

Green Gas explained

Introduction

Green Gas is a substitute for natural gas. Green Gas produced by gasification of biomass is called bioSNG. SNG has the same characteristics and specifications as fossil natural gas. It can be injected into the natural gas grid and can be used for all the same applications where natural gas is currently used for. The production of SNG by means of biomass gasification is an innovative process that decreases CO₂ emissions and makes use of existing infrastructure. In the Netherlands this equals half of the total national energy consumption. If SNG is used for transport applications it is a second generation transport fuel. SNG can be produced from biomass with an efficiency of approximately 70%.

What is Green Gas?

Green gas is a general name for all gases that replace natural gas and are produced from biomass. Green gas is also called SNG and mainly consists of methane (CH₄). SNG stands for Substitute Natural Gas and is fully exchangeable with fossil natural gas.

Technology

The SNG production process has three important steps: gasification, gas cleaning and methanation.

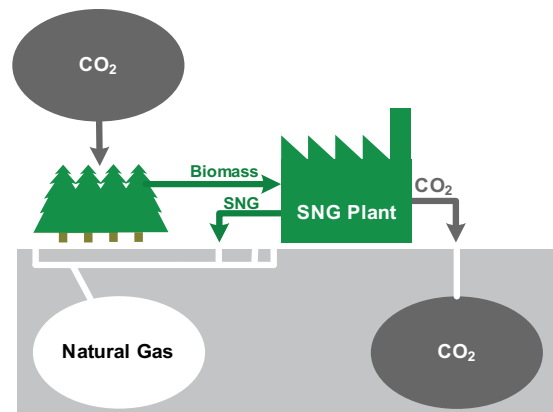
Gasification is a thermal process wherein solid biomass is converted into a gas. The main components of this gas are carbon monoxide (CO), hydrogen (H₂) and a large amount of methane (CH₄).



The gasifier is based on MILENA technology that has been developed by ECN. This unique design uses lignocellulosic biomass and enables the production of high amounts of methane in the gasifier itself. In the gas cleaning step all unwanted components such as tars, sulphur and carbon dioxide (CO₂) are removed. A key part of the gas cleaning is the OLGA tar removal system that has been developed and patented by ECN. After the gas cleaning step only CO, H₂, CH₄ and water remain present in the gas. In the final step of the SNG process, CO and H₂ react with each other and from CH₄ in a catalytic process called methanation. The final product of the SNG process is methane.

Efficiency en Advantages

The efficiency for the conversion of biomass to SNG is high: approximately 70%. SNG has the same characteristics as regular natural gas. It can be injected in the natural gas grid.



A typical SNG system converts 1 kilogram of biomass into 0.4 Nm³ Green Gas and produces 0.4 Nm³ of CO₂ as a by-product.

Specifications for the injection of natural gas into the regional gas grid are already available for the Netherlands and some other countries. Specifications for injection in the high-pressure grid of the Netherlands are being developed.

When used in a car as Compressed Natural Gas, SNG is a second generation transport fuel. The important difference between SNG from biomass and fossil natural gas is that SNG reduces CO₂ emissions with almost 100%. If the CO₂ from the SNG production process is stored, the CO₂ reduction is even higher: almost 200%.

Economy

SNG should be competitive with fossil natural gas. SNG plants use economy of scale to produce SNG against lower cost. ECN foresees that an SNG plant of a size larger than 100MW can be



competitive with fossil natural gas. If the SNG is used for bio fuels in transport, the plant size could be smaller because the price for SNG is higher. In terms of CO₂ equivalent cost, SNG is among the lowest cost options for renewable energy.

Green Gas and Policy

Green Gas has an important place in one of the “energy transition pathways” that are defined by the Dutch ministry of Economic Affairs. This pathway is called “new gas” and according to the vision document of its working group the amount of natural gas replacement by green gas in the year 2050 should be a challenging 50%.



Green gas is also part of the “Innovation Agenda” from the Dutch Government. This strategic research agenda should pave the way for reaching the Dutch government’s energy objectives.

Green Gas and ECN

In the past 5 years ECN has developed a unique knowledge position on SNG technology. Activities focus on gasification, tar removal and gas cleaning. The objective of the group Syngas & SNG is to develop SNG technology and to bring this technology to the market. SNG that is produced from coal can be considered as conventional technology. SNG from biomass can not. ECN intends to bridge the gap. Between now and the point where SNG technology is ready for a demonstration plant lies a challenging R&D trajectory.



Summary

ECN is excited that the SNG technology that is being developed here receives a great deal of interest from industry and government. A clear R&D trajectory, mainly consisting of duration tests and further construction of the pilot scale testing facilities, paves the way to a SNG demonstration plant in some years time. With the right financing and support for the R&D trajectory, this moment can be brought forward. This demo plant together with the unique knowledge forms the basis of a further commercialization of SNG technology; a second-generation technology that produces SNG from biomass that does not compete with food production with an efficiency of 70% and potentially negative CO₂ emissions (carbon sink). Large scale implementation of SNG leads to reduction of CO₂ emissions, increases security of supply, offers great business opportunities and strongly improves the knowledge position of the Netherlands.



Further Information

Check out our website: <http://www.ecn.nl/en/bkm>
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