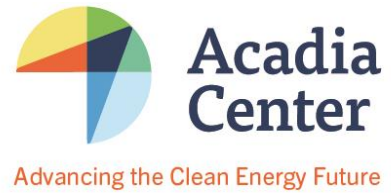


Fuel Cell Vehicles:

GHG Emissions from Hydrogen Production

March 2015

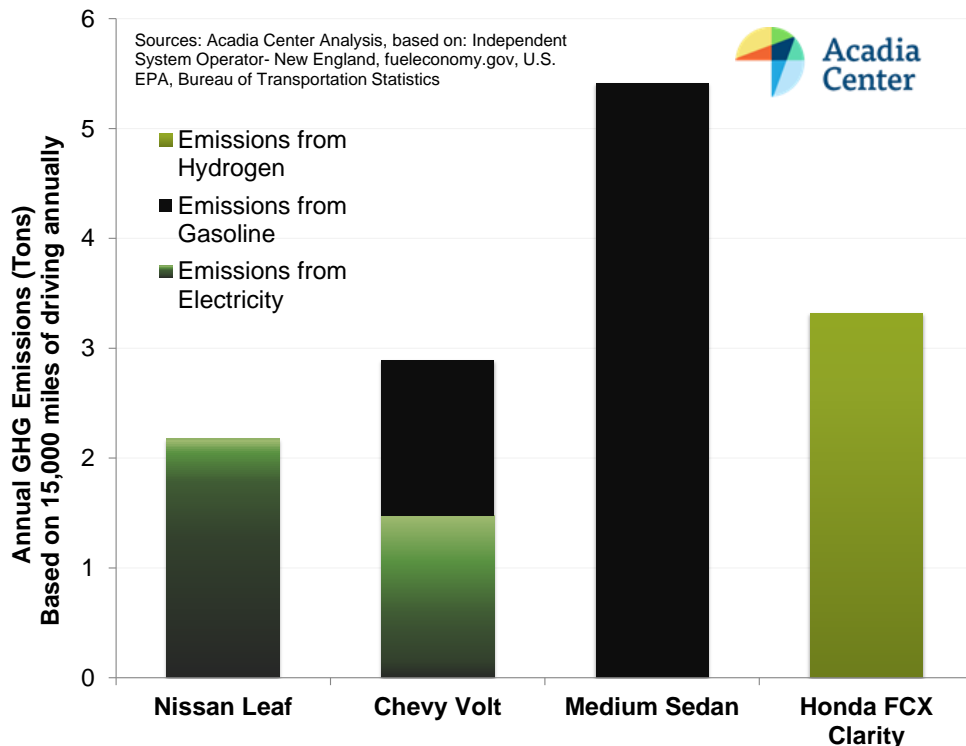


In the coming year, vehicles powered by fuel cells are expected to come to market in the United States, first in California and subsequently in other regions. Fuel cells are a technology that uses hydrogen to generate electricity. A fuel cell vehicle (FCV) uses this electricity to run the motor. FCVs have environmental benefits because they emit no local pollutants and the only direct byproduct is water. However, the greenhouse gas (GHG) emissions associated with the production of hydrogen for FCVs must be properly evaluated to determine the role of FCVs in meeting our short-term and long-term GHG reduction targets. New England states have no policies in place at present to ensure that production of hydrogen will become cleaner over time and that fuel cell vehicles will eventually be truly zero emissions.

Producing Hydrogen Using Fossil Fuels

The most economical method for producing hydrogen today is steam reforming of methane. In this process, a byproduct of the hydrogen production is carbon dioxide, which is a greenhouse gas. In addition, there can be GHG emissions associated with the energy source used to create the steam, such as the combustion of fossil fuels. Chart 1 shows the GHG emissions from a FCV using hydrogen derived from a steam reforming process that combusts natural gas as the energy source. These emissions are compared with a battery electric vehicle and a plug-in hybrid using the electricity grid mix in New England along with a traditional gasoline vehicle. This shows that an FCV can be responsible for 39% fewer GHG emissions than a gasoline vehicle, and a battery electric vehicle typically has 60% fewer GHG emissions than a gasoline vehicle.

Chart 1: GHG Emissions from FCVs, Gasoline Vehicles, and EVs in ISO-NE



Producing Hydrogen Using Renewables

There are clear pathways towards zero GHG emissions hydrogen. The method known as “electrolysis” uses electricity to split a water molecule, producing hydrogen and oxygen as a byproduct. This method has zero process emissions and, just like electric vehicles, the electricity used can be renewable, with zero GHG emissions. As a result, electrolysis using renewable electricity generation can have a clear role in meeting our long-term greenhouse gas emissions targets, including an 80% reduction by 2050. Other methods for producing hydrogen with zero GHG emissions are also under development right now.

Making Fuel Cell Vehicles Part of a Clean Energy Future

The key question is how to ensure that hydrogen production uses cleaner methods in a manner consistent with our greenhouse gas targets. In New England, electricity for electric vehicles is covered by the Regional Greenhouse Gas Initiative and will be covered by the federal requirements under the proposed Clean Power Plan. However, other fuels used for transportation, such as gasoline and hydrogen produced by energy sources other than grid electricity, have no similar framework. Other jurisdictions have covered transportation in a variety of ways. For example, California is now covering all sectors of the economy with a cap-and-trade program, including transportation. California also has specific requirements for hydrogen from renewable sources and encourages cleaner hydrogen with the Low Carbon Fuel Standard. New England states should adopt an appropriate combination of these policies to fully integrate FCVs into our clean energy future.

Conclusion

At the moment, fuel cell vehicles are more environmentally friendly than gasoline vehicles but do not necessarily offer the same GHG reductions as EVs for comparable uses in New England. Fuel cell vehicles may be the most environmentally friendly option for some categories of uses, where battery technology is not sufficiently advanced to meet certain needs.

In order to harness the potential of fuel cell vehicles, we need appropriate policies to promote clean hydrogen, such as renewable hydrogen standards or coverage in a Low Carbon Fuel Standard, a cap and trade program, or a carbon tax, to ensure that our short-term and long-term GHG goals are met.

For more information:

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