NREL
NATIONAL RENEWABLE ENERGY LABORATORY

ENERGY SYSTEMS INTEGRATION

ESI optimizes the design and performance of electrical, thermal, fuel, and water pathways at all scales.

PARTNERSHIPS

NREL + HyET Hydrogen

HyET Hydrogen, a Dutch developer of hydrogen compression and purification equipment, and the National Renewable Energy Laboratory (NREL) are collaborating to develop membrane electrode assembly (MEA) manufacturing automation technology for electrochemical hydrogen compression (EHC). EHC has the potential to outcompete mechanical compression for hydrogen end-use applications.

R&D STRATEGY

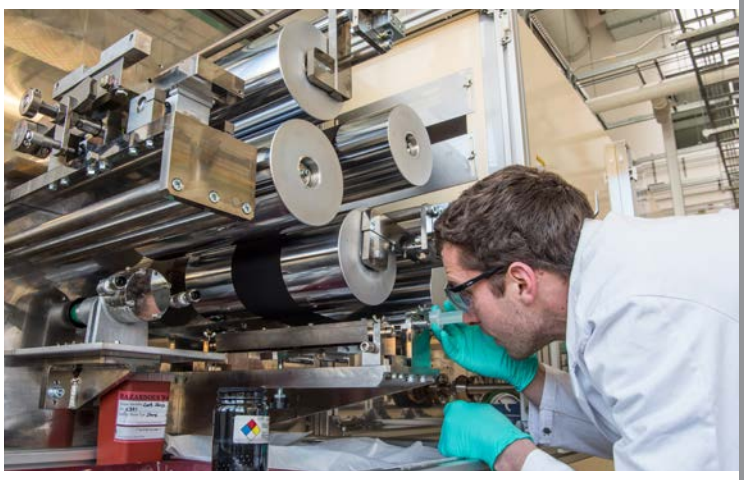
HyET has a hydrogen compressor that can output 10 kg/d (fully scalable to industrial applications) at up to 700 bar, but the energy demand and reliability require top-quality EHC MEAs, preferably prepared by cost-effective, high-capacity manufacturing. High pressure requires a special MEA design, which deviates from typical proton-exchange membrane fuel cells, with adapted catalyst-layer substrates and a modified coating process.

NREL and HyET will develop roll-to-roll catalyst-coating processes fit for EHC MEA manufacturing. In addition, in-line quality-inspection methods will be developed and selected to check the MEAs prior to use in an EHC stack assembly. NREL and HyET will eventually design an automated manufacturing process for EHC MEAs and approach potential U.S. suppliers of manufacturing equipment that might be interested in bringing the technology to market.

For the past 10 years, NREL has developed competency and testing capabilities that support the scale-up to high-volume production of membranes, electrodes, and MEAs for fuel cells, electrolysis, and other electrochemical generation and storage technologies. In this project, NREL will bring to bear extensive test beds, fabrication equipment, and expertise to assist HyET in developing (1) inks and coatings relevant to high-volume electrode production and (2) real-time inspection techniques capable of in-line quality control for HyET's EHC MEAs. In addition, NREL will assist HyET in designing the layout and specifications of the manufacturing equipment.

IMPACT

The project will result in the development of roll-to-roll catalyst-coating processes fit for EHC MEAs and the identification of in-line quality-inspection techniques for MEA materials during manufacturing. The design and specification of a manufacturing line for the high-volume production of MEAs will be performed, and production line equipment suppliers will be engaged.



NREL researcher Scott Mauger, coats a fuel cell catalyst layer onto carbon-paper diffusion media using gravure coating in the Energy Systems Fabrication Lab, for a Roll-to-Roll research web-line manufacturing project. The catalyst layer is a composite of carbon-supported platinum catalyst blended with an ion-conducting polymer. *Photo by Dennis Schroeder / NREL*

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/esif/work-with-us.html
or contact:
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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***.

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