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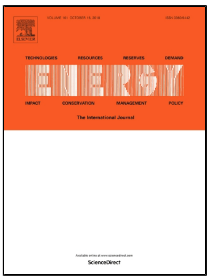

Profitability and Greenhouse Gas Emissions of Gasification-based Biofuel Production - analysis of sector specific policy instruments and comparison to conventional biomass conversion technologies

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Profitability and Greenhouse Gas Emissions of Gasification-based Biofuel Production - analysis of sector specific policy instruments and comparison to conventional biomass conversion technologies

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Abstract

The required level of a sector specific CO_{2e}-cost in the transport sector to make the net annual profit (NAP) of three different gasification based biofuel production systems positive (systems profitable) is investigated. The analysis is made for two different energy market scenarios for 2030 and 2040. The results show that the additional required sector specific CO_{2e}-cost (additional to a sector wide general cost) is not higher than the current level of CO_{2e}-tax in Sweden. The required total level of CO_{2e}-cost for the transport sector is in the 450 ppm_v scenario in general higher than the current CO_2-tax level but not higher than the fuel tax level (including also energy tax).

The study also compares the NAP and greenhouse gas (GHG) emission reduction potential of the gasification-based systems to a system where the biomass is used in conventional bio-CHP to produce heat and power and where the power is used in the transport sector (in battery electric vehicles (BEV)). Under the investigated energy market scenarios the bio-CHP and BEV system has higher NAP and higher GHG emission reduction potential. However, the bio-CHP system has a stronger dependency on the availability of large heat sinks and profits from a high price of delivered heat.

Abbreviations

AIC	Annual investment cost
BEV	Battery Electric Vehicle
CCS	Carbon Capture and Storage
CEPCI	Chemical Engineering Plant Cost Index
CHP	Combined Heat and power
CO_{2e}	Carbon dioxide equivalent
CRF	Captial Recovery Factor
DH	District Heating
FT	Fischer-Tropsch
GHG	Greenhouse gas
GWP	Global Warming Potential
ICE	Internal Combustion Engine
INT	Integrated
LCA	Life cycle assessment
Mbtu	Million british thermal units