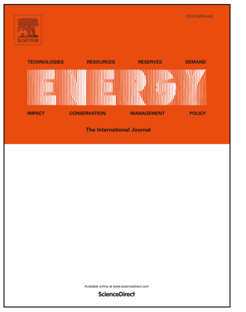

Liquid Solar Fuel – Liquid hydrocarbons from solar energy and biomass

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Liquid Solar Fuel – Liquid hydrocarbons from solar energy and biomass

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ABSTRACT

The Liquid Solar Fuel (LSF) concept aims to provide renewable-energy-based fuels like synthetic Diesel and Kerosene for long-distance transport via trucks, ships and airplanes and for remote machinery. The purpose of this paper is to present a preliminary design and performance model of a small scale plant with a rated production capacity of 100 barrels per day. First technical and economic performance estimates suggest that an achievable process efficiency around 50 % and a product cost of ca. 1 US$/liter for large scale units in the medium term future can be attractive when compared to similar processes like power-to-liquid or biomass-to-liquid.

A key attribute of the LSF concept is to maximize efficiency of all physical and chemical processes involved by continuous full-load operation of the synthesis process avoiding any transients, and by integrating and recycling all involved energy and material flows. How to achieve this in an effective way in spite of mainly using variable renewable energy from sunshine and wind for power supply is a key finding of the analysis, significantly reducing the need for major storage facilities for hydrogen and other involved substances.

A major implication of the study is that carbon-free production of synthetic liquid hydrocarbon fuels is possible with present state-of-the-art technologies and can be efficient and affordable under appropriate frame conditions that exist in many parts of the world.

The analysis has been made in the frame of internal activities of the Department of Systems Analysis and Technology Assessment at the German Aerospace Center (DLR) in Stuttgart, Germany, since 2008, and had the goal to identify sustainable solutions for future long-distance transport fuels. The model analysis provides technical and economic performance estimates of a first prototype.

KEYWORDS

Liquid Solar Fuels, System Analysis, Renewable Energy, Solar Energy, Fischer-Tropsch Synthesis, System Integration