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Assessment of usage of hydrogen as alternative fuel into NETPLAN

Abstract:

Hydrogen has been promoted as an alternative carrier for use in fuel cell driven light-duty vehicles (LDV) in the transportation sector that can mitigate the energy security and environmental issues associated with petroleum dependence. However, the major challenge to hydrogen deployment is the lack of an existing infrastructure for producing, delivering and refueling. Additionally, there are uncertainties and risks involved in the introduction of a new vehicle technology to the market which inhibits related investment.

An extended-term (e.g., 40 years) evaluation of economics, performance, and environmental impact of large-scale hydrogen deployment is necessary to effectively evaluate its value. The multi-stage network flow optimization model NETPLAN has been used to perform such an evaluation in this work, where performance has been assessed in terms of overall economics and carbon dioxide emissions associated with both the light-duty vehicle and the electric power generation sectors. Conclusions vary dependent on the price of gasoline, the price of natural gas, the cost imposed on carbon dioxide emissions, the composition of the electric power generation portfolio, and the relative cost of gasoline-fueled, fuel cell, and pluggable hybrid electric LDVs.