South Africa: Green methanol production with sewage sludge as feedstock

The Challenge

Carbon is a key element for the production of green methanol. Identifying a suitable carbon source is anything but an easy task and one that is a decisive one in the final PtX product choice by project developers.

One the one hand, there are logistical challenges when it comes to finding a carbon source in sufficient quantity and at a proximity that allows for a project to be commercially viable. Setting up the production process for green hydrogen is already an intricate undertaking, having to consider water and renewable electricity supply. Transforming the hydrogen into green methanol adds further layers to the project set up.

Another layer of complexity is added by regulations, such as the EU Renewable Energy Directive (RED) II, which define specific conditions as to which types of carbon sources are considered as sustainable and can therefore qualify for premium pricing under certain EU quotas.

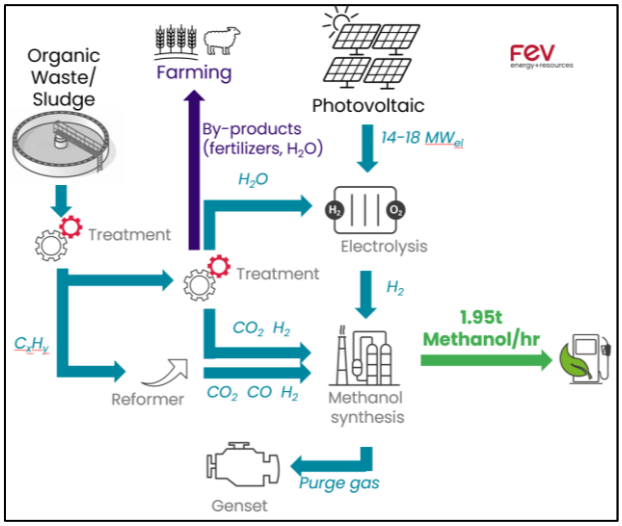
The Solution (BtX/PtX Hybrid)

Sewage sludge from wastewater treatment plants is an untapped carbon source in South Africa. At the same time, it is a sanitation hazard that municipalities need to find a solution for, not least because wet sludge becomes a source of methane slip (unintentional methane emissions during processes where methane should be captured) if stored for too long.

The PPP at hand PPP focuses on a use case of sewage sludge as feedstock for green methanol production. The project aims to set up a circular architecture (see image) at a first project site in Gauteng Province in South Africa; In a first step, the sewage sludge is treated and decomposed into fertilizer byproducts (phosphates and nitrates), water, short chain hydrocarbons and CO2. The derived water can partially be used for the electrolysis to produce green hydrogen, using electricity generated from renewable energy sources. Solar PVs will be co-located with the project. The derived carbon source then feeds into synthesizing the green hydrogen into green methanol.

During periods, where renewable energy is at minimal supply, methanol can still be produced from biomass conversion. The resulting product would be biofuel. When renewable energy is available and makes it possible to produce green hydrogen through electrolysis, part of the resulting product would be e-methanol (or 'Renwable Fuel of Non-Biological Origin' (RFNBO) in the terms of EU regulation).

Ultimately, the product obtained from this process will be a mix of methanol produced from biomass conversion (BtX) and from electrolysis and synthesis (PtX). At a stage where producing green methanol purely via electrolysis and synthesis is not economically viable, the combined production route, in fact, has the merit to improve the competitiveness of the product. For certification purposes, smart management and monitoring systems have to prove the mass balance between the BtX and PtX production pathways.



Our Services

The PPP sets out to tackle a number of pre-feasibility questions to sharpen the business model of the concept. Analyses will be undertaken to assess

- how a mixed bio- and e-fuel product can be classified and certified under existing EU legislation;
- the availability of sewage sludge as a feedstock at potential replication sites in South Africa;
- economically viable transport quantities to export destinations ;
- Possible contractual arrangements for long-term supply of feedstock, renewable electricity, land use, etc.
- Market potential for the sale of surplus byproducts (fertilizers, metal salts, water, etc.);
- Possible methodology to determine price of the renewable fuel for long-term offtake

Wastewater feedstock near green methanol production facility of FEV and GeFP. Photo: Green eFuels Producers

At a glance	
Duration	April 2025 – September 2026
Country	South Africa
Objective	Refining the business case for green methanol production with sewage sludge as feedstock
Partners	FEV Europe, FEV Consulting, INM Operations b.v., FEV North Africa, Green eFuels Producers (GeFP) and GIZ
Expected results	Analyses on • how a mixed bio- and e-fuel product can be classified and certified under existing EU legislation; • the availability of sewage sludge as a feedstock at potential replication sites in South Africa; • economically viable transport quantities to export destinations ; • Possible contractual arrangements • • for long-term supply of feedstock, renewable electricity, land use, etc. • Market potential for the sale of surplus byproducts (fertilizers, metal salts, water, etc.)

Expected Impacts

The PPP results will help in refining the scope to which the concept can be implemented at further project sites. There are a number of further project sites in South Africa, where sewage sludge availability could be used for green methanol production. The relevance of making use of this unavoidable biowaste also goes beyond South Africa.

The International Hydrogen Ramp-up Programme (H2Uppp) of the German Federal Ministry for Economic Affairs and Energy (BMWE) promotes projects and market development for green hydrogen in selected developing and emerging countries as part of the National Hydrogen Strategy.

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