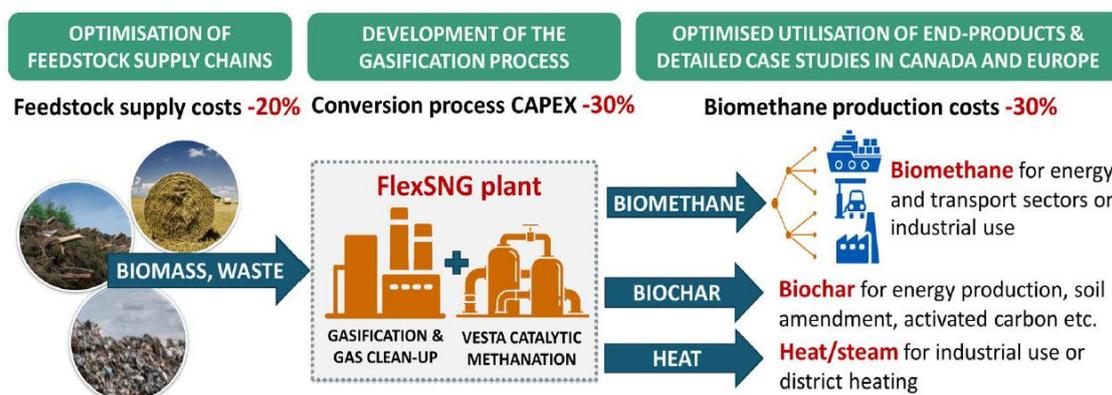


Flexible Production of Synthetic Natural Gas and Biochar via Gasification of Biomass and Waste Feedstocks



The transition towards **climate neutrality** by 2050 is one of the main themes in the agenda of the European Union and its member states. To reach this target, the European Union aims at increasing the share of renewable energy sources in both heat, electricity and transport use. **Bioenergy** will play an ever increasingly role in this transition but further improvements in conversion technologies and biomass supply chain management are required to reduce the bioenergy/biofuel production costs and boost the market uptake of advanced biofuels and bioenergy in replacement of fossil fuel alternatives.

The newly launched H2020 project **FlexSNG** aims at solving this issue by developing a cost-effective gasification-based process for flexible production of **pipeline-quality biomethane, high-value biochar and renewable heat** from a wide variety of **low-quality biomass residues and biogenic waste feedstocks**. The combination of feedstock supply chain optimization and new technology innovations leads to significant cost reductions that allow **lowering biomethane production costs by more than 30%** compared to state-of-the-art biomass-to-SNG technologies. The medium-scale conversion units of 50-150 MW biomass/waste input facilitate the use of local biomass residues and biogenic waste fractions without heavy transport logistics. The key innovative technology at the core of the FlexSNG concept is the **flexible gasification process** that can switch between **two operation modes** according to market signals or feedstock availability and price:

1. **co-production of biomethane, biochar and heat**
2. **maximised production of biomethane and heat**

The biomethane product, with a methane content of 96-98%, can be readily **injected into the existing gas infrastructure** for distribution to various end-consumers in the transport sector, heat/power production, industries and households. The co-produced biochar is a solid and therefore **easily storable bioenergy carrier** that can be used to displace fossil feedstocks in energy production and industry (e.g. iron and steel making) but also has wide markets in material use (e.g. soil amendment, activated carbon). The **by-product heat** that is recovered from the gasification/synthesis process is either used for renewable district heating or supplied to industries as process steam.

One of the key benefits of the FlexSNG concept is **feedstock-flexibility**, which is enabled by the two novel features of the gasification process: 1) in co-production mode, the gasifier is operated at lower temperature (700-800 °C), which reduces the risk for ash melting, and 2) when maximising biomethane production, the gasification performance of particularly challenging waste feeds can be improved by co-feeding of biochar. This approach makes possible to convert a much wider range of lower quality, low-cost biomass residues and biogenic waste feedstocks into added-value products than achieved with state-of-the-art gasification technologies.

FlexSNG is an **EU-Canada** jointly funded action that brings together a well-balanced mix of leading universities, research institutes, SMEs and technology providers/engineering companies from seven European countries and Canada. The technical development and validation activities of the project focus on the three key enabling technologies that form the backbone of the FlexSNG process: low-cost oxygen supply via oxygen transport membranes (OTMs), flexible gasification process and simplified gas clean-up. The experimental work culminates to week-long test campaigns, where the process is validated to TRL5 at VTT's Piloting Centre in Bioruukki, Finland. Another central activity in the project is feedstock supply chain optimization that, using sophisticated modelling tools and systems analysis approach, aims at improving feedstock supply chain management and logistics to reach 20% reduction in feedstock supply costs. Towards the end of the project, techno-economic assessments and case studies will be carried out to identify the most promising locations and conditions for successful industrial deployment of the FlexSNG concept in Europe and Canada.

FlexSNG – Flexible Production of Synthetic Natural Gas and Biochar via Gasification of Biomass and Waste Feedstocks

FlexSNG is a Research and Innovation Action (RIA) that started on June 1st 2021 and will run for 36 months until May 31st 2024.

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