

Electric and hydrogen vehicles will offer a green bargain for Alberta's transportation sector

April 27 2022, by Bev Betkowski



Master's student Minza Haider modelled the potential impact of electric and hydrogen-powered vehicles on Alberta's transportation sector over the next 30 years. Credit: University of Alberta

In the drive to transition from conventional gasoline engines to low-carbon fuel vehicles, those that run on rechargeable batteries may have

the edge—at least for a while.

Battery [electric vehicles](#) are forecast to make up the largest number of low-carbon fuel vehicles on the road by 2050, University of Alberta research shows.

A modeling exercise calculating [greenhouse gas](#) (GHG) emissions and [market share](#) for battery electric and [hydrogen fuel cell vehicles](#) showed that the latter are predicted to lag behind in the market, due to their high cost, performance and availability, said Minza Haider, a Faculty of Engineering graduate student conducting the work to earn a master of science in engineering management.

However, both types of energy-efficient vehicles are geared up to eventually sideline their gas-burning cousins as the automobiles of the future, she believes.

"There's a transition coming, and we have the potential to decarbonize the transportation sector most effectively by adopting what are proving to be viable alternative vehicles," Haider said.

Haider is one of several U of A researchers presenting their work along with other industry experts at the Canadian Hydrogen Convention this week in Edmonton.

Her study looked at the assortment of conventional and [hybrid vehicles](#) and at the adoption of low-carbon vehicles on Alberta roads. Associated system-wide GHG emissions including from resource extraction, conversion to fuel and fuel use were factored in. The research also addressed costs including buying, operating and maintaining the vehicles, along with carbon prices.

Several scenarios based on different carbon pricing were then modeled

up to the year 2050 for adoption of the low-carbon vehicles into the transportation sector.

Haider's research revealed that GHG emissions from battery electric vehicles become the lowest at the carbon pricing scenario of \$50 per ton by the 2040s, and will continue to decline by 2050. At higher carbon pricing scenarios of \$170 per ton and \$350 per ton, the GHG emissions are lowest in 2030 and beyond.

And though hydrogen vehicles are still an [emerging technology](#), they have strong potential to lower emissions through the use of methods like auto-thermal reforming (ATR) coupled with carbon capture and storage to produce hydrogen, a process that has lower GHG emissions than other current production technologies.

This technology, coupled with high carbon capture, results in lower GHG emissions than battery electric vehicles that are supplied by the current electricity grid over the life cycle.

GHG emissions from [hydrogen fuel cell](#) electric vehicles were found to be favorable at \$0 per ton and \$50 per ton until the 2040s, considering hydrogen production with ATR, combined with an associated 91 percent [carbon capture](#) rate.

The analysis showed that in the proposed \$170 per ton carbon price scenario, emissions from electric and hydrogen cars would be 1.9 and 18 grams per kilometer respectively, compared with 240 grams per kilometer for gasoline cars in 2030. By 2050, those numbers would be 1.5 grams per kilometer for electric cars, 18 for hydrogen cars (with ATR supplied hydrogen) and 227 grams per kilometer for gasoline cars.

Emissions for both types of vehicles were forecast to be much lower than for conventional gas-burning vehicles.

In addition, the research projected that low-carbon vehicles will eventually cost about the same as a conventional vehicle—battery electric cars by 2030 and hydrogen cars by 2040.

The study's findings, to be published in a scientific paper, can help [policy makers](#) and energy producers navigate a changing transportation scene, Haider believes.

"When building a green economy for Canadian roads, it's important to plan for and invest in transitioning to low-carbon vehicles."

For anyone interested in buying a low-carbon vehicle, the study also confirms that it would be "an environmentally conscious choice to make," she added.

Provided by University of Alberta

Citation: Electric and hydrogen vehicles will offer a green bargain for Alberta's transportation sector (2022, April 27) retrieved 23 April 2024 from <https://techxplore.com/news/2022-04-electric-hydrogen-vehicles-green-bargain.html>

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