

## XII.0 Small Business Innovation Research (SBIR) Hydrogen Program New Projects Awarded in FY 2010

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 \$100,000 each for about nine months to explore the feasibility of innovative concepts. Phase II is the principal research or R&D effort, and these awards are up to \$750,000 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 projects awarded in FY 2010 related to the Hydrogen Program. On the following pages are brief descriptions of each.

**TABLE 1.** FY 2010 SBIR Projects Related to the Hydrogen Program

	<b>Title</b>	<b>Company</b>	<b>City, State</b>
XII.1	Low-Cost, Durable Water Vapor Transport Exchanger (Phase I Project)	Creare Incorporated	Hanover, NH
XII.2	Hydrogen Fueling Station Cost Reduction; Study of a Cryogenic Liquid Phase Pump as an Alternative to Gas Compression (Phase I Project)	Engineering, Procurement & Construction, LLC	Lakewood, CO
XII.3	Low Cost Metal Hydride Hydrogen Storage System for Forklift Applications (Phase I Project)	Hawaii Hydrogen Carriers, LLC	Honolulu, HI
XII.4	Low Cost Large Scale PEM Electrolysis for Renewable Energy Storage (Phase I Project)	Proton Energy Systems	Wallingford, CT
XII.5	Thermochemically Integrated Solid State Hydrogen Separator and Compressor (Phase I Project)	FuelCell Energy, Inc.	Danbury, CT
XII.6	A Novel Process for Improved Hydrogen Separation and Recovery (Phase I Project)	Reaction Systems, LLC	Parker, CO
XII.7	Poison-Tolerant WGS Catalyst for Biomass-Coal Co-Gasification Systems (Phase I STTR Project)	TDA Research, Inc.	Wheat Ridge, CO
XII.8	Novel Ceramic Membranes for Efficient Hydrogen Recover (Phase I Project)	Technology Assessment and Transfer, Inc.	Annapolis, MD
XII.9	Unitized Design for Home Refueling Appliance for Hydrogen Generation to 5000 psi (Phase II Project)	Giner Electrochemical Systems, LLC	Newton, MA
XII.10	Process Intensification of Hydrogen Unit Operations Using an Electrochemical Device (Phase II Project)	H2 Pump, LLC	North Albany, NY
XII.11	Hydrogen by Wire Home Fueling System (Phase II Project)	Proton Energy Systems	Wallingford, CT

## PHASE I PROJECTS

### XII.1 Low-Cost, Durable Water Vapor Transport Exchanger

Creare Incorporated  
16 Great Hollow Road  
P.O. Box 71  
Hanover, NH 03755-3116

This project will develop critical technology that will enable vehicle propulsion and stationary power generation using low-cost, durable fuel cell power systems. This water management technology will enable reliable fuel cell operation by preventing dryout of the fuel cell and providing water needed for fuel processing.

### XII.2 Hydrogen Fueling Station Cost Reduction; Study of a Cryogenic Liquid Phase Pump as an Alternative to Gas Compression

Engineering, Procurement & Construction, LLC  
12211 W Alameda Parkway  
Suite #105  
Lakewood, CO 80228-2825

This project will develop a database of hydrogen refueling costs, and create a methodology to evaluate technology lifecycle cost reduction. Hydrogen compression costs which currently account for a substantial portion for the total costs of hydrogen fueling infrastructure must be reduced for low cost dispensing to become commercially viable.

### XII.3 Low Cost Metal Hydride Hydrogen Storage System for Forklift Applications

Hawaii Hydrogen Carriers, LLC  
531 Cooke Street  
Honolulu, HI 96813-5235

This project will develop a low cost metal hydride hydrogen storage solution for fork lift trucks thus to enable widespread consumer uptake of hydrogen fuel cell-powered fork lift trucks due to the increased overall value proposition and inherent safety of these low pressure systems.

## XII.4 Low Cost Large Scale PEM Electrolysis for Renewable Energy Storage

Proton Energy Systems  
10 Technology Drive  
Wallingford, CT 06492-1955

This company manufactures hydrogen generation systems which can be integrated with renewable energy sources to generate hydrogen fuel while producing minimal carbon footprint. This project aims to reduce the cost of this technology through development of improved membrane technology designed to reduce raw material cost and improve electrical efficiency. (See II.E.4 for complete report.)

## XII.5 Thermochemically Integrated Solid State Hydrogen Separator and Compressor

FuelCell Energy, Inc.  
3 Great Pasture Rd.  
Danbury, CT 06813-1305

This project focuses on the development of a thermally integrated solid-state hydrogen separator and compressor to produce high pressure, high purity hydrogen to meet future hydrogen refueling infrastructure needs. (See III.16 for complete report.)

## XII.6 A Novel Process for Improved Hydrogen Separation and Recovery

Reaction Systems, LLC  
19039 E. Plaza Dr., Suite 290  
Parker, CO 80134-8704

This project will develop a technology that will allow hydrogen to be produced more economically facilitating the increased use of fuel cells, which will reduce our energy consumption.

## XII.7 Poison-Tolerant WGS Catalyst for Biomass-Coal Co-Gasification Systems

TDA Research, Inc.  
12345 W. 52nd Ave.  
Wheat Ridge, CO 80033-1916

This project will develop an enabling technology for Coal-Biomass-to-Liquids (CBTL) processes. The CBTL system uses domestic feedstock and will have a greenhouse gas footprint better than conventional coal or petroleum fuels allowing a highly efficient and environmentally responsible utilization of coal.

## STTR PROJECT

### XII.8 Novel Ceramic Membranes for Efficient Hydrogen Recovery

Technology Assessment and Transfer, Inc.  
133 Defense Hwy., Suite 212  
Annapolis, MD 21401-8907

This project will develop an all-ceramic separation membrane module to cleanly recover hydrogen gas from coal. This module will increase the efficiency of the process and eliminate U.S. dependence on precious metals used for hydrogen separation.

## PHASE II PROJECTS

### XII.9 Unitized Design for Home Refueling Appliance for Hydrogen Generation to 5000 psi

Giner Electrochemical Systems, LLC  
89 Rumford Avenue  
Newton, MA 02466-1311

This project will develop a “unitized” electrolyzer design that can be used as a home refueling appliance and will result in a safe, high efficiency, low capital cost system that will provide competitively-priced hydrogen for fuel-cell vehicles. (See II.I.5 for complete report.)

### XII.10 Process Intensification of Hydrogen Unit Operations Using an Electrochemical Device

H2 Pump, LLC  
11 Northway Lane  
North Albany, NY 12110

This project will develop a technology that is a simplified, multi-functional device which pumps, purifies, and pressurized hydrogen in a single, low cost, efficient, non-mechanical process.

### XII.11 Hydrogen by Wire Home Fueling System

Proton Energy Systems  
10 Technology Drive  
Wallingford, CT 06492-1955

This project will develop a high pressure hydrogen system that eliminates major noise pollution and frequent maintenance requirements. It is also an attractive option for backup power when integrated with a proton exchange membrane fuel cell and has advantages over batteries in factors such as available life and safety. (See II.I.7 for complete report.)