SYNTHETIC NATURAL GAS (SNG) DEVELOPMENT AND IMPLEMENTATION TRAJECTORY

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ABSTRACT: Substitution of natural gas by a renewable equivalent is an interesting option to reduce the use of fossil fuels and the accompanying greenhouse gas emissions, as well as from the point of view of security of supply. The renewable alternative for natural gas is the so-called green natural gas, i.e. gaseous energy carriers produced from biomass comprising both biogas and Synthetic Natural Gas (SNG). Whereas digestion is an available and commercially proven technology with widespread implementation on farm scale, the technology for SNG production, however, is still under development and realisation of the first semi-commercial plant is not expected before 2010. Within the implementation trajectory of green natural gas biogas however can be considered as a "1st Generation" green natural gas, while SNG is the "2nd Generation" gas with an implementation in a later phase, but with a much higher almost unlimited potential.

1 INTRODUCTION

Substitution of natural gas by a renewable equivalent is an interesting option to reduce the use of fossil fuels and the accompanying greenhouse gas emissions, as well as from the point of view of security of supply. The renewable alternative for natural gas is the so-called green natural gas, i.e. gaseous energy carriers produced from biomass comprising both biogas and Synthetic Natural Gas (SNG).

Via this route can be benefited from all the advantages of natural gas, like the existing dense infrastructure, trade and supply network, and natural gas applications. In the Netherlands the ambition is defined to replace 20% of the natural gas by green natural gas. With a current annual consumption of natural gas in the Netherlands being approximately 1,500 PJ a 20% substitution would hence correspond to 300 PJ. The potential of (upgraded) biogas and landfill gas in the Netherlands is maximum 60 PJ due to limited availability of suitable digestible feedstock materials. To reach the ambition of 20% substitution in 2030 a SNG production capacity is required of at least 240 PJ.

2 TECHNOLOGY

Whereas digestion is an available and commercially proven technology with widespread implementation on farm scale, the technology for SNG production, however, is still under development and realisation of the first semi-commercial plant is not expected before 2010. Within the implementation trajectory of green natural gas biogas however can be considered as a "1st Generation" green natural gas, while SNG is the "2nd Generation" gas with an implementation in a later phase, but with a much higher almost unlimited potential.

3 DEVELOPMENT & IMPLEMENTATION TRAJECTORY

SNG ultimately will be produced by converting the biomass via gasification into a methane-rich product gas and, after cleaning, conversion of the H_2 and CO in the gas to CH_4 by catalytic methanation. The crude SNG product has to be upgraded to pipeline specification by removal of CO_2 and water.

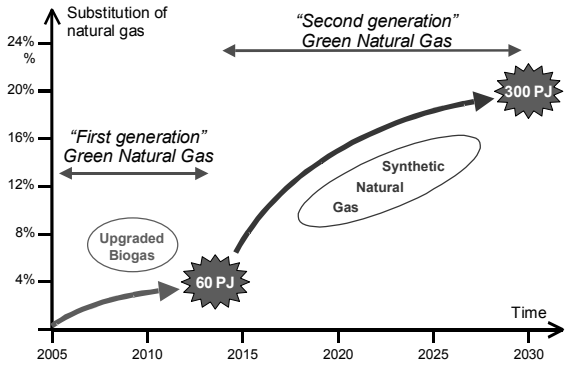

Figure 1: Development & implementation trajectory

This technology for integrated bio-SNG production is still in the R&D phase and a development trajectory is necessary before the technology is ready for market implementation. The optimum trajectory aiming at fast implementation of SNG will contains the following phases:

- Slipstream demonstration at a small scale (~10 MW_{th}) demonstration installation, where the main fraction of the product gas is utilised for power production, to take place in 2007.
- Construction of an integrated bio-SNG pilot plant and the performance of a test programme to support the slipstream demonstration, to take place in 2007.
- Full stream demonstration at the small scale (~10 MW_{th}) demonstration installation, utilising the complete gas stream for SNG production, estimated to start around 2009.
- Large-scale (~50-200 MW_{th}) demonstration,
- Large-scale (~500-1000 MW_{th}) commercial implementation, projected after 2015.