Life Cycle Assessment of Hydrogen Production and Consumption in an Isolated Territory

Hydrogen produced from renewables works as an energy carrier and as energy storage medium and thus hydrogen can help to overcome the intermittency of typical renewable energy sources. However, there is no comprehensive environmental performance study of hydrogen production and consumption. In this study, detailed cradle to grave life cycle analyses are performed in an isolated territory. The hydrogen is produced on-site by Polymer Electrolyte Membrane (PEM) water electrolysis based on electricity from wind turbines that would otherwise have been curtailed and subsequently transported with gas cylinder by road and ferry. The hydrogen is used to provide electricity and heat through fuel cell stacks as well as hydrogen fuel for fuel cell vehicles. In order to evaluate the environmental impacts related to the hydrogen production and utilisation, this work conducts an investigation of the entire life cycle of the described hydrogen production, transportation, and utilisation. All the processes related to the equipment manufacture, operation, maintenance, and disposal are considered in this study.

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