



## NREL + GENERAL MOTORS

NREL and General Motors Corporation (GM) are collaborating on multiple projects to improve the cost, performance, and durability of polymer electrolyte membrane (PEM) fuel cells, which convert hydrogen and oxygen into electricity to power vehicles without emitting pollutants.

Hydrogen and oxygen gases are fed into PEM fuel cells via separate gas-diffusion layers and react on platinum-based catalysts, embedded in electrodes, to produce hydrogen and oxygen ions. The hydrogen ions then pass through the proton-conducting polymer membrane that separates the electrodes and react with the oxygen to form water vapor. This reaction creates a voltage between the two electrodes, which function like the electrodes on a battery, producing electrical power. Together, the gas-diffusion layers, electrodes, and membrane are called a membrane electrode assembly (MEA), which constitutes the working “guts” of a PEM fuel cell.

### R&D STRATEGY

NREL and GM aim to improve PEM fuel cells through such efforts as creating better fuel cell catalysts and support materials, developing and implementing new characterization methods for MEAs, identifying potential impacts of contaminants leached from the balance-of-plant components in fuel cells, such as structural plastics and sealants, and developing new on-line visual and thermal defect detection methods for MEA manufacturing.

### IMPACT

Lowering the cost and improving the durability and performance of fuel cell systems will help get more drivers behind the wheels of fuel cell vehicles. These vehicles achieve the zero emissions of electric vehicles while delivering the performance and range that drivers expect from gasoline-fueled vehicles. Fuel cell vehicles may be an important technology for reducing the greenhouse gas emissions from the transportation sector as the world makes a transition to a clean energy economy.



NREL researcher Ami Yang Neyerlin examines the performance of fuel cells using the GM test stands in the ESIF. *Photo by Dennis Schroeder, NREL 39266*

PARTNERSHIPS

### Partner with NREL at the ESIF

User facility access to the ESIF is awarded through the review and approval of user proposals, depending on the scientific merit, suitability of the user facilities, and the appropriateness of the work to DOE objectives, and includes a signed user agreement for the facility.

For more information, please visit:

[www.nrel.gov/esi/working\\_with.html](http://www.nrel.gov/esi/working_with.html)

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The Energy Systems Integration Facility (ESIF) at the National Renewable Energy Laboratory (NREL) provides the R&D capabilities needed for private industry, academia, government, and public entities to collaborate on utility-scale solutions for integrating renewable energy and other efficiency technologies into our energy systems.

To learn more about the ESIF, visit: [www.nrel.gov/esif](http://www.nrel.gov/esif).

**National Renewable Energy Laboratory**

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