



Research Report

EXECUTIVE SUMMARY:

Fuel Cells Annual Report 2011

Market Development for Fuel Cells in the
Stationary, Portable, and Transport Sectors

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Section 1

EXECUTIVE SUMMARY

1.1 Introduction

The adoption of fuel cell-powered products is gathering increasing momentum within a wide swath of applications. Although not without its setbacks, the shift from an R&D-based industry to a fully commercial one is well underway.

The reasons for the groundswell of interest in fuel cells are as varied as the sectors that are implementing the technology. Indeed, fuel cell technology is playing a role in many areas, from “future-proofing” homes, rolling out off-grid base stations in rural Africa, decarbonizing transport, and cleaning up ports to reducing energy dependence on oil-producing nations and increasing resilience in energy networks.

Due to this increased interest from a range of stakeholders including government, utilities, developers and the finance industry Pike Research is producing this annual quantitative overview of developments in the fuel cell industry. This report is not aimed at the lay reader but those who are looking for an understanding of the growth, or not, in key sectors, and their applications. The three sectors covered in the report are transport, stationary and portable within which some 30 plus applications are measured.

In our first *Fuel Cells Annual Report*, Pike Research aims to provide a benchmark for the development of the industry. The data published in the report have been gathered from primary sources and independently verified. Company-based information is kept confidential; thus, the level of granularity of the information provided in this report varies.

Also note that Pike Research’s dataset only contains information on units that have been *shipped*. This is normally at fuel cell system level, but also where clearly highlighted covers fuel cell stacks. The report does not track time of sales, or annual revenues, which can differ from time of shipment of systems due to growing order backlogs in some companies. In addition, Pike Research does not provide any data on toys or education kits and the forecasts do not include niche transport or auxiliary power units (APUs). As of 2012, we will include a niche transport and APU projection in the fuel cell forecast.

1.2 Fuel Cell Industry Sectors

Between 2008 and 2010, the fuel cell industry experienced a CAGR in fuel cell systems shipped of roughly 27%, which is lower than some industry commentators would have liked to see. However, this figure belies the fact that a number of companies have shifted to profit per unit status. Profit at company level is still elusive, but a handful of companies have now taken the necessary first step of making a profit on each unit sold.

1.2.1 Stationary Fuel Cell Sector

From 2008 to 2010, the importance of the stationary fuel cell sector became increasingly clear. Approximately one-third of all fuel cell systems shipped in 2009 were in the stationary sector. By the end of 2010, this figure had increased to 50%. Shipments are continuing to pick up speed due to the breadth of applications that are being targeted with deployments. Some big-ticket markets such as residential are already seeing shipments in the tens of thousands. These numbers are primarily being driven by the Japanese market, power for grid-tied and off-grid base stations globally, and combined heat and power (CHP)

plants for a variety of markets, including hospitals and hotels. As a result of this range of markets, revenue from the stationary sector increased nearly 30% between 2009 and 2010.

1.2.2 Portable Fuel Cell Sector

The portable fuel cell sector has taken something of a beating over the past few years, with multiple delays in the rollout of integrated fuel cells in personal electronics. Today, though, it is clear that many of the major OEMs, as well as the smaller independent portable fuel cell companies, are “pump-priming” this market with external battery rechargers. The initial foray into this application occurred in 2009 with the sale of 3,000 Toshiba Dynarios in Japan. Since then, a handful of other companies have followed suit and more products will be released this year (2011).

Yet, such success does not represent the end game in this sector. Legitimate questions are being raised, including concerns about the value add for the average consumer. Still, the size of the opportunity related to using fuel cells to power laptops, smartphones, cameras, etc. is certainly large enough to sustain the continued development of the fuel cell stack and system architecture small and powerful enough for this application – at least in the short to medium term.

Note that the portable sector saw a breakout application in the form of remote monitoring units during 2010. This is a global market, and a number of fuel cell companies are positioning themselves to become more and more active in this space.

In terms of numbers, the portable fuel cell sector actually logged a decrease between 2009 and 2010. However, this decline was caused by the somewhat artificial spike in 2009 due to the Dynario sales.

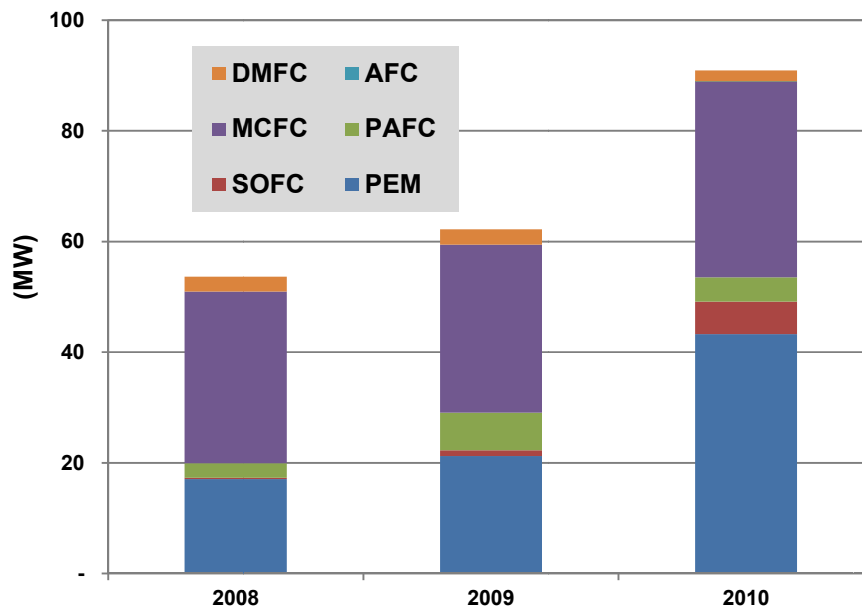
1.2.3 Transport Fuel Cell Sector

The transport fuel cell sector, which continues to garner the highest level of press attention, also recorded a decline in shipments (of 10%) between 2009 and 2010. Buses and light-duty vehicles are still being released in batches, thereby creating annual peaks and troughs. The niche transport sub-sector continued to experience growth, but some of the longer-term applications (e.g., trains and aerospace) did not see any further progress between 2009 and 2010. Note that APUs are still very much the poster child for the transport fuel cell sector.

1.3 Electrolyte Type

Lock in/lock out of electrolyte type is still clearly not occurring. In 2010, over 90% of units shipped were low-temperature fuel cells, predominately polymer electrolyte membrane (PEM) fuel cells and direct methanol fuel cells (DMFCs). However, the same two electrolytes only made up 50% of the total megawatts shipped in 2010.

Chart 1.1 Global Megawatts of Fuel Cell Product Shipments by Electrolyte: 2008-2010



(Source: Pike Research)

1.4 Fuel Cells and Government Positioning

In terms of government positioning, the big four (the United States, Germany, Japan, and South Korea) are still pushing their local industries forward with direct interventionist policies. While this type of policy remains rare, more and more countries are becoming actively involved through less direct action. Countries are attempting to remove barriers to market entry for micro CHP (mCHP), for example, independent of the underlying technology. They are establishing job subsidies for key high-tech industries and providing more support for the transfer of technology from universities to the market. The optimal level of government involvement depends on an individual's point of view of the role of government. What is clear, however, is that fuel cell technology is part of the solution in the energy portfolio of many countries.

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Section 12

SCOPE OF STUDY

Pike Research has prepared this report to provide both direct and interested stakeholders with an analytical overview of the status of the global fuel cell industry. The report examines fuel cells in stationary, portable, and transport applications, with a focus on the period of 2008-2010. It also reviews the main technology types and information from key companies.

The report's purpose is not to provide an exhaustive technical assessment of the technologies. Rather, it aims to offer a strategic assessment of current market positioning, industry issues, and projections based on business-as-usual (BAU) scenarios. Pike Research strives to identify and examine new market segments to aid readers in the development of their business models. All major global regions are covered and the forecast period extends through 2017.

SOURCES AND METHODOLOGY

Pike Research's industry analysts utilize a variety of research sources in preparing Research Reports. The key component of Pike Research's analysis is primary research gained from phone and in-person interviews with industry leaders including executives, engineers, and marketing professionals. Analysts are diligent in ensuring that they speak with representatives from every part of the value chain, including but not limited to technology companies, utilities and other service providers, industry associations, government agencies, and the investment community.

Additional analysis includes secondary research conducted by Pike Research's analysts and the firm's staff of research assistants. Where applicable, all secondary research sources are appropriately cited within this report.

These primary and secondary research sources, combined with the analyst's industry expertise, are synthesized into the qualitative and quantitative analysis presented in Pike Research's reports. Great care is taken in making sure that all analysis is well-supported by facts, but where the facts are unknown and assumptions must be made, analysts document their assumptions and are prepared to explain their methodology, both within the body of a report and in direct conversations with clients.

Pike Research is an independent market research firm whose goal is to present an objective, unbiased view of market opportunities within its coverage areas. The firm is not beholden to any special interests and is thus able to offer clear, actionable advice to help clients succeed in the industry, unfettered by technology hype, political agendas, or emotional factors that are inherent in cleantech markets.

NOTES

Global North: The Global North refers to the 57 countries with high human development that have a Human Development Index above .8 as reported in the United Nations Development Programme Report 2005. Most, but not all, of these countries are located in the Northern Hemisphere

CAGR refers to compound average annual growth rate, using the formula:

$$\text{CAGR} = (\text{End Year Value} \div \text{Start Year Value})^{(1/\text{steps})} - 1.$$

CAGRs presented in the tables are for the entire timeframe in the title. Where data for fewer years are given, the CAGR is for the range presented. Where relevant, CAGRs for shorter timeframes may be given as well.

Figures are based on the best estimates available at the time of calculation. Annual revenues, shipments, and sales are based on end-of-year figures unless otherwise noted. All values are expressed in year 2011 U.S. dollars unless otherwise noted. Percentages may not add up to 100 due to rounding.

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