructure also needs to be developed. CNG may therefore have a role for larger operations with a centralised depot and limited range of operations. Where this is the case, the sustainability benefits of CNG can be dramatic.. It should be noted however that thanks to the increasingly stringent emission standards for diesel engines discussed above, "the gap between tailpipe emissions benefits from natural gas vehicles (NGVs) and conventional vehicles with modern emissions controls has narrowed" (Alternative Fuels Data Center, 2012). Furthermore, modelling from Argonne National Laboratories in the United States suggests that, in light duty vehicles, the lifecycle greenhouse gas advantage of gas fuels is only 6%-11% over diesel, with the main sources of emissions being leakage of gas during the production process (Alternative Fuels Data Center, 2012).

Liquefied Natural Gas

Liquefied natural gas offers an advantage over diesel in that it has a greater energy density which extends the range needed before necessary refuelling.

The cost of keeping LNG in a liquefied state is currently a drawback for vehicles as it requires a significant amount of energy, making the use of LNG less efficient.

A significant drawback for the uptake of LNG and CNG is the limited amount of dedicated refilling stations available throughout Australia. To become a viable alternative to diesel the number of stations offering LNG and CNG will have to increase nationwide.