DME as a Promising Platform Molecule for Fuels

André Sternberg, Florian Rümmele, Achim Schaadt and Robert Szolak

Fraunhofer Institute for Solar Energy Systems ISE, Heidenhofstraße 2, 79110 Freiburg

Abstract

The defossilization of the transport sector represents a significant challenge in the context of climate protection. An important component in addressing this challenge is the utilization of renewable fuels, particularly for aviation and sipping. Currently, several production pathways are investigated for renewable fuels. One promising platform molecule for renewable fuels is dimethyl ether (DME).

The project "e-Fuels fürs Länd" conducts a comprehensive feasibility study to investigate three scenarios for DME-based fuel production, focusing on maximizing value creation in Baden-Württemberg, developing robust business models, and ensuring a swift market ramp-up. This initiative explicitly emphasizes technologies "Made in Baden-Württemberg," thereby establishing a framework for domestic fuel production.

The first scenario delineates a short-term value chain wherein biomass is converted into fuels utilizing established DME technologies. In contrast, the medium- and long-term scenarios primarily leverage hydrogen sourced from electrolysis and CO_2 captured through direct air capture as feedstock. Innovative technologies originating from Baden-Württemberg are also integrated into the analysis. Notably, the INDIGO process is included, which facilitates efficient and cost-effective DME production from raw methanol. Furthermore, the DME-to-Olefins process is examined to enhance the production of high-quality fuels, such as kerosene and gasoline. Concurrently, Fraunhofer ISE and its partners are advancing the development of innovative technologies for direct air capture of CO_2, which play a crucial role in the production of renewable fuels.

Through rigorous techno-economic analyses, optimization potentials are identified and quantified, aiming to establish a viable business case for fuel production. The outcomes of this project seek not only to ensure industrial value creation in Baden-Württemberg but also to contribute to the attainment of global climate objectives and the preservation of regional employment.