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# World Fuel Cells

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Industry Study with Forecasts for **2011 & 2016**

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Study #2194 | May 2007 | \$5500 | 393 pages

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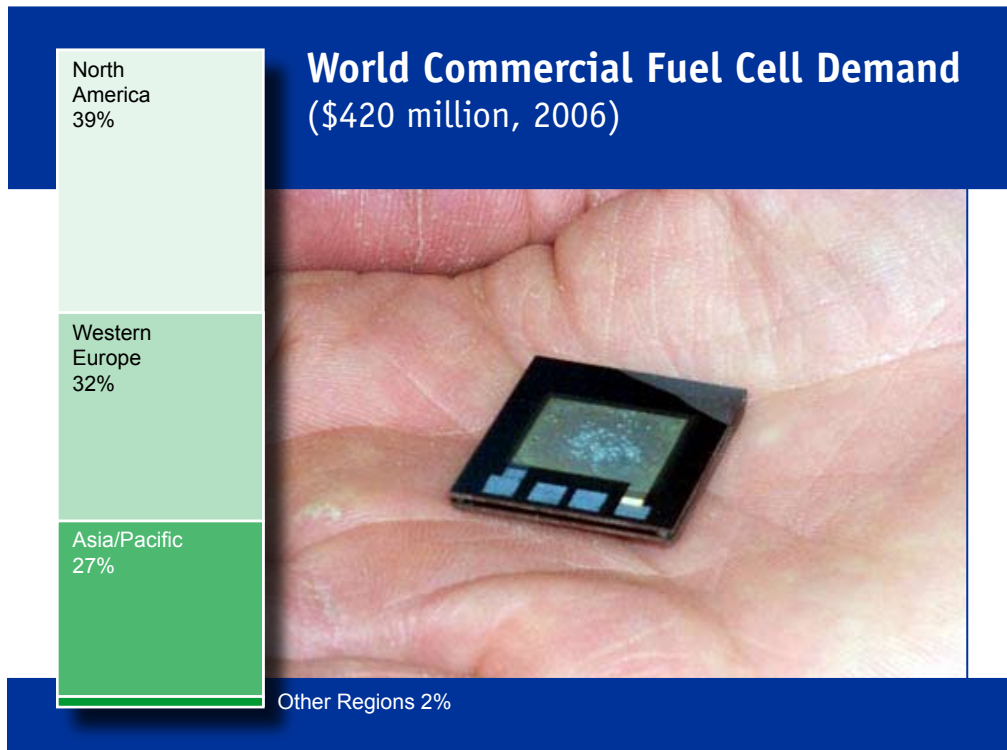
*Commercial demand for fuel cell products and services -- including revenues associated with prototyping, demonstration and test marketing -- will expand nearly sixfold to \$2.5 billion in 2011.*

## Global fuel cell spending to rise 15% annually through 2011

Global fuel cell spending -- including research and development funding and investment in fuel cell enterprises, as well as commercial sales -- is projected to grow more than 15 percent per year through 2011 to over \$10 billion and total \$19 billion in 2016. Commercial demand for fuel cell products and services -- including revenues associated with prototyping, demonstration and test marketing activities -- will expand nearly sixfold to \$2.5 billion in 2011 and reach \$8.5 billion in 2016. Despite the small size of fuel cell technology's current commercial footprint, a number of viable markets are expected to develop over the next ten years as technological advances and economies of scale help drive costs down to competitive levels. High energy prices and environmental concerns will also contribute to fuel cell commercialization and market gains.

## Demand to remain concentrated in five countries

In 2006, five countries -- the US, Japan, Germany, Canada and the UK -- accounted for four-fifths of all commercial fuel cell demand. These and other developed nations will continue to account for the vast majority of product and service sales over the next decade, with a few notable exceptions, like China. Most developing countries are not expected to become sizable fuel cell



markets until some time later, due both to less evolved end-use sectors and a scarcity of capital to invest in early-generation fuel cell systems. However, fuel cells will find some use as a source of electricity in developing nations with inadequate central power grids.

## Portable electronics market to grow the fastest

With a number of products now on the market, electric power generation applications accounted for well over half of all commercial fuel cell sales in 2006. However, the portable electronics market is forecast to register the strongest growth through 2011 and beyond, rising from what are presently extremely low

levels of demand, as commercialization activity picks up. Advances will be spurred by the considerably lower cost hurdles that exist in this market and the ability of fuel cells to offer much longer run times than even the best battery designs. Demand for fuel cell-powered motor vehicles will also rise at a healthy rate, driven by increases in prototyping, demonstration and test marketing activity as fuel cell technology continues to improve and manufacturing costs decline. Nevertheless, the use of fuel cells as an auxiliary power source on buses and trucks, an application that is less price sensitive than vehicle propulsion, could well occur before fuel cell-powered vehicles are on the road in commercially significant numbers.

## Sample Text, Table & Chart

### WESTERN EUROPE

**Germany: Fuel Cell Outlook & Suppliers** -- Total on fuel cell-related activities in Germany is forecast to increase by 10 percent per year through 2011. The market for fuel cell products is expected to reach \$1.5 billion in that year. In 2016, overall fuel cell sales are expected to reach \$2.5 billion, while commercial sales are expected to reach \$1.5 billion. Spending and sales gains in the fuel cell market are not as robust as those projected for other regions, in part a function of the better-developed nature of the fuel cell market in Germany compared to most other countries in the region. Nonetheless, Germany will remain by far the biggest single fuel cell market in Western Europe, accounting for 36 percent of all commercial fuel cell sales in 2016. Electric power generation applications will account for a single share of fuel cell sales, as in most other areas, but motor vehicles and portable electronics-related product and service demand are expected to grow somewhat faster, bolstering their shares of the fuel cell market.

Roughly 350 organizations of various types are involved in every aspect of the German fuel cell business. In the private sector, these include both large multidivisional corporations with fuel cell technology development programs, as well as numerous smaller enterprises that more or less specialize in fuel cells. Notable locally headquartered firms include BASF (which boosted the size of its fuel cell component business operations with the December 2006 acquisition of PEMEAS), the CFC Solutions subsidiary of Tognum, DaimlerChrysler, P21, Proton Motor Fuel Cell, SFC Smart Fuel Cell, SGL Carbon, Siemens and Volkswagen. In addition, in January 2007 Ceramic Fuel Cells of Australia began construction of a large-scale fuel cell production facility in Heinsberg that is scheduled to start operations in 2009.

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TABLE VI-4

### GERMANY - COMMERCIAL FUEL CELL DEMAND (million dollars)

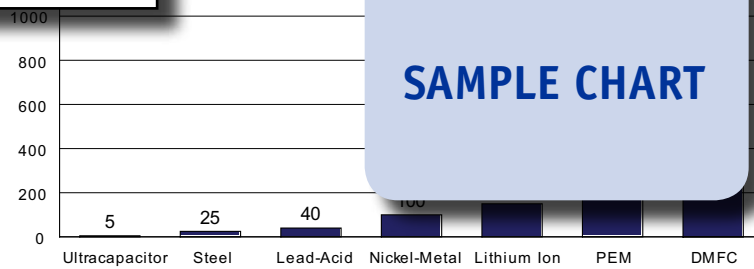
Item	1996	2001	2006	2011	2016
Population (million persons)	82	82	82	82	82
\$ fuel cell/capita	17	25	40	100	150
Commercial Fuel Cell Demand	1,380	2,050	3,280	8,200	12,300
By Application:					
Electric Power Generation	1,000	1,400	2,200	5,500	8,000
Motor Vehicles	100	150	250	600	900
Other Transportation Equipment	50	75	125	300	450
Industrial Stationary/Motive Power	100	150	250	600	900
Portable Electronics	50	75	125	300	450
Other	50	75	125	300	450
By Chemistry:					
Proton-Exchange Membrane	100	150	250	600	900
Phosphoric Acid	50	75	125	300	450
Solid-Oxide	50	75	125	300	450
Molten Carbonate	50	75	125	300	450
Direct Methanol	50	75	125	300	450
Alkaline	50	75	125	300	450
Other	50	75	125	300	450
% commercial	17	25	40	100	150
Total Fuel Cell Spending	1,380	2,050	3,280	8,200	12,300

SAMPLE  
TEXT

SAMPLE  
TABLE

CHART III-2

### ANIMETRIC ENERGY DENSITY OF VARIOUS POWER CONVERSION & STORAGE SYSTEMS (watt hours / kilogram)



SAMPLE  
CHART

## Sample Profile, Table & Forecast

### COMPANY PROFILES

#### Finmeccanica SpA

Piazza Monte Grappa, Four  
 00195 Roma  
 Italy  
 39-6-324  
 http://wv

**SAMPLE  
 PROFILE**

Revenue (bil 2005)  
 Geograph (al) Europe 78%  
 America  
 Research and development 2 billion (2005)  
 Employment: 58,060 (2006)

Key Products: molten carbonate fuel cell power plants

Finmeccanica develops, designs and produces aircraft, satellites, missile systems and other high-technology equipment. The Company operates in eight segments: Aeronautics; Space; Helicopters; Defense Electronics; Defense Systems; Transport; Energy; and Other Activities.

The Company is active in the world fuel cell industry through the Energy segment, which had 2006 revenues of \$1.2 billion, including eliminations. Among the segment's operations is the Ansaldo Fuel Cells SpA affiliate (Italy), which is also known as AFCo. AFCo is involved in the industrial production and commercialization of molten carbonate fuel cell (MCFC) power plants. AFCo is also owned by EnerTAD Group (Italy) and FINCANTIERI SpA (Italy).

MCFC power plants are being developed by AFCo in 500 kilowatt (kW) to 5 megawatt (MW) sizes and include the SERIES 500 and SERIES 2TW units. The SERIES 500 product provides up to 500 kW of power in grid-connection or standalone modes. This unit can be used

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TABLE VI-3

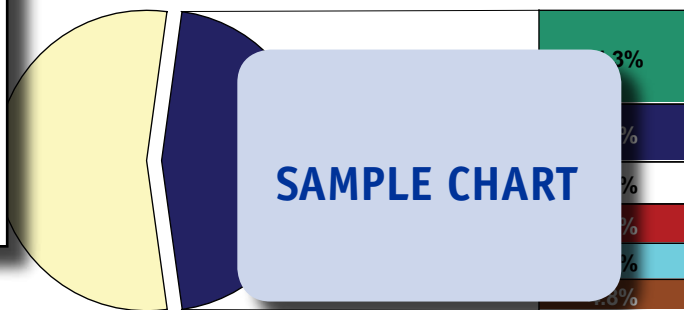
### GERMANY - ECONOMIC & MARKET ENVIRONMENT

Item	1996	2001	2006	2011	2016
Population (million persons)	81.9	82.4	82.5	82.4	82.2
per capita GDP	25,000	28,000	32,000	35,000	37,000
Gross Domestic Product (bil 2000\$)	2,000	2,500	3,000	3,500	3,800
% of GDP	1.5	1.5	1.5	1.5	1.5
Gross Fixed Investment (bil 2000\$)	450	500	550	600	650
kWh/\$ GDP	0.15	0.15	0.15	0.15	0.15
Electric Power Generation (bil kWh)	35	35	35	35	35
vehicles/mil \$ GDP	0.2	0.2	0.2	0.2	0.2
Motor Vehicle Production (000 units)	400	400	400	400	400
000\$ electronic/capita	36	36	36	36	36
Electronic Product Shipments (bil \$)	112	112	112	112	112

**SAMPLE  
 TABLE**

CHART IX-1

### WORLD FUEL CELL MARKET SHARE BY COMPANY, 2006 (\$420 million)



**SAMPLE  
 CHART**



**OTHER STUDIES**

**Electric Power Equipment**

This study analyzes the US market for electric power equipment. It presents historical demand data (1996, 2001, 2006) and forecasts to 2011 and 2016 by type (circuit breakers, low voltage switchgear, fuses, re-lays, duct, power transformers, distribution transformers, nonutility transformers, specialty transformers); and by market (industrial/nonutility generators, electric utilities, commercial, residential, government/institutional). The study also evaluates company market share and profiles leading equipment producers.

#2198.....06/2007..... \$4400

**Batteries**

US demand for primary and secondary batteries will grow 4.3% annually through 2011. Growth will be driven by strong demand for battery-powered products and motor vehicles, and by an ongoing shift toward more expensive, better-performing batteries. Primary batteries will outpace secondary/rechargeable types, led by primary lithium batteries. This study analyzes the \$12.1 billion US batteries industry to 2011 and 2016 by product and market. It also evaluates market share and profiles major producers.

#2178.....03/2007..... \$4500

**Batteries in China**

Demand for batteries in China will grow 13.2% annually through 2010. Gains will be driven by the emergence of electric bicycles and strong domestic consumer demand for battery-powered products. Alkaline and lithium batteries will be the fastest growing primary type while rechargeable lithium batteries will pace the secondary battery segment. This study analyzes the ¥59 billion Chinese battery industry to 2010 and 2015 by product and market. It also evaluates market share and profiles leading competitors.

#2151.....02/2007..... \$4900

**Solar Energy Products**

US demand for photovoltaic modules will more than triple by 2010, driven by innovations, economies of scale and government subsidies. Crystalline silicon cells will remain dominant while thin films will post stronger growth. Thin films use little or no silicon and can integrate photovoltaics within roofing shingles and other building materials. This study forecasts US solar energy product demand to 2010 and 2015 by product, market and region. It also evaluates market share and profiles major producers.

#2126.....12/2006..... \$4300

**World Batteries**

Global battery demand will grow 6.9% yearly through 2010, led by China, India, Indonesia, South Korea, Poland, Brazil and Russia. Industrialized world markets will grow more slowly. Non-lead-acid secondary batteries will outpace primary and lead-acid secondary types. The consumer segment will lead gains by market. This study analyzes the \$52.6 billion world battery industry to 2010 and 2015 by product, market, world region and for 32 countries. It also evaluates company market share and profiles major firms.

#2095.....08/2006..... \$5700

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