

Life Cycle Assessment of Green Hydrogen Supply Pathways

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In the current era of climate change and depleting fossil fuel resources, green hydrogen is a potential candidate to mitigate large dependency on fossil fuels and still abiding by the strict environmental regulations. Transporting hydrogen over long distances is the main impediment to the success of hydrogen infrastructure globally. However, storing hydrogen in other chemicals such as Liquid Organic Hydrogen Carriers (LOHC) and liquid ammonia can be a potential solution to address the issue. Therefore, this study presents a cradle to gate life cycle assessment of three hydrogen supply chain infrastructures: (a) Liquid hydrogen; (b) LOHC; (c) liquid ammonia for short (100 km) and long (400 km) distances. The results show that hydrogen supply as liquid hydrogen is the most environmentally friendly option for short and long distances. But, hydrogen losses due to boil off may present significant challenge on economic perspective as well. On contrary, hydrogen supply via LOHC is producing the highest emission with 4.65 kgCO₂-eq/kgH₂ as Global Warming Potential (GWP), whereas liquid ammonia presents a relatively lower number of emissions with 4.02 kgCO₂-eq/kgH₂ as GWP over long distance.