

Green Vehicles and the Role of Liquefied Bio-methane

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Editorial

At global level, the interest in renewable energy sources is growing together with sensitivity towards environmental issues. The transport sector represents a major item on the global balance of greenhouse gas (GHG) emissions. It covers 19% of global energy use, corresponding to about 23% of carbon dioxide (CO₂) emissions. It is forecasted that energy use and GHG emissions in this sector will increase by 50% by 2030 and more than 80% by 2050. For this reason, the Intergovernmental Panel on Climate Change (IPCC) advises that global GHG emissions must be reduced by at least 50% by 2050. Thus transport sector will play a significant role to meet the target level of CO₂ in the atmosphere [1].

Natural gas is considered the alternative fuel that, in the short-medium term, can best substitute conventional fuels in order to reduce their environmental impact, because it is readily available at a competitive price, using technologies already in widespread use. It can be used compressed (CNG) for cars and light duty vehicles and in liquid phase (LNG) for heavy duty vehicles. In the latter case, it is a good alternative to diesel fuel, because of reduced on-board weight and space requirements, due to its high energy density. Diesel substitution by LNG produces an interesting life cycle GHG emissions reduction (about 10%) [2].

The natural gas used for this purpose can be bought directly at regasification terminals (brought by LNG ships from big liquefaction facilities), can be liquefied on site from pipeline gas or it can be obtained from a renewable source.

In particular, biomethane from landfills or anaerobic digesters could play a significant role as renewable source of feedstock gas, because it limits GHG emissions (the CO₂ emissions during its combustion are the same captured during biomass growth) and it can reduce the dependency in natural gas and oil importations.

The supply of liquefied natural gas can represent a big issue for the spread of green vehicles fuelled by LNG. Indeed, it is not always possible its purchase at regasification terminals for the position of the terminal respect to the final user and/or for the marketing strategy of the regasification owner. Moreover it can be not economically feasible the liquefaction on site through small liquefaction plants. Therefore the use of biomethane as source could provide the solution to the

feasibility of such alternative fuel, thanks to the incentives policy to support the use of biomethane as vehicle fuel in place in several EU countries (e.g. in Italy).

Existing studies tried to perform a technical and economic analysis of the production of liquefied biomethane. One of the main finding was that biogas is not a convenient source by itself, because it costs more than pipeline gas, unless a proper incentive scheme subsists [3].

There are several variables that need to be considered during these evaluations and that can affect the results. First of all the technologies involved. Both for biogas production and upgrading there are several technologies available as well as for methane liquefaction. Traditional liquefaction cycles could be used or, alternatively, cryogenic separation processes for performing at the same time biogas upgrading (i.e. CO₂ separation) and methane liquefaction could be introduced, even if still in a development stage. Moreover the business model adopted plays a significant role. It comprehends the specification of who is the owner of the biogas plant and of the liquefaction facility and who can benefit of the incentives. Are they the same? Is there a liquefaction plant for every biogas plant or is it better to build a bigger liquefaction unit supplied by more biogas plants? These and several other questions need to be kept in mind in order to make a comprehensive analysis that represents the real context where the plants are built. Thus, it is not possible to provide an a priori assessment for the incentives necessary, but each case has to be carefully studied. However it has been demonstrated that the feasibility of this technology can already exist in certain markets (as in Italy) and represents a valuable solution to the problem of methane supply for green vehicles fuelled by LNG [3].

References

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