

**Fuel Choices for Fuel-Cell Vehicles:
Well-to-Wheels Energy and Emission Impacts**

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Abstract

Because of their high energy efficiencies and low emissions, fuel-cell vehicles are undergoing extensive research and development. While hydrogen will likely be the ultimate fuel to power fuel-cell vehicles, because of current infrastructure constraints, hydrogen-carrying fuels are being investigated as transitional fuel-cell fuels. A complete well-to-wheels evaluation of fuel-cell vehicle energy and emission effects that examines (1) energy feedstock recovery and transportation; (2) fuel production, transportation, and distribution; and (3) vehicle operation must be conducted to assist decision makers in selecting the fuel-cell fuels that achieve the greatest energy and emission benefits.

A fuel-cycle model developed at Argonne National Laboratory — called the Greenhouse gases, Regulated Emissions, and Energy use in Transportation (GREET) model — was used to evaluate well-to-wheels energy and emission impacts of various fuel-cell fuels. The results show that different fuel-cell fuels can have significantly different energy and greenhouse gas emission effects. Therefore, if fuel-cell vehicles are to achieve the envisioned energy and emission reduction benefits, pathways for producing the fuels that power them must be carefully examined.

Keywords: well-to-wheels analysis, fuel-cell vehicles, fuels, energy use, greenhouse gas emissions, and hydrogen