

Fuel Cells

A **Green** Solution?

Fuel cell vehicles can be powered by hydrogen made from gasoline, produced by refineries like this. But that choice will not clean up our atmosphere.



Environmental benefits depend on hydrogen source

Hydrogen fuel cells are portrayed as the green alternative to internal-combustion engines, which emit greenhouse gases that cause global warming. We are told the only emissions created by driving a hydrogen fuel-cell-powered vehicle will be water.

But where does the hydrogen come from? What polluting emissions will be created by generating it? To be pollution-free, the hydrogen must be derived from renewable energy, such as solar or wind. Unfortunately, hydrogen from these sources is not yet available at a commercial scale. It is currently manufactured by "stripping" it out of fossil fuels, such as natural gas, methanol or gasoline, or by passing a heavy electric current through water.

These fossil fuel-based sources of hydrogen differ widely in the emissions they generate, but they are now being proposed as the power source for fuel cell vehicles, without public discussion of the environmental consequences.

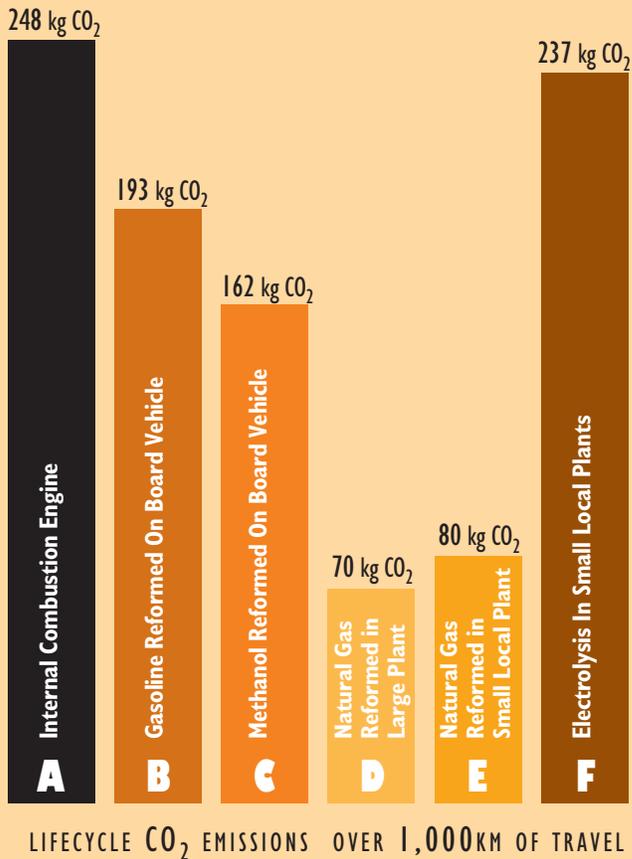
Fuel cells will provide a major environmental step forward only if we choose the cleanest methods to manufacture and deliver the hydrogen. Indeed, if the right decisions are not made, this revolutionary technology will perform only marginally more efficiently than current engines, we will simply shift much of the pollution from the tailpipe to hydrogen production plants, and our vehicles will continue to contribute to global warming. We will have wasted major investments in a remarkable invention by failing to capture the real environmental gains it could offer.

What is a fuel cell?

Unlike a conventional vehicle engine, which burns gasoline and emits air pollutants that create urban smog and greenhouse gases that cause climate change, a fuel cell converts fuel energy into electric power without combustion. With pure hydrogen fuel, this process can result in no tailpipe release of greenhouse gases or smog-forming pollutants.

This summary is taken from "____," by the Pembina Institute and the David Suzuki Foundation.

Natural Gas: Best Current Source For Hydrogen Fuel



A Internal Combustion Engine (ICE) - Mercedes-Benz A-class vehicle used as a basis of comparison. Majority of greenhouse gas (GHG) emissions result from vehicle operation, with 26% occurring upstream - the producing, refining, and distributing of gasoline.

B Gasoline Reformed On Board Vehicle - GHG emissions approx. 22% less than ICE. Upstream emissions approx. 28%.

C Methanol Reformed On Board Vehicle - GHG emissions approx. 35% less than ICE. Upstream emissions approx. 43%.

D Natural Gas Reformed In Large Plant - GHG emissions approx. 72% less than ICE. 100% of emissions upstream of vehicle operation.

E Natural Gas Reformed In Small Local Plants (e.g. service stations) - GHG emissions approx. 68% less than ICE. 100% of emissions upstream of vehicle operation.

F Electrolysis In Small Local Plants - GHG emissions approx. 5% less than ICE. 100% of emissions upstream of vehicle operation. Even with highly efficient generation of electric power, this method places huge demands on electrical grid. (Currently, new generation is through burning of natural gas.)

For copies of the full report “_____,” please contact either organization.

Many transportation analysts expect concerns about air pollution to drive a transition from internal-combustion engine to fuel cell vehicles (FCVs). The automobile industry is now developing vehicles run by fuel cells.

But the environmental benefits of such a major investment in new technology will be negated if a highly polluting source of hydrogen is chosen. Some regional air pollutants will still be created and significant amounts of greenhouse gases will still be released “upstream” in the hydrogen production process, contributing to global climate change.

In other words, while operating a vehicle powered by a hydrogen fuel cell may cause no polluting emissions, generating the hydrogen in an environmentally inefficient manner could largely cancel out this advantage.

Which method of hydrogen production is most efficient?

A study by The Pembina Institute for Appropriate Development, based in Alberta, and The David Suzuki Foundation, based in Vancouver, looked at the emissions of greenhouse gases associated with hydrogen production.

Using a technique known as Life-Cycle Value Assessment, the study takes into account the environmental impacts of acquiring raw material for the fuel, processing and refining the fuel, transporting and distributing the fuel, and operating vehicles.

As a common unit of comparison, the Mercedes-Benz A-Class vehicle, which is being used by both Ballard and Mercedes to develop FCV market prototypes, was chosen. The results can be seen in the accompanying graph.

A clean fuel-cell strategy

This study clearly indicates that an ill-informed choice of fuel production for FCVs could lead to only modest greenhouse gas emission reductions—in the order of 10 per cent—a tragic squandering of opportunity, since an informed decision could lead to huge emission reductions.

With this in mind, The Pembina Institute and The David Suzuki Foundation strongly urge that the automotive industry and the fuel-cell industry choose carefully when considering methods for manufacturing and distributing hydrogen.

Canada cannot hope to meet the standards of the Kyoto Protocol unless motor-vehicle emissions are substantially reduced. With the production and marketing of FCVs just over the horizon, our choices today are critical. By making the mistake of powering our FCV vehicles with “dirty” hydrogen, we will entrench the role of vehicles as the biggest and fastest growing contributor to global warming. Instead, by considering lifecycle emissions in selecting hydrogen fuel sources, the fuel cell can live up to its environmental potential.

David Suzuki Foundation

Finding solutions

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