

Liquid hydrogen "batteries" for storing renewable energy



Background

None of the today's energy storages are feasible to serve the on-going revolution from fossil to carbon-free renewable energy as they are limited in storage times and capacities. Hydrogen is a flexible energy carrier, but its storage, transport and use as compressed or liquid form is challenging due to efficiency and safety reasons. Therefore development of a feasible hydrogen storage media is vitally needed globally and nationally.

What is the LOHC concept?

Liquid organic hydrogen carriers (LOHCs) can be reversibly hydrogenated and dehydrogenated using catalysts and elevated temperatures, resembling liquid hydrogen "batteries". In 2017, Hydrogen Council defined LOHCs as an alternative for transport and storage of hydrogen. LOHCs would offer an energy storage solution compatible with the existing infrastructure for liquid fuels with flexible storage times and capacities. This concept could serve as storage of renewable energy for energy sectors, residential use, shipping and mobile applications. The LOHC system based on dibenzyl toluenes is already commercialised by Hydrogenious GmbH. In Japan, LOHC system based on toluene is demonstrated.

Development needs

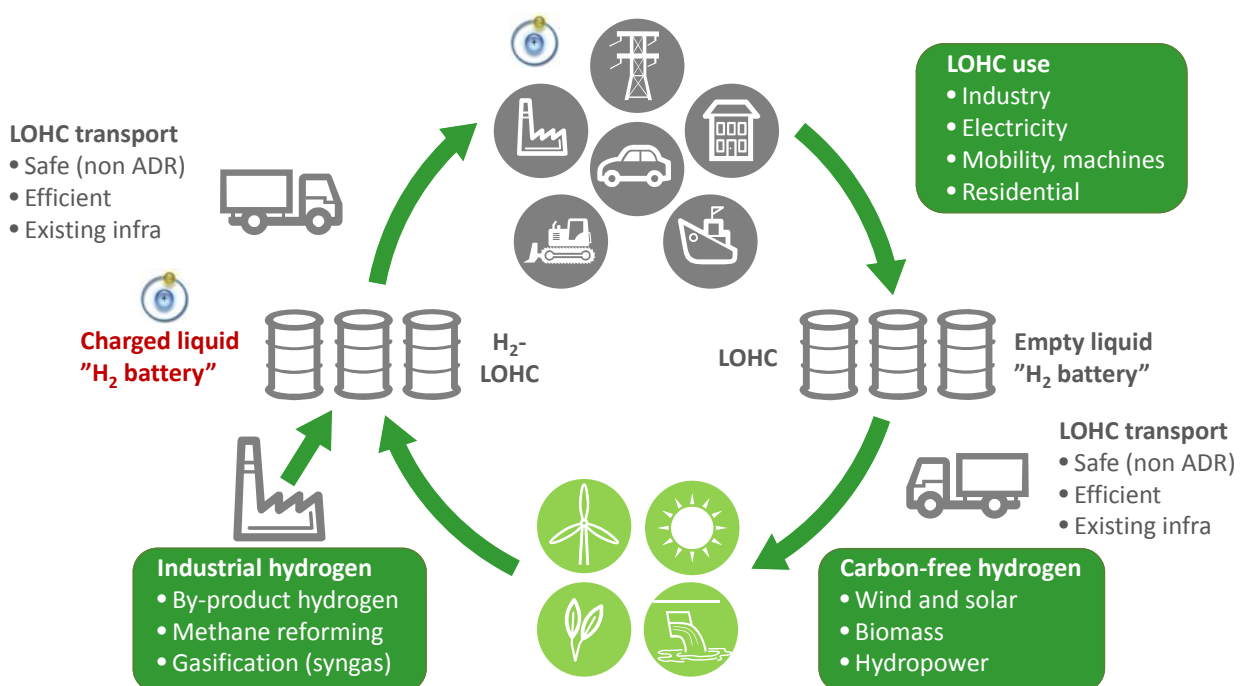
Hydrogen release temperature from LOHC is currently relatively high, thus catalysts are developed to achieve milder reaction conditions. New components can be designed to optimise their performance and system integration. Storage capacity of the concept itself is not limited: LOHC liquid can be stored as well in canisters as in the large caverns.

The LOHCNESS project

In the LOHCNESS project, the feasibility and performance of the LOHC solutions will be evaluated aiming at

- Identifying the business possibilities and best uses around the LOHC concept.
- Finding efficient hydrogen release catalysts for the new proof-of-concept testing.
- Demonstrating the existing LOHC concept of Hydrogenious GmbH and the new set-up for hydrogen release.

Practical information of the LOHC concept is generated, particularly, in terms of the purity of hydrogen released and the long-term durability of the LOHC fuel cell installation. Development of catalyst and components aims at improved system. LOHC is a promising hydrogen storage solution to enable low-carbon energy, and to support energy companies and manufacturers of catalysts, fuel cells, and components.



Partners

VTT Technical Research Centre of Finland Ltd., University of Helsinki, Fortum, St1 Renewable Energy Oy, Oy Woikoski Ab, Leppäkosken Sähkö Oy, Aino Energia Oy.

Contact: paivi.aakko-saksa@vtt.fi,
timo.repo@helsinki.fi
Website: www.vtt.fi/sites/lohcnness



HELSINGIN YLIOPISTO
HELSINGFORS UNIVERSITET
UNIVERSITY OF HELSINKI



WOIKOSKI

