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Hydrogen Hybrid Vehicle Powered With Ovonic® Solid State Hydrogen Storage

A practical first step on the road to a hydrogen-fueled future

Rochester Hills, Mich., September 21, 2005 – There is no doubt that hydrogen is one of the most promising fuels of the future. The only remaining questions are how and when America's transportation fleet will make the leap to this clean, renewable energy carrier.

Energy Conversion Devices, Inc. (ECD Ovonic) (NASDAQ: ENER) is convinced that the when is soon and the how is by means of a methodical transition from today's fossil-fueled vehicles to cars and trucks engineered for hydrogen propulsion. To take a long stride forward on this path, ECD Ovonic and its partners successfully completed a demonstration project to modify a commercial gasoline/electric hybrid vehicle to run on hydrogen utilizing a new low-pressure, metal hydride hydrogen storage system developed and manufactured by Ovonic Hydrogen Systems, LLC.

According to the Environmental Protection Agency (EPA), hybrid-electric vehicles are the most fuel-efficient autos currently on the road. "Combining the best features of an internal combustion engine with an electric drive system can significantly improve fuel economy without sacrificing performance or driving range" notes the EPA in its 2004 Fuel Economy Guide. A hydrogen-fueled hybrid vehicle builds on this foundation to create an ideal bridge to the future.

Auto industry experts agree that the ultimate goal is hydrogen-powered fuel-cell vehicles. Unfortunately, some of the technology required to reach this end is not yet within reach. However, while the hydrogen hybrid runs on hydrogen just like a fuel-cell vehicle, it can be available much sooner and at a fraction of the cost. Exhaust emissions are reduced below the current SULEV/PZEV standard and no greenhouse gases are produced. It can share the same refueling equipment and follow codes and standards intended for implementation when fuel-cell vehicles arrive, thereby accelerating infrastructure build-up. This vehicle will also heighten consumer awareness of hydrogen's safety.

The key change to the hybrid vehicle is the installation of a proprietary Ovonic® Solid Hydrogen Storage System developed and manufactured by Ovonic® Hydrogen Systems, LLC...

The major components of the Ovonic® system are

- Two lightweight metal hydride fiber-wrapped vessels with a total internal volume of 66 liters that store 3.5 kg of hydrogen at an operating pressure typically less than 300psi;
- Integrated heat exchange system. During refueling, an off-vehicle coolant supply system is connected to dissipate heat from the hydrogen storage tank. When driving, heat from the engine's cooling system is routed to the hydrogen storage tank to facilitate release of hydrogen fuel from the storage alloy.

Other modifications to the vehicle were:

- Removal of the original gasoline tank, fuel lines, and catalytic converter;
- Fitting the new hydrogen fuel storage system where the original gasoline tank was, with appropriate vents and leak detectors to ensure safe operation;
- Installation of hydrogen fuel lines equipped with pressure and temperature sensors, four gaseous fuel injectors, an exhaust air-fuel-ratio sensor, and a control computer to operate the new fuel injectors;
- Addition of a turbocharger.

A hybrid hydrogen vehicle with an Ovonic® metal hydride onboard hydrogen storage system demonstrates excellent potential for meeting both fuel cost and driving range targets established by the Department of Energy (DOE). Alternative storage methods – liquid hydrogen inside a super-insulated cryogenic tank and gaseous hydrogen stored at extreme pressures – show notably less potential of meeting future goals than the ECD Ovonic approach.

ECD Ovonic began efforts to perfect metal-hydride technology many years ago and the company has established a dominant patent position in this field. The Ovonic® metal-hydride system engineered by Ovonic Hydrogen Systems, LLC, comprises powdered metallic alloys capable of rapidly absorbing hydrogen.

A metal hydride is formed when gaseous H₂ molecules dissociate into individual hydrogen atoms and bond with metal atoms in the storage alloy. Removing heat drives this absorption process, while adding heat reverses the chemical reaction, causing the hydrogen atoms to reform as H₂ molecules inside the storage vessel.

The metal-hydride system offers several advantages in powering hydrogen-fueled vehicles over other types of systems. Storage density is significantly higher than high-pressure gaseous alternative. The technology needed to store hydrogen within metal hydrides has gone through hundreds of refilling cycles with minimal performance degradation. Finally, the metal-hydride system is fully scalable and can be adapted for a variety of mobile tanks as well as larger scale systems for filling-station storage.

The hybrid vehicle modified by ECD Ovonic has a driving range of nearly 200 miles and requires about 8 minutes for refueling using a filling pressure of 1500 psi.

About ECD Ovonic

ECD Ovonic is the leader in the synthesis of new materials and the development of advanced production technology and innovative products. It has invented, pioneered and developed enabling technologies in the fields of energy and information leading to new products and production processes based on amorphous, disordered and related materials. ECD Ovonic's proprietary advanced information technologies include Ovonic™ phase-change electrical memory, Ovonic™ phase-change optical memory and the Ovonic™ Threshold Switch. The Company's portfolio of alternative energy solutions includes thin-film amorphous solar cells, modules, panels and systems for generating solar electric power; NiMH batteries; hydride storage materials capable of storing hydrogen in the solid state for use as a feedstock for fuel cells or internal combustion engines or as an enhancement or replacement for any type of hydrocarbon fuel; and fuel cell technology. ECD Ovonic designs and builds manufacturing

machinery that incorporates its proprietary production processes, maintains ongoing research and development programs to continually improve its products and develops new applications for or its technologies. ECD Ovonic holds the basic patents in its fields. More information on ECD Ovonic is available on www.ovonic.com.

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