XI. SMALL BUSINESS INNOVATION RESEARCH (SBIR) FUEL CELL TECHNOLOGIES OFFICE NEW PROJECTS AWARDED IN FY 2015

XI.0 Small Business Innovation Research (SBIR) Fuel Cell Technologies Office New Projects Awarded in FY 2015

The Small Business Innovation Research (SBIR) program provides small businesses with opportunities to participate in DOE research activities by exploring new and innovative approaches to achieve research and development (R&D) objectives. The funds set aside for SBIR projects are used to support an annual competition for Phase I awards of up to $225,000 each for about nine months to explore the feasibility of innovative concepts. Phase II R&D efforts further demonstrate the technologies to move them into the marketplace, and these awards are up to $1,500,000 over a two-year period. Small Business Technology Transfer (STTR) projects include substantial (at least 30%) cooperative research collaboration between the small business and a non-profit research institution.

Table 1 lists the SBIR Phase I projects, and Table 2 lists the SBIR Phase II projects awarded in FY 2015 related to the Hydrogen and Fuel Cells Program. Brief descriptions of each project follow.

TABLE 1. FY 2015 SBIR Phase I Projects Related to the Hydrogen and Fuel Cells Program

	Title	Company	City, State
XI.1	Fuel Cell-Battery Electric Hybrid for Utility or Municipal MD or HD Bucket Trucks (H2BT)	US Hybrid Corporation	Torrance, CA
XI.2	Cross-polarized Near-UV Detector for In-line Quality Control of PEM Materials	Mainstream Engineering Corporation	Rockledge, FL
XI.3	Non-Platinum Group Metal OER/ORR Catalysts for Alkaline Membrane Fuel Cells and Electrolyzers	Proton Energy Systems	Wallingford, CT
XI.4	Non-Precious Metal Bi-Functional Catalysts	PH Matter, LLC	Columbus, OH
XI.5	Diode Laser Sensor for Contaminants in Hydrogen Fuel	Southwest Sciences, Inc.	Santa Fe, NM
XI.6	Hydrogen Contamination Detection	Sustainable Innovations, LLC	East Hartford, CT

TABLE 2. FY 2015 SBIR Phase II Projects Related to the Hydrogen and Fuel Cells Program

	Title	Company	City, State
XI.7	Ionomer Dispersion Impact on Advanced Fuel Cell and Electrolyzer Performance and Durability	Giner, Inc.	Newton, MA
XI.8	New High Performance Water Vapor Membranes to Improve Fuel Cell Balance of Plant Efficiency and Lower Costs	Tetramer Technologies, LLC	Pendleton, SC
XI.9	Flexible Barrier Coatings for Harsh Environments	GVD Corp.	Cambridge, MA
XI.10	High Performance Long Lifetime Catalyst for Proton Exchange Membrane Electrolysis	Giner, Inc.	Newton, MA
XI.11	New Approaches to Improved PEM Electrolyzer Ion Exchange Membranes	Tetramer Technologies, LLC	Pendleton, SC

PHASE I PROJECTS

XI.1 Fuel Cell-Battery Electric Hybrid for Utility or Municipal MD or HD Bucket Trucks (H2BT)

US Hybrid Corporation
445 Maple Ave.
Torrance, CA 90503-3807

The project will develop and demonstrate polymer electrolyte membrane (PEM) fuel cell-battery electric hybrid trucks for medium- or heavy-duty (MD or HD) bucket trucks with drivetrain-integrated electric power take-off systems. The fuel cell bucket truck has no emission and saves 1,400 gallons of diesel fuel per year. It is cleaner, quieter, and friendlier to operate, with a fuel cell power plant enabling mobility via renewable energy.

XI.2 Cross-polarized Near-UV Detector for In-line Quality Control of PEM Material

Mainstream Engineering
200 Yellow Place
Rockledge, FL 32955-5327

Mainstream Engineering Corporation of Rockledge, Florida, will develop a real-time, in-line optical detector for the measurement of fuel cell membrane thickness. Previously, the Fuel Cell Technologies Office funded the National Renewable Energy Laboratory (NREL) to develop non-destructive in-line quality control techniques for membrane electrode assembly components production. Mainstream Engineering's project involves technical transfer of NREL intellectual property on optical techniques. Mainstream will design and fabricate a quality control device that is readily implementable in a roll-to-roll production line for the production of one or more membrane electrode assembly component materials. Their quality control device will help to drive down the costs of fuel cells by reducing waste and improving the process efficiency of roll-to-roll manufacturing of PEMs.

XI.3 Non-Platinum Group Metal OER/ORR Catalysts for Alkaline Membrane Fuel Cells and Electrolyzers

Proton OnSite
10 Technology Drive
Wallingford, CT 06492

The project will develop a non-precious metal catalyst based on doped cobalt oxides for use as an oxygen catalyst in reversible alkaline membrane fuel cells. This project also aims to develop a more efficient bidirectional alkaline exchange membrane cell stack which can ultimately be deployed for low cost and lightweight energy storage requirements. The innovation will provide a cost-effective and simpler system approach to generating hydrogen via electrolysis, and converting it back to electricity in fuel cell mode.

XI.4 Non-Precious Metal Bi-Functional Catalysts

PH Matter, LLC
1275 Kinnear Rd.
Columbus, OH 43212

The project will develop a non-precious metal catalyst based on phosphorus-doped carbon–nitrogen materials for use as an oxygen catalyst in reversible alkaline membrane fuel cells. The technology will be used for stationary energy storage applications.

XI.5 Diode Laser Sensor for Contaminants in Hydrogen Fuel

Southwest Sciences, Inc.
1570 Pacheco Street
Santa Fe, NM 87505

The project will develop a diode laser sensor for detection of typical impurities found in hydrogen fuel at the refueling station. A contaminant detector for hydrogen fuel is needed to prevent fouling of fuel cell vehicle propulsion systems.

XI.6 Hydrogen Contamination Detection

Sustainable Innovations, LLC
111 Roberts Street, Suite J
East Hartford, CT 06854

Sustainable Innovations has teamed with the University of Connecticut to develop an innovative multi-channel hydrogen fuel quality monitor to detect multiple impurities at low levels in hydrogen. Successful development of a low-cost hydrogen contaminant sensor will prove critically important in expanding markets for hydrogen used in industrial and fueling applications.

PHASE II PROJECTS

XI.7 Ionomer Dispersion Impact on Advanced Fuel Cell and Electrolyzer Performance and Durability

Giner Inc.
89 Rumford Avenue
Newton, MA 02466-1311

The project will develop advanced membrane and electrode components that may significantly enhance the durability and performance of proton exchange membrane fuel cells and electrolyzers. Enhanced durability and performance will lead to cost reductions for fuel cells and for hydrogen and accelerate public acceptance of hydrogen vehicles.

XI.8 New High Performance Water Vapor Membranes to Improve Fuel Cell Balance of Plant Efficiency and Lower Costs

Tetramer Technologies, LLC
657 South Mechanic Street
Pendleton, SC 29670

Tetramer Technologies has developed an advanced water vapor transport membrane (WVT) for fuel cell vehicles. This new technology showed no anhydride formation and produced a higher WVT performance with a lower cost. This project will focus on optimizing the polymer synthesis, characterization, film formation through roll coating, testing, and manufacturing scale-up unit operations. The new membranes will improve the humidifier durability and increase balance of plant efficiency.

XI.9 Flexible Barrier Coatings for Harsh Environments

GVD Corporation
45 Spinelli Place
Cambridge, MA 02138

The project will develop a barrier coating for o-rings and other high pressure hydrogen seals to prevent hydrogen from permeating the seal, even at 200°C and 700 bar. GVD Corporation is partnered with Green Tweed and Massachusetts Institute of Technology. The new barrier coating will reduce permeability of the seals by 10x compared to the uncoated baseline performance.

XI.10 High Performance Long Lifetime Catalyst for Proton Exchange Membrane Electrolysis

Giner Inc.
89 Rumford Ave.
Newton, MA 02466

The project addresses high capital and operating costs of PEM electrolysis. It will help commercialize advanced water electrolysis catalysts that are more active and require an order of magnitude less precious metal than industry standards. This effort will make water electrolysis more efficient and competitive compared to other hydrogen production technologies.

XI.11 New Approaches to Improved PEM Electrolyzer Ion Exchange Membranes

Tetramer Technologies, LLC
657 S. Mechanic Street
Pendleton, SC 29670

Tetramer Technologies, LLC, has developed a new membrane molecular architecture, which has demonstrated equivalent or better performance compared to the current Nafion® materials at 50% lower cost. These attributes directly address the high electrolyzer cost and performance issues. Key attributes of Tetramer's technology vs. the current Nafion® electrolyzer membranes are improved physical performance properties, 50% lower hydrogen permeability, and equal or higher conductivity. This technology will provide thinner membranes, which can lower costs and increase performance directly through decreased ionic resistance, and indirectly through the reduction of the overall cell potential. Tetramer's membranes can also provide 50% less hydrogen crossover loss, thus improving the electrolyzer yield and lowering costs.