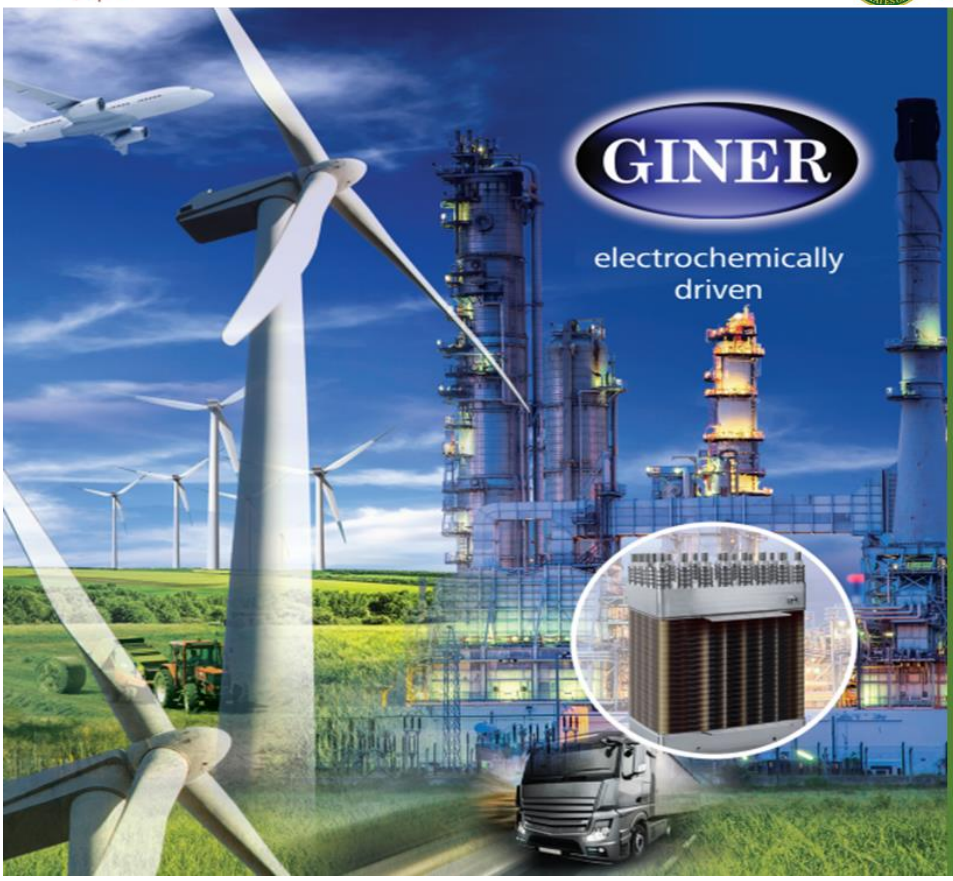

DOE SBIR/STTR SUCCESS

Giner's innovative technology makes it possible to place a full electrolyzer system in a small location and to deliver enough hydrogen to support any fuel cell electric vehicle (FCEV) onsite.

FACTS

PHASE III SUCCESS
Giner has achieved over $4M in sales of products developed through DOE SBIR awards, and is now planning the manufacturing stage of complete electrolyzer stacks.

IMPACT
Giner has developed on-site hydrogen refueling stations which can generate up to 200 kg of hydrogen/day—e nough for nearly 50 refills per day.

DOE PROGRAM/OFFICE
Fuel Cell Technologies Office (FCTO), Office of Energy Efficiency and Renewable Energy (EERE).

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Every scientific discovery, no matter how significant, must overcome a number of barriers before it can be translated to a commercial product. Often, these barriers are necessary steps to maximize efficiency and reliability and lower costs to the point where a commercial market develops. This is certainly the case for proton-exchange membrane (PEM), fuel cells, and electrolyzers, which produce energy from hydrogen for powering hydrogen vehicles, and transform energy back into hydrogen as a form of energy storage.

Although many companies are currently working on ways to efficiently exploit hydrogen energy for use in motor vehicles, the relatively high capital costs and low performance of fuel cells and electrolyzers have prevented widespread commercialization of this technology. Recently, however, Giner, Inc. (Giner for short) has made a significant stride in the development of innovative membranes and cell stacks for

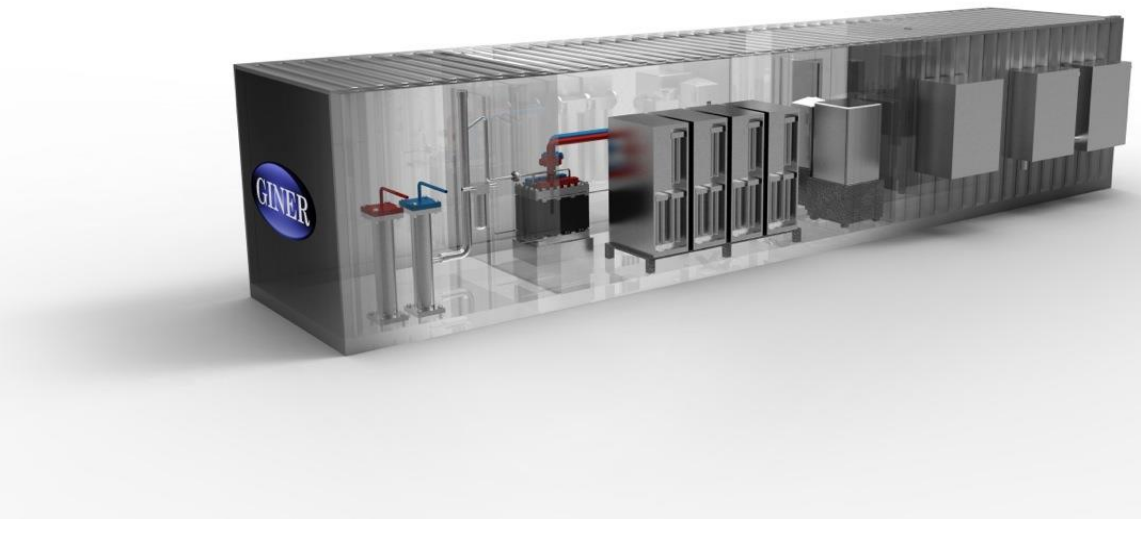
efficient, low-cost electrolyzers to be employed in on–site, on–demand refueling hydrogen stations, which make hydrogen from electricity, or store electricity sourced from solar, wind or other renewable sources.

“Giner’s advantage over its competitors lies in innovative materials and processing developed through multiple R&D projects.” explains Dr. Hui Xu, Giner’s Technical Director of Energy Conversion Materials. “As an example, Giner’s R&D resulted in a membrane that is much thinner than those used in conventional electrolyzers, but with excellent mechanical strength, allowing for lower resistance in the water electrolysis process.”

The membrane’s relative thinness, combined with its excellent mechanical properties, allows the cell to be operated at higher temperatures and voltages, yielding efficiencies better than 45 kWh/kg of H_2 produced at the stack level. Efficiency is extremely important in electrolysis as the cost of energy is the highest contributor to electrolyzed hydrogen. Giner has used this technology in generating on-site hydrogen refueling stations which can generate up to 200 kg of hydrogen/day; enough for nearly 50 refills per day. In the coming months Giner will unveil a stack capable of producing 450 kg/day. This is enough to refill between 100 and 150 cars per day. The significance of this is that for the first time, an electrolyzer system that can fit in a very small space will be capable of delivering onsite enough H_2 to support all the FCEV coming to CA and soon the North East of the USA. Giner has continuously developed domestic and international relationships which focus on testing, demonstrating, and implementing the building blocks of the Hydrogen economy. “Giner’s technology advances are also resulting from close collaboration with DOE’s National Laboratories and industrial partners”, said Dr. Xu, “As an example, we have worked with the National Renewable Energy Laboratory (NREL), Areva, Abengoa, Viessman and many others who contribute today to innovations in the fields of Power, Gas, and Hydrogen Refueling Stations (HRS), as well as Energy Storage applications.”

In the near future Giner will be able to show Multi-MW stacks in place in centralized locations where green electricity can be purchased at sufficiently low prices allowing for H_2 at scale demonstrations, fueling the HRS locations within 100 to 200 mile radius, this will be a game changer in the way we think of electrolysis today, and the overall cost of green H_2.

In the case of Giner, “Achieving these R&D results was possible thanks to the SBIR/STTR programs.” said Dr. Cortney Mittelsteadt, Giner’s VP for Technology. Giner was awarded 4 Phase II DOE SBIR grants from the Department of Energy’s (DOE) Fuel Cell Technologies Office to address various fuel cells and electrolyzer issues



Model of Giner ‘s Highway Refueling Station for fuel cell electric vehicles.

that are considered critical to market entry. “What makes the SBIR program essential to developing innovative technologies,” explain Dr. Mittelsteadt, “is the opportunity it offers to leverage technology transfer from the DOE National Laboratories. On one hand, the SBIR program promotes further research within the National Laboratories by testing scientific concepts in real-world applications. On the other hand, SBIR makes it possible to incorporate the Labs’ scientific results in the company’s technology and production framework, in order to advance them into a mature and commercially feasible technology.”

As a result of this R&D model, Giner has achieved over $4M in sales of products developed within the DOE SBIR awards received for PEM technology innovation, and it is now planning the manufacturing stage of complete electrolyzer stacks. The company’s PEM electrolysis heritage can be traced to the Apollo Space Program and one of the company founders, Anthony LaConti. Giner has long sold smaller electrolyzers for on-site hydrogen generation systems, with more than 10,000 electrolyzers in use around the world. Giner is also a leading innovator for solutions in renewable energy storage, regenerative fuel cell systems for aerospace, alcohol sensors and cell tissue preservation. Today Giner employs 60 people and holds over 100 U.S. patents.

Written By Claudia Cantoni, Commercialization Program Manager, DOE SBIR/STTR