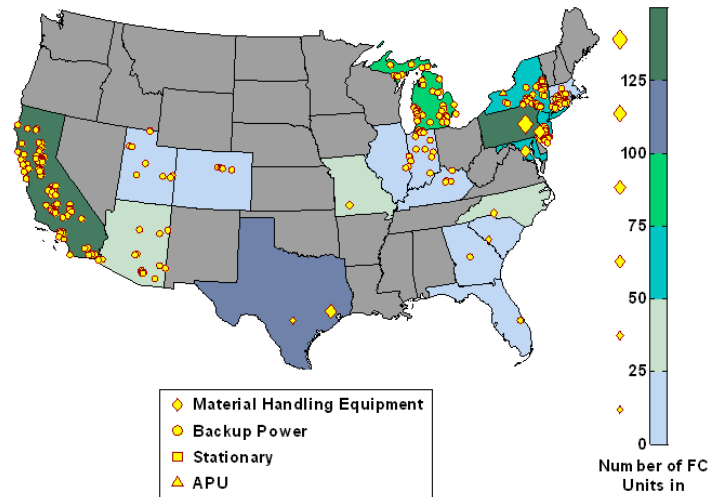


Highlights from U.S. Department of Energy's Fuel Cell Recovery Act Projects

The American Recovery and Reinvestment Act of 2009 (Recovery Act) was signed into law by President Obama on February 17, 2009. The Recovery Act was an unprecedented effort to jumpstart our economy, create or save millions of jobs, and put a down payment on addressing long-neglected challenges so our country can thrive in the twenty-first century. On April 15, 2009, the Energy Department announced \$41.6 million in Recovery Act funding to accelerate the commercialization and deployment of fuel cells; and to build a robust fuel cell manufacturing industry in the United States, with accompanying jobs in fuel cell manufacturing, installation, maintenance, and support services.¹ Grants were awarded to develop and deploy a variety of fuel cell technologies including polymer electrolyte, solid oxide and direct-methanol fuel cells in stationary, portable, and

National Renewable Energy's (NREL) Hydrogen Secure Data Center (HSDC) has established data reporting protocols with each of the project teams. Composite Data Products (CDPs) and Detailed Data Products (DDPs) showing progress to-date have been prepared. The CDPs are available on the NREL HSDC website.²

specialty vehicle applications (i.e., lift trucks). This funding has supported the deployment of over 1,000 fuel cell systems. These efforts are accelerating the potential of fuel cells to provide power in stationary, portable, and specialty vehicle applications; and to cut carbon emissions, create jobs, and broaden our nation's clean energy technology portfolio.



DOE Recovery Act-Funded Fuel Cell Deployment Locations.
National Renewable Energy Laboratory

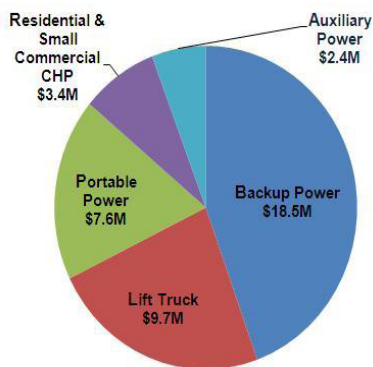
Recovery Act and Market Transformation Activities

DOE supported projects have spurred companies to order >3,000 fuel cell powered lift trucks with *no* DOE funding. Approximately 200 jobs were created or retained as a result of these Recovery Act projects.*

**Includes supply chain and other indirect jobs. Recovery.gov reports that a range of 22 - 71 direct jobs are created or retained quarterly as a result of these Recovery Act projects. If it is assumed that at least 3 indirect jobs are created for each direct job, this would imply that 200 or more jobs were created or retained as a result of these projects.*

From lab to deployment:

DOE has supported R&D by all fuel cell developers involved in these projects.



Industry participants provide approximately **\$54 million** in cost-shared funding—for a total of **~\$96 million**.

Company	Award	Application
Plug Power (7A)	\$2.7 M	Backup Power
ReliOn, Inc.*	\$8.5 M	Backup Power
Sprint Nextel	\$7.3 M	Backup Power
FedEx Freight East**	\$1.3 M	Lift Truck
GENCO**	\$6.1 M	Lift Truck
Nuvera Fuel Cells*	\$1.1 M	Lift Truck
Sysco Houston**	\$1.2 M	Lift Truck
Jadoo Power	\$2.2 M	Portable
MTI Micro Fuel Cells*	\$3.0 M	Portable
Univ. of N. Florida*	\$2.4 M	Portable
Plug Power (6A)	\$3.4 M	CHP
Delphi Automotive	\$2.4 M	Auxiliary Power

*Project completed **Fully deployed

Backup Power

Three projects were awarded \$18.5M in Recovery Act funding for fuel cell deployments in backup power – ReliOn, Inc.; Sprint Nextel; and Plug Power, Inc.

ReliOn, Inc. (with fuel cell deployments at AT&T and Pacific Gas & Electric sites) and Sprint Nextel are demonstrating the technical and economic viability of deploying 1 kW to 10 kW polymer electrolyte membrane (PEM) fuel cells with 72 hours of on-site fuel storage to provide backup power for critical cellular tower sites and utility networks. As of April 2012, over 650 fuel cells have been installed and are operational at over 300 sites nationwide. Data collected from the National Renewable Energy Laboratory (NREL) has already shown over 99.7% reliability of the fuel cells. Since the beginning of the projects, the maximum

continuous grid outage the fuel cells have had the opportunity to support was 29 hours, which they did successfully. Recovery Act funding has also facilitated further market transformation. For example, as a result of Recovery Act deployments, Air Products, with no DOE funding, developed a short-truck bulk hydrogen refueler. This delivery system is being used to deliver hydrogen to a wider range of sites, including the more remote backup power locations.



Refueling hydrogen tanks for backup power (top right); AT&T cellular tower site with fuel cells for backup power. *ReliOn, Inc.*

Plug Power is demonstrating the market viability of low temperature, 6 kW, PEM fuel cells fueled by liquid petroleum gas to provide clean and reliable primary power and 72 hours or more of emergency backup power. Ten fuel cells are currently operational at the Warner Robins Air Force Base in Warner Robins, Georgia. An additional 10 fuel cells will begin operation in May 2012 at an engineering building at Fort Irwin in Barstow, California.

Deployment Site	City, State	Operational FCs (#)
FedEx Freight East	Springfield, MO	35
Coca Cola (GENCO)	Charlotte, NC	40
Kimberly Clark (GENCO)	Graniteville, SC	25
Sysco Philadelphia (GENCO)	Philadelphia, PA	95
Wegmans (GENCO)	Pottsville, PA	136
Whole Foods Market (GENCO)	Landover, MD	61
H-E-B (Nuvera Fuel Cells)	San Antonio, TX	14
Sysco Houston	Houston, TX	98
TOTAL		504

Material Handling Equipment (MHE)

Four projects were awarded \$9.7M in Recovery Act funding to deploy fuel cell powered lift trucks, or material handling equipment (MHE), as replacements for battery and propane powered lift truck fleets. By the end of December 2011, over 500 fuel cells for MHE were operational, bringing the Recovery Act MHE projects to full deployment. Combined, these lift trucks already have achieved over 1 million hours of operation and used more than 100,000 kg of hydrogen from over 150,000 indoor hydrogen refueling events. Various end users have shown evidence of increased productivity in their warehouse operations as a result of using the fuel cells, some as much as

10%.³ NREL analysis has shown annualized financial savings of up to \$5,700/lift truck (Class I & II) when using fuel cells over battery technologies.⁴

The lessons learned from these projects, in part, have leveraged additional fuel cell deployments with no DOE funding with some of the end users. FedEx Freight purchased an additional five fuel cell powered lift trucks for their service center in Springfield, Missouri, bringing their total fleet to 40 fuel cell lift trucks. Sysco Foods is planning to deploy over 900 additional fuel cell lift trucks throughout seven difference distribution centers nationwide. Four of the seven distribution centers will be operational by June 2012.



Left: Class III fuel cell powered lift truck at Sysco Houston distribution center in Houston, TX. *Sysco Houston.*
Right: Indoor refueling station for fuel cell powered lift trucks at FedEx Freight East facility in Springfield, MO. *FedEx Freight East.*

For More Information

For more information, visit <http://www.hydrogenandfuelcells.energy.gov>.

References and Notes

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