

Advantages and Difficulties of Joint Ecological and Economic Assessments of the Production and Use of E-Fuels

Donnerstag, 18. November 2021
10.30 – 11.00 Uhr
Kongress 1

Referent

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Abstract

E-fuels are seen as an opportunity to defossilize transport, especially in sectors where direct electrification through the use of batteries is not readily possible, e.g. aviation. These fuels are produced from carbon dioxide and water by means of high amounts of electricity and are therefore criticized for high efficiency losses. Moreover, it is unclear whether and how they will reach a price level in the future at which they can compete with fossil fuel or other types of renewable drive technologies. In order to answer the issues involved and to reach the corresponding development goals, it is important to guide the development process with environmental and economic assessments. This should be done at an early stage, because changes can be made more easily and the results of the assessments can still influence the engineering.

Currently innovative production ways for synthetic fuels are developed, one of them at the KIT as part of the Kopernikus project P2X. The special features of this Fischer-Tropsch (FT) based fuel production concept is that all of the production steps, from the direct air capture plant to the high temperature co-electrolysis to the FT-synthesis and the final processing, are highly integrated and the applied technologies, e.g. FT-synthesis with microstructured apparatus, are suitable for small-scale container plants. The integration of these plants leads to efficiency gains, e.g. due to heat recovery. A demonstration plant is under construction at the Campus North of KIT.

In cooperation with the technical partners, the above described development in the Kopernikus project P2X is also accompanied by a life cycle assessment (LCA) and a techno-economic assessment (TEA). The advantage is that both assessments are done in parallel on the same data basis. Many publications focus either on economic or on environmental aspects. This can lead to contradictory conclusions, which are hard to analyze due to differences e.g. in assessment boundaries, assumptions or plant scale. The joint assessment also offers the possibility to calculate combined indicators such as carbon abatement costs and thus to carry out an integrated assessment.

The presentation will introduce the different types of LCA and TEA integration and explain the difficulties and advantages of a joint assessment using the example of the above described FT-fuel production. The presentation will also focus on combined indicators like carbon abatement cost and the challenges concerning uncertainty and results interpretation, when ecological and economic results are evaluated together.

The presentation has not yet been given at another event.