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PRE-PROCESSING Simulation | ENGINEERING Process Design | POST-PROCESSING GWI Analysis | POST-PROCESSING Cost Estimation | Regulatory Framework

Regulatory Framework
Renewable Fuels from Steel Mill Gases

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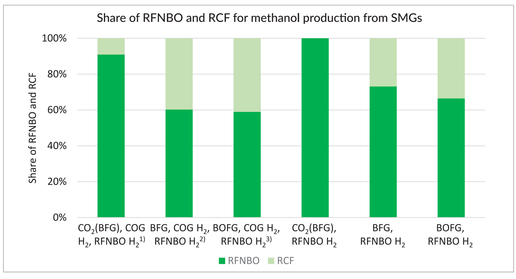
Challenge

The production of renewable liquid and gaseous transport fuels of non-biological origin (RFNBOs) and recycled carbon fuels (RCFs) must comply with the EU's Renewable Energy Directive for the use of renewable energy in the transport sector. To be recognized as RFNBO or RCF by the EU, a minimum greenhouse gas (GHG) emission savings of ≥70 % is required compared to fossil fuels.

Objective
Production of RFNBOs and RCFs from SMGs

Steel mill gases (SMGs) are converted to a mixture of RFNBOs and RCFs by reaction with RFNBO H_2 and/or H_2 obtained from coke oven gas (COG). The share of RFNBO in the output fuel depends on the input of renewable energy (mainly as RFNBO H_2) into the process. The share of RCF depends on the energy content of inputs that qualify as a source to produce RCFs (blast furnace gas (BFG), basic oxygen furnace gas (BOFG) and COG H_2) into the process.



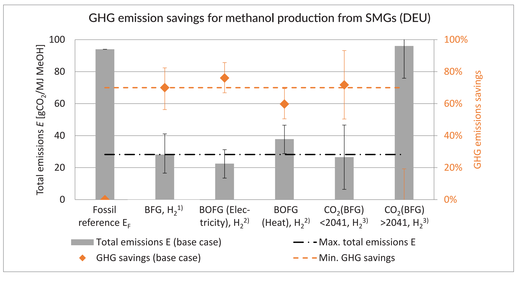
Share of RFNBO and RCF depends on CO_x-source and composition of H_2 (RFNBO H_2/COG H_2): 1) 87 %/13 % 2) 80 %/20 % 3) 88 %/12 %.

Methodology
Calculation of GHG savings of RFNBOs/RCFs

The Delegated Act (EU) 2023/1185 determines the total emissions E from the use of RFNBOs and RCFs and the GHG savings using the two formulas below. For the production of methanol from BFG and BOFG the total emissions E and the GHG savings mainly depend on the previous use or the substitution of SMGs ($e_{i\,rigid}$) and the process energy source used.

$$GHG\ Savings = \frac{(E_F - E)}{E_F}$$

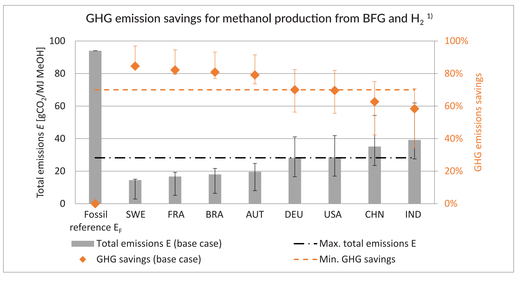
$$E = e_{i\,elastic} + e_{i\,rigid} - e_{ex-use} + e_p + e_{td} + e_u - e_{ccs}$$



H_2 (RFNBO H_2/COG H_2): 1) 80 %/20 % 2) 88 %/12 % 3) 87 %/13 %. The influence of the process energy source used is shown by bars.

Transferability
Worldwide production of RFNBOs and RCFs

The total emissions E and the GHG savings for the production of methanol from SMGs must be calculated under consideration of the site-specific framework conditions, such as the previous use of SMGs and the CO_2 emissions of the electricity grid in the respective country. The utilization of SMGs to produce RFNBOs and RCFs presents an attractive option worldwide as GHG emissions can be reduced by ≥70 % compared to fossil fuels.



1) H_2 Composition: 80 % RFNBO H_2/20 % COG H_2. Carbon footprint of BFG is calculated based on the CO_2 emissions of the electricity grid.

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A KEY BUILDING BLOCK FOR THE CLIMATE PROTECTION

CO_2 reduction by cooperation of process industrial sectors