

WINTERGREEN RESEARCH, INC.

**Fuel Cell Transportation Market Opportunities, Strategies,
and Forecasts, 2007 to 2013**

Fuel Cell Transportation



Picture by Susie Eustis

MOUNTAINS OF OPPORTUNITY

**WinterGreen Research, Inc.
Lexington, Massachusetts**

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CHECK OUT THESE KEY TOPICS

FUEL CELL VEHICLE MARKET SHARES
TOTAL VEHICLE FUEL CELL MARKET FORECAST
FUEL CELL TRANSPORTATION MARKET DEVELOPMENT
Hydrogen Gas, H₂, Essential to Power Fuel Cell Engines
Conventional Transportation Energy Devices
Fuel Cell Transportation Competitive Landscape
VEHICULAR APPLICATIONS FOR FUEL CELLS
FUEL CELL VS INTERNAL COMBUSTION ENGINE
TYPES OF FUEL CELL TECHNOLOGY
HYDROGEN FLOW
FUEL CELL TESTING
FUEL CELL ACTIVITIES OF INDUSTRY ASSOCIATIONS AND
INDUSTRY/GOVERNMENT PARTNERSHIPS
FUEL CELL STACK ISSUES
HYDROGEN AND FUEL CELL TECHNOLOGIES ALTERNATIVES
ADVANCED HYBRID SYSTEMS

OPPORTUNITY ABOUNDS

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Fuel cell trials of the hydrogen-powered busses are going well. The busses operate efficiently, are powered from a fueling station, and passengers like them.

Commercialization of fuel cells for transportation relate to making vehicle fuel cells cost competitive. Challenges are low-cost infrastructure, range, and power density. Cost reduction, component integration, complexity reduction, and increasing safety are needed.

Innovative changes in vehicle design and materials to reduce vehicle weight and improve aerodynamics will benefit fuel cell vehicles as well as conventional vehicles. The use of platinum is a central issue. Platinum is used in the core of the PEM fuel cell that is used for transport. The price of the core has to be drastically reduced for fuel cell vehicles to be viable.

A unique and integrated fuel cell power system is aimed directly at low output applications where smaller internal combustion engines (ICE) and batteries are the power source. These include personal transport and fleet type vehicles used in closed range environments (airports, amusement parks, golf courses, malls, delivery circuits).

Two and three wheeled scooters represent a target market. Stationary, marine and portable power applications are a target market.

Hybrid and personal power represent the most likely avenue for fuel cell vehicular development. People will begin to own more than one vehicle. The personal vehicle will provide for moving around a local region, back and forth to work and around town to activities and stores.

These personal vehicles will be very comfortable with music and good seating. They will be good for fuel cells because they will be small and suitable for one or two people at the most.

Not much power is needed as the speeds are slow and the pickup not demanding. Major issues affecting the commercialization of hydrogen fuel cell automobiles are the cost of the fuel, building of requisite fueling infrastructure, and vehicle range. Range is limited to on-board storage ability.

A hydrogen economy is a challenge that transcends the ability of industry and depends on governments to deliver necessary infrastructure. The capacity of the individual major stakeholders is limited to providing components of the fuel cell and hydrogen economy.

Governments exist to create infrastructure that is useful to the culture sustained within national borders. There are significant infrastructure investments that need to be made to make fuel cells a reality. These are the task of government. Table 3-illustrates fuel cell infrastructure investment needed.

The cost of new infrastructure for fuel cell refueling raises from \$2 billion per year initially to \$21 billion per year by 2010. This cost will likely be borne by governments as well as private industry. Market growth depends on \$5 billion infrastructure investment in local hydrogen manufacture for fuel cells.

It represents an environmentally sound investment in environmentally clean fuel. It further represents a very sound business investment that will reap enormous returns for the investors over many years.

Total vehicle fuel cell markets for autos at \$772.7 million in 2007 will grow to \$98 billion by 2013. Commercial introduction means that auto, bus, and truck segments will grow. Cars that use fuel cell systems are evolving sophisticated capability. By the end of the forecast period, trucks are expected to account for the largest portion of spending.

Companies Profiled

Market Leaders

Ballard
Toyota Motor Corporation
Ford Motor
General Motors
Damlier

Other Market Participants

Global Thermoelectric	Fuel Cell Technologies
Palcan	Hydrogenics
Avista Labs	Ebara Ballard
FuelCell Energy	GE Microgen
General Motors	H Power
Idatech	Matsushita Electric Industrial Co., Ltd
Nuvera	Plug Power
Proton Energy Systems	Sanyo Electric
Siemens Westinghouse Power	Teledyne Energy Systems
UTC Fuel Cells	

Fuel Cell Transportation Strategies and Forecasts, 2007-2013

REPORT METHODOLOGY

THIS IS THE *TWO-HUNDRED AND THIRTEENTH* REPORT IN A SERIES OF MARKET RESEARCH REPORTS THAT PROVIDE FORECASTS IN COMMUNICATIONS, TELECOMMUNICATIONS, THE INTERNET, COMPUTER, SOFTWARE, TELEPHONE EQUIPMENT, AND ENERGY. THE PROJECT LEADERS TAKE DIRECT RESPONSIBILITY FOR WRITING AND PREPARING EACH REPORT. THEY HAVE SIGNIFICANT EXPERIENCE PREPARING INDUSTRY STUDIES. FORECASTS ARE BASED ON PRIMARY RESEARCH AND PROPRIETARY DATA BASES. FORECASTS REFLECT ANALYSIS OF THE MARKET TRENDS IN THE SEGMENT AND RELATED SEGMENTS. UNIT AND DOLLAR SHIPMENTS ARE ANALYZED THROUGH CONSIDERATION OF DOLLAR VOLUME OF EACH MARKET PARTICIPATION IN THE SEGMENT. INSTALLED BASE ANALYSIS AND UNIT ANALYSIS IS BASED ON INTERVIEWS AND AN INFORMATION SEARCH. MARKET SHARE ANALYSIS INCLUDES CONVERSATIONS WITH KEY CUSTOMERS OF PRODUCTS, INDUSTRY SEGMENT LEADERS, MARKETING DIRECTORS, DISTRIBUTORS, LEADING MARKET PARTICIPANTS, OPINION LEADERS, AND COMPANIES SEEKING TO DEVELOP MEASURABLE MARKET SHARE. OVER 200 IN DEPTH INTERVIEWS ARE CONDUCTED FOR EACH REPORT WITH A BROAD RANGE OF KEY PARTICIPANTS AND INDUSTRY LEADERS IN THE MARKET SEGMENT.

YOU MUST HAVE THIS STUDY

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ABOUT THE COMPANY

WINTERGREEN RESEARCH, HAS A UNIQUE RESEARCH STRATEGY THAT RELATES TO IDENTIFYING MARKET TRENDS THROUGH READING AND INTERVIEWING OPINION LEADERS. BY READING THE ELECTRONIC EQUIVALENT OF 40 FEET OF PAPER, WINTERGREEN RESEARCH SENIOR ANALYSTS CAN LEARN A LOT MORE ABOUT MARKETS, A LOT FASTER THAN CAN BE LEARNED THROUGH EXPENSIVE SURVEYS AND FOCUS GROUPS. THINKING ABOUT MARKET TRENDS IS A HIGH PRIORITY AT WINTERGREEN RESEARCH. AS WITH ALL RESEARCH, THE VALUE PROPOSITION FOR COMPETITIVE ANALYSIS COMES FROM INTELLECTUAL INPUT.

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