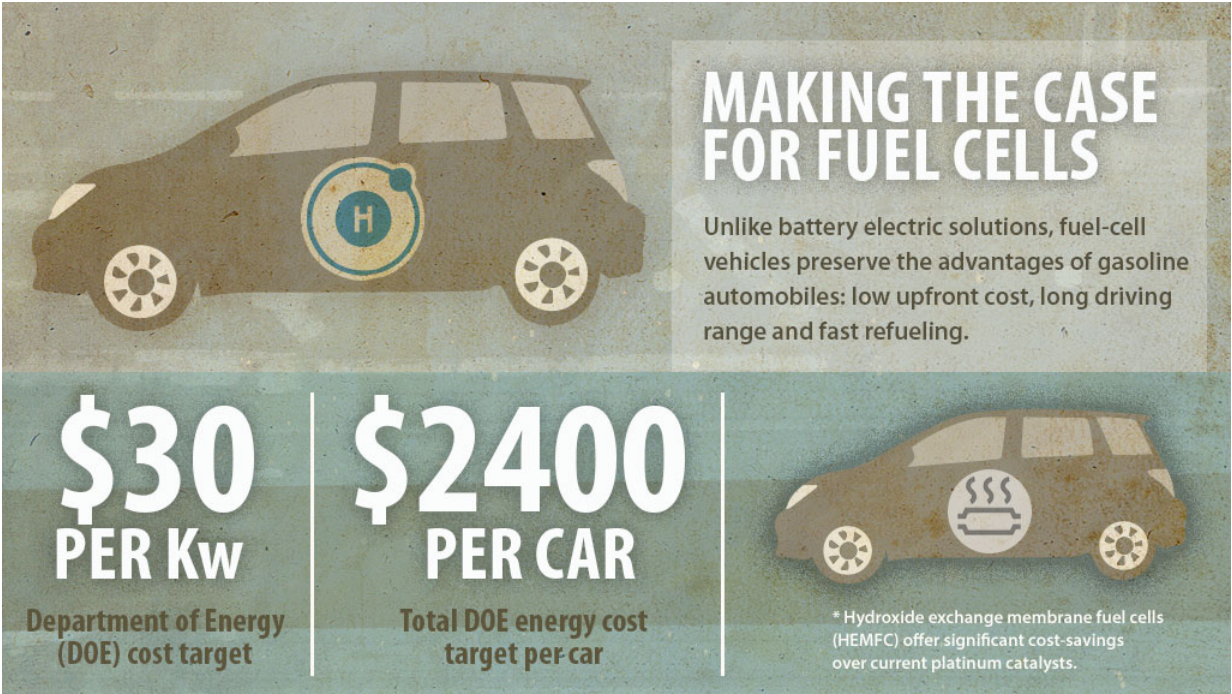


Team sets performance targets for alternative fuel cell technology

December 12 2016, by Diane Kukich



MAKING THE CASE FOR FUEL CELLS

Unlike battery electric solutions, fuel-cell vehicles preserve the advantages of gasoline automobiles: low upfront cost, long driving range and fast refueling.

\$30 PER Kw
Department of Energy (DOE) cost target

\$2400 PER CAR
Total DOE energy cost target per car

* Hydroxide exchange membrane fuel cells (HEMFC) offer significant cost-savings over current platinum catalysts.

Fuel-cell vehicles offer several advantages over battery-powered cars, but costs have been an obstacle. A new paper shows how an alternative technology could give fuel cells greater traction in the quest for zero-emissions vehicles. Credit: University Of Delaware/Jeffrey Chase

The pathway to zero-emission vehicles has taken two forks, one toward battery electric cars like the Tesla and the other toward fuel-cell-powered automobiles like the Toyota Mirai.

The University of Delaware's Yushan Yan believes that fuel-cell vehicles are the way to go, because they best preserve the advantages of gasoline automobiles: low upfront cost, long driving range and fast refueling.

But he also believes that a new fuel-cell technology may be necessary.

For Yan, that approach is a new twist on traditional fuel cells, known as [proton exchange membrane](#) fuel cells, or PEMFCs, which rely on costly platinum-based catalysts. Yan and his research team are pursuing an alternative technology, the hydroxide exchange membrane fuel cell (HEMFC), because of its inherent cost advantages.

He sees the rationale for this proposed switch as a matter of very simple arithmetic.

"To make fuel-cell cars a reality, the DOE (Department of Energy) has set a system cost target of \$30 per kilowatt, which translates into about \$2,400 per car," he says. "Right now, the cost for PEMFCs is \$52 per kilowatt, which is a big improvement over where the technology started."

"But the catalyst accounts for only about \$12 of that total, leaving \$40 worth of other components. So even if we throw in some magic, we can't get the rest of the way down to the target of \$30 with PEMFCs."

Yan is co-author on a new paper published in the online version of *Nature Nanotechnology* that he views as a roadmap to a unified strategy for HEMFC zero-emission cars based on three arguments.

"First, to become a commercial reality, fuel-cell engines have to be at cost parity with their gasoline counterparts," he says, "and moving from an acid platform with the PEMFC to a base system with the HEMFC will enable a collateral benefit in bringing down all of the associated [costs](#)."

"Then, if we agree that this is the best approach, we need to get everyone in the HEMFC research community on board. If we want to succeed, we have to work together."

Finally, Yan warns that it is insufficient just to have a lower cost.

"It doesn't work to compare our results today with those from yesterday or the day before," he says. "To succeed commercially with HEMFCs, we have to match or beat the performance of PEMFCs. It's that simple—we can't succeed without achieving performance parity."

More information: Brian P. Setzler et al, Activity targets for nanostructured platinum-group-metal-free catalysts in hydroxide exchange membrane fuel cells, *Nature Nanotechnology* (2016). [DOI: 10.1038/nnano.2016.265](https://doi.org/10.1038/nnano.2016.265)

Provided by University of Delaware

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