

WINTERGREEN RESEARCH, INC.

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

Fuel Cell Fuel Sources



Picture by Susie Eustis

MOUNTAINS OF OPPORTUNITY

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

www.wintergreenresearch.com

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CHECK OUT THESE KEY TOPICS

FUEL CELL MARKET DEVELOPMENT
ALTERNATIVE FUEL SOURCE FOR FUEL CELLS
ECONOMICS OF FUEL COST

Hydrogen Gas, H₂, Essential to Power Fuel Cell Engines

Governments Exists to Create Infrastructure
Fuel Cell Transportation Competitive Landscape

FUEL CELL SUPPLY INFRASTRUCTURE

END TO END FUEL SOURCE PARAMETER ANALYSIS

HYDROGEN PRODUCTION

FUEL CELL OPERATIONS

METHANOL FUEL CELLS

FUEL CELL TECHNOLOGY

HYDROGEN POTENTIAL

NATURAL GAS AND HYDROGEN FUEL DELIVERY

BARRIERS TO ALTERNATIVE FUEL USE

STRATEGIC ALLIANCES

OPPORTUNITY ABOUNDS

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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).

Renewable energy is the only alternative for making hydrogen. Other sources of energy are more efficiently used directly. Natural gas should be used directly. Electricity is available in off peak hours to make some hydrogen. Otherwise, renewable sources are the most reasonable energy source for manufacturing hydrogen.

Fuel cells for buildings and homes might make good backup generators, but not daily energy sources. Hydrogen can be produced on Earth by water electrolysis. This process may be very efficient (in excess of 80%). There is always a catch. The process uses electricity. It therefore does not make much sense to use electricity to generate hydrogen to generate electricity.

The production of high purity hydrogen can happen via electrolysis for export. Hydro electricity is generally an attractive way to achieve power sources. The achievement of transporting the electricity efficiently over long distances is perhaps a more effective means of using hydropower than of converting the hydro power to manufacturing hydrogen.

The time scale of the market broadening for natural gas in the motor vehicle sector strongly depends on the build-up of a refueling infrastructure. Favorable conditions for alternative energy sources are expected to encourage vehicle production and consumer acceptance.

Over the longer term, the chemistry of fuel cells will be studied and mastered. At that time, renewal sources of energy including wind and solar power will be converted to hydrogen for use in the fuel cells. The high cost of the catalyst platinum is one of several deterrents to rapid implementation hydrogen infrastructure. Natural gas is an interim technology that can be used in local filling stations to manufacture hydrogen should that become economically attractive.

Renewable energy as a fuel source for hydrogen manufacture is what scientists think is needed. Infrastructure investment at \$247 million in 2005 is expected to reach \$25.2 billion by 2013. In this manner the global economy can evolve.

Estimated potential for the main alternative fuels by 2020: biomass derived fuels 15%, natural gas 10%, LPG 5% and hydrogen a few per cent.

Companies Profiled

Market Participants

Air Products	Anuvu
Ballard	California Fuel Cell Partnership
DaimlerChrysler	Dynetek
Defense Advanced Research Projects Agency (DARPA)	Ebara
Energy Conversion Devices	Energy Partners Ltd.
Ford	FuelCell Energy
Fuel Cell Technologies	GE Energy
General Motors	GreenVolt Power
HERA	Hitachi/Tokai
Hydrogenics	Hyundai Motor
Icelandic New Energy	IdaCorp/IdaTech
Impco	Johnson Controls/Optima Batteries
Merubeni	Matsushita
Messer	Millennium Cell
Mitsui	NEC
Niagra Mohawk Power Corp	Nuvera
Northeast Advanced Vehicle Consortium (NAVC)	Palcan
Northern Power Systems	Polar
Proton Energy Systems	Plug Power
PSA Peugeot Citroen	Polyfuel
Samsung Advanced Institute of Technology	Sanyo
Siemens Westinghouse	Snow Leopard
Teledyne Technologies/Teledyne Energy Systems	Tokyo Gas
Toshiba	TotalFinaElf
Toyota	UTC Fuel Cells
Ultralife Batteries	

Fuel Cell Fuel Sources Strategies and Forecasts, 2007-2013

REPORT METHODOLOGY

THIS IS THE *TWO-HUNDRED AND FOURTEENTH* 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

Fuel Cell Fuel Sources Market Opportunities, Strategies, and Forecasts, 2007 to 2013

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