Jobs In Fuel Cell Technologies

Existing and emerging fuel cell applications hold large job growth potential.

Photo courtesy of NREL

Growth of fuel cell applications for specialty vehicles, portable power, auxiliary power, backup power, and stationary power are expected to generate a range of new jobs in the near term. Transportation applications, including light-duty vehicles, will also create many more job opportunities over the next 10 to 20 years.

National energy security, environmental pollution, and climate change are driving the development of cleaner domestic energy alternatives. Fuel cells are among the promising technologies that are expected to transform our energy sector. They represent highly efficient and fuel-flexible technologies that offer diverse benefits. For example, fuel cells can be used in a wide range of applications—from portable electronics, to stationary electricity generation, to passenger vehicles.

Today's Technology and Its Growth Potential

Some fuel cell technologies are available today in markets where they cost effectively deliver environmental and performance benefits. Today's fuel cell technology offers cost-competitive solutions for specialty vehicles (such as forklifts and airport ground vehicles), back-up power systems, combined heat and power production, and portable power units. In 2009 alone, the fuel cell market grew 40%, with 24,000 global fuel cell shipments worldwide.[1]

As fuel cell costs decrease, the technology will expand into additional applications. Some of the largest potential markets for the technology include stationary power generation and transportation, such as passenger cars and buses. If fuel cells gain a significant share of such markets, the industry will grow markedly, creating many new jobs. High growth in the light-duty vehicles sector would expand job opportunities beginning around 2020, creating an estimated 680,000 net new jobs by 2035.[2] Fuel cells in early market applications are expected to create new job opportunities within an earlier time frame. The employment impacts of these near-term fuel cell applications will be quantified as part of a U.S. Department of Energy (DOE) study to be released within the next year.

DOE Supports Fuel Cell Development

Although fuel cells have already achieved market competitiveness in near-term power generation applications, significant market penetration into markets such as light-duty transportation will require further reductions in cost and improvements in durability. The DOE Fuel Cell Technologies Program pursues a broad portfolio of applied research, demonstration, and deployment activities for applications across multiple sectors, using a variety of technical approaches and diverse sources of fuel, such as hydrogen. These efforts span the full spectrum of technology readiness—

Fuel Cell Technology Jobs

- Mechanical engineers
- Chemists
- Chemical engineers
- Electrical engineers
- Materials scientists
- Laboratory technicians
- Factory workers
- Machinists
- Industrial engineers
- Power plant operators
- Power plant maintenance staff
- Bus, truck and other fleet drivers
- Vehicle technicians
- Fueling infrastructure installers
- Hydrogen production technicians

[1] Fuel Cell Today's 2010 Industry Review press release, *Fuel Cells: Sustainability*, http://www.your-story.org/fuel-cell-industry-grows-by-over-40-in-2009-says-fuel-cell-today-84424/.

[2] U.S. DOE, *Effects of a Transition to a Hydrogen Economy on Employment in the United States: Report to Congress*, July 2008.

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> *"We need to invest in the jobs of the future and in the industries of the future, because the country that leads in clean energy and energy efficiency today, I'm absolutely convinced, is going to lead the global economy tomorrow."*
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> **— President Barack Obama**
> **March 2010**

from early market applications that are already viable or are expected to become viable in the next few years, such as forklifts, backup power, and portable power applications; to mid-term markets, such as residential and commercial combined-heat-and-power systems, auxiliary power units, fleet vehicles, and buses; and longer-term markets, including light-duty passenger vehicles and other transportation applications.

Continuing technological progress in fuel cell systems; manufacturing technology; and hydrogen production, delivery, and storage will allow fuel cells to compete in markets with more stringent cost, durability, and performance requirements. Codes and standards, in parallel with public education activities, will address economic and institutional challenges to widespread market acceptance. The growth of current markets and expansion into broader, larger-volume markets will allow fuel cell technologies to provide significant employment, economic, and environmental benefits on a national scale.

Photo courtesy of NREL

Hydrogen fuel cells use an efficient electrochemical process to generate electricity, with pure water and potentially useful heat as the only byproducts. These fuel cells are not only pollution-free, but also can provide more than twice the efficiency of traditional combustion technologies.

Outlook for Fuel Cell Technology Careers

Fuel cell technologies will offer employment opportunities in a wide range of industries. While these technologies remain in the early stages of market entry, the opportunities are limited to a relatively small number of companies, research institutions, and similar entities. Most of these jobs require engineering and science backgrounds related to product and technology development.

As various fuel cell applications gain market share, the industry is expected to undergo significant growth. Employment opportunities will open up in businesses that develop, manufacture, operate, and maintain the fuel cell systems. Jobs will also become available in businesses that produce and deliver the hydrogen and other fuels used by these systems.

Because fuel cells are an emerging technology, employment opportunities in the industry will change and evolve—but gradually. As the demand for engineers and scientists who are knowledgeable about fuel cell technologies grows, U.S. colleges and universities can be expected to develop and expand appropriate curricula and study programs. As fuel cell markets continue to grow, the programs for retraining technicians and mechanics to service the installations and vehicles may require rapid expansion. According to an American Solar Energy Society study, fuel cells are the third fastest growing renewable energy industry after biomass and solar.[3]

[3] ASES Green Collar Jobs report, *http://www.ases.org/images/stories/ASES/pdfs/CO_Jobs_Final_Report_December2008.pdf*

Educating Future Scientists and Engineers

The Fuel Cell Technologies Program is funding the development of fuel cell education modules. These include general education courses, specialized science and engineering courses, minor and concentration programs, curriculum modules, internships, lab classes and kits, and textbook chapters. The work is being conducted at several universities, including California State University-Los Angeles, Humboldt State University, the University of California-Berkeley, Michigan Technological University, the University of Central Florida, and the University of North Dakota.

These projects are designed to introduce hydrogen and fuel cell technology to students across the country, educating the scientists, engineers, and potential end users of tomorrow. To learn more about these and other education opportunities visit *http://www.fuelcells.org/ced/education.html*.

Fuel Cells as a Future Jobs Engine

- Vehicle applications of fuel cells may open up to 675,000 net new jobs between 2020 and 2050.
- These job gains are distributed across 41 industries in all parts of the country.
- Applications in stationary power generation are expected to create a broad range of jobs in an earlier time frame.

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