# Summary Gas-powered driving and sailing -
## The cost and environmental impact of natural gas and green gas as transport fuels

### Introduction

Although petrol and diesel still account for the lion's share of transport fuels, a number of alternatives are on the rise. This study, conducted for the New Gas Platform, part of the Netherlands' Energy Transition, reviews some of the key gaseous alternatives that are already on the market:

- Compressed Natural Gas (CNG).
- Liquefied Natural Gas (LNG).
- Bio-CNG en bio-LNG, both produced from biogas and green gas[1].

The costs and environmental impact of these fuels have been calculated for various transport applications: CNG and bio-CNG in cars, light goods vehicles and buses, and LNG and bio-LNG in heavy goods vehicles, buses and inland shipping vessels. These were then compared with the costs and environmental impact of diesel, biodiesel and bioethanol.

In the case of the bio-CNG and bio-LNG routes, two different green gas feedstocks were considered: landfill gas and biogas from co-digestion (50-50) of corn and manure.

### The cost of driving and sailing on gas

In the cost comparison the costs of fuel, filling stations and vehicles were examined, in all cases exclusive of taxes, charges and subsidies[2]. These calculations showed that as things stand at the moment the green gas routes are generally more expensive than the diesel route. The only exception is driving on bio-CNG from landfill gas, as long as additional vehicle costs are limited[3]. For cars on bio-CNG the costs are similar to or lower than those of biodiesel and bioethanol from wheat, while for heavier vehicles and vessels the costs of the green gas routes are higher.

For the respective cost items, the results are as follows:

- *Fuel costs:* In the current situation the net fuel costs of CNG and LNG are similar to those of diesel. The costs of bio-CNG and bio-LNG from co-digestion are 30-75% higher than the present diesel price, but the green gas routes from landfill gas are around 50-65% cheaper than diesel. With the green gas routes the costs depend very much on the scale of digestion operations.
- *Filling station costs:* In some cases fleet operators will themselves invest in a CNG or LNG filling point. The associated costs will vary with the volume of fuel consumed and will lie somewhere between about € 300,000 and € 2 million.

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1 This report does not deal with LPG. Although this is also a gaseous fuel, it is manufactured during the refining of crude oil and is not produced from natural gas or biogas.

2 For policy-makers and from a macro-economic perspective it is these net costs that are often the key issue. In calculating the costs for those using the gas (consumers and industry) these must obviously be included, though, and these figures may be very different.

3 The cases calculated show that this applies only to passenger cars.

– *Vehicle costs:* Cars running on CNG are often no more expensive than standard vehicles, or only marginally so, but in the heavier segment and for LNG this is not the case, with a CNG town bus costing around € 40,000 more and an LNG heavy goods vehicle about € 65,000.

It should be added, though, that there is certainly scope for reducing the costs of the gaseous routes in the future. Not only have vehicle costs declined over the past few years with rising production volumes; in a few years the costs of diesel vehicles and vessels are likely to increase as emission standards become ever more stringent. Gas-powered vehicles and vessels already meet such standards. The fuel costs of bio-CNG and bio-LNG may still fall as the scale of biogas production increases.

## Environmental impact

The lifecycle $CO_2$ emissions of the green gas routes are substantially lower than in the case of diesel (a 80-90% reduction). The natural gas routes may also yield $CO_2$ savings, but to a lesser extent (approx. 15-35% with the current Dutch natural gas mix). The emission savings depend very much on where the natural gas is sourced and, to a lesser degree, on the mode of biogas production. Bio-CNG and bio-LNG production from landfill gas score slightly better than co-digestion.

Comparing the green gas routes with the other biofuels in use today (biodiesel and bioethanol), we see that the $CO_2$ savings of bio-CNG and bio-LNG are considerably greater than those of biodiesel and bio-ethanol from wheat, and similar to or higher than those of bioethanol from sugarcane[4].

A switch from diesel to gaseous fuels will lead to a marked reduction in emissions of the air pollutants $NO_x$ and $PM_{10}$, in many cases by 50 to 90%.

## Recommendations

It is recommended to put the results of this study in a broader perspective and compare the figures with the costs and benefits of using green gas in other sectors. It is also recommended to monitor cost trends in the coming years. Given the fairly rapid growth in use of these fuels we see today, it is well feasible that vehicle costs in particular will decline in the future, while the costs of the reference vehicles and vessels will rise as new emission standards come into force.

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[4] Greenhouse gas emissions associated with indirect land-use changes have not been considered in this report. These may be relevant for liquid biofuels and for corn cultivated for use in co-digestion.