State OF THE States

Fuel Cells in America 2012

FUEL CELLS 2000
www.fuelcells.org

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Authors and Acknowledgements

This report was written and compiled by Sandra Curtin, Jennifer Gangi and Ryan Skukowski of Fuel Cells 2000, an activity of Breakthrough Technologies Institute in Washington, DC. Support was provided by the U.S. Department of Energy's Energy Efficiency and Renewable Energy Fuel Cell Technologies Program.

About This Report

The information contained in this report was collected from public records, websites, and contact with state and industry representatives as of August 2012, particularly Fuel Cells 2000's State Fuel Cell and Hydrogen Database and North Carolina Solar Center's Database of State Incentives for Renewables & Efficiency (DSIRE). It is a follow-up to Fuel Cells 2000's 2011 and 2010 reports, State of the States: Fuel Cells in America. If we've missed something in your state, please let us know at info@fuelcells.org

About Fuel Cells 2000

Fuel Cells 2000's mission is to promote the commercialization of fuel cells and hydrogen by supplying accurate, unbiased industry information and developing and disseminating summary materials accessible to a general audience. Fuel Cells 2000 is independent and non-aligned, and supports fuel cells of all types for all applications.

Fuel Cells 2000 is an activity of the Breakthrough Technologies Institute (BTI), a non-profit [501(c)(3)] independent, educational organization that identifies and promotes environmental and energy technologies that can improve the human condition. BTI was established in 1993 to ensure that emerging technologies have a voice in environmental and energy policy debates.

Front Cover photo credits

Upper left – Bloom Energy installation at JMB Realty's Constellation Place in Los Angeles, California

Upper Right – Fuel cell hybrid shuttle bus at Joint Base Lewis-McChord, Washington

Bottom Left – Fuel cell forklifts at the Defense Logistics Agency's Defense Distribution Depot in San Joaquin, California

Bottom Middle – ReliOn fuel cell providing backup power to a telecommunications site

Bottom Right – UTC Power fuel cell installed at its headquarters in South Windsor, Connecticut

Fuel Cells: A Bipartisan Solution…Words of Support from the U.S. Congress

"As the lead author on the Fuel Cell Industrial Vehicle Jobs Act of 2011, HR 1659, I continue to believe that fuel cells will empower the private sector innovation we need to keep American products competitive in the global market. This technology not only improves our domestic energy security and helps protect our environment, it also has led to job creation. From end users to parts suppliers, the fuel cell industry touches nearly every state in the nation, employing middle-class families with the kind of jobs that bring stability to our communities and help restore the American Dream." – **Congressman Paul Tonko (D - NY)**

"I would like to congratulate the state of Ohio on yet again being recognized as a U.S. leader in fuel cells. With recent investments such as hydrogen stations at the Ohio State University and the successful attraction of fuel cell companies to the state, including NexTech and Roll-Royce Fuel Cell Systems, Ohio has been making a rapid expansion into this important industry. Fuel cells and hydrogen-based technologies have enormous potential to create high-tech jobs and should be an integral part of an "all-of-the-above" energy plan that will decrease energy costs and our dependence on foreign oil."
– **Congressman Steve Stivers (R -OH)**

"I am proud to represent a state that is leading the nation in the innovation of hydrogen fuel cells. This alternative energy source is going to be critical to our country's future energy policies and the creation of homegrown, American-owned jobs. Fuel cells are already providing less bulky, more reliable energy for military communications devices; are contributing to the efficiency of numerous manufacturing facilities; and one day could heat and power our homes. I was pleased to bring Secretary Chu to see the research being done by the South Carolina Fuel Cell Alliance, and to have played a role in helping the Department of Energy include fuel cell as part of their future research initiatives." – **Congressman James E. Clyburn (D- SC)**

"The development of hydrogen and fuel cell technology in the United States will not only reduce our nation's reliance on foreign oil, but create tens of thousands of high-quality jobs for American workers, including many residents of the district I represent. Pennsylvania's 15th District is home to one of the world's largest producers of merchant hydrogen, giving our region a unique opportunity to lead America's transition to a clean energy future that includes hydrogen and fuel cell technologies."
– **Congressman Charles W. Dent (R- PA)**

"Although Hawaii imports more than 90% of our primary energy in the form of fossil fuels, we are working hard to make Hawaii more energy independent and efficient. The progress we have made has been a collaborative effort - from citizens, private businesses, military, and government - that we must continue. I worked with these energy leaders to help create a Path to Sustainability plan, a document that highlights the importance of cooperation and teamwork. As shown in the new Fuel Cells 2000 State of the States report, expanding the use of fuel cells is an important component of the progress Hawaii has made. From the U.S. Army Pacific to the University of Hawaii, diverse stakeholders are pursuing research, development, and deployment of fuel cell technology to help meet our transportation and energy needs. If we keep up the momentum, I know that Hawaii will continue to be a national leader in clean energy technologies, creating jobs, ending our dependence on fossil fuels, and ensuring a prosperous, sustainable economy for generations to come." – **Congresswoman Mazie K. Hirono (D - HI)**

Acronyms Used in this Report

AFV	**Alternative Fuel Vehicle**
ARRA	**American Recovery and Reinvestment Act**
CHP	**Combined Heat and Power**
DMFC	**Direct Methanol Fuel Cell**
DOD	**U.S. Department of Defense**
DOE	**U.S. Department of Energy**
DOT	**U.S. Department of Transportation**
FAA	**Federal Aviation Administration**
FCE	**FuelCell Energy**
FCEV	**Fuel Cell Electric Vehicle**
FCV	**Fuel Cell Vehicle**
FTA	**Federal Transit Administration**
kW	**Kilowatt**
MW	**Megawatt**
MWh	**Megawatt-Hour**
OEMs	**Original Equipment Manufacturers**
PEM	**Proton Exchange Membrane Fuel Cell**
R&D	**Research and Development**
RPS	**Renewable Portfolio Standard**
SGIP	**California's Self Generation Incentive Program**
sq. ft.	**Square Feet**
ZEB	**Zero Emission Bus**
ZEV	**Zero Emission Vehicle**

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Fuel Cells: Made in America

Fuel cells are moving fast – out of the laboratory and manufacturing facilities and into service around the world. The U.S. has long been a leader in fuel cell technology – home to many of the leading fuel cell manufacturers and component suppliers, the largest installations and deployments in several market sectors, record numbers of patents, and cutting-edge university research.

Certain states in the U.S. continue to be a driving force in setting fuel cell policy, providing funding and legislative support, or focusing on attracting investment for businesses to relocate or expand. This not only creates jobs and opportunities for local businesses and the supply chain, but also helps to move the entire industry forward.

In 2010, Fuel Cells 2000 published "State of the States: Fuel Cells in America," and in June 2011, released a follow-up report. Both provided a comprehensive analysis of state activities supporting fuel cell and hydrogen technology, as well as a catalog of recent installations and deployments in each state, so that readers could get a sense of just how much is happening around the country and compare their home state to others.

Since our last report, there have been several positive storylines for the U.S. fuel cell industry – larger orders, bigger systems, and major customers, many of them returning to buy more after the initial purchase.

In just the past year since our last report, in the U.S., there have been more than:

- **1,700** fuel cell-powered forklifts deployed or ordered
- **25** fuel cell buses placed or planned for transit service
- More than **74 megawatts (MW)** of stationary power installed or purchased

A few of the big name customers included in these numbers include Fortune 500 companies Apple, eBay, Coca-Cola, and Walmart, all trusting fuel cells to provide reliable power to company data centers, stores and facilities. Some are purchasing multi-MW systems. Others are replacing fleets of battery forklifts with fuel cells. Sysco, the food distributor, has more than 750 fuel cell forklifts operating at seven facilities, with more on order.

In our previous State of the States reports, we selected what we felt were the Top 5 Fuel Cell States, and in last year's report, we expanded the list to highlight five up-and-coming states that were hot on the Top 5's heels.

A fuel cell is an electrochemical device that combines hydrogen and oxygen to produce electricity, with water and heat as its by-product.

Fuel cells offer a unique combination of benefits that make them a vital technology ideally suited for a number of applications. Fuel cells are complementary, not competitors, to other electricity generation technologies, particularly renewable ones.

Fuel Cell Benefits

- Fuel flexible - operation on conventional or renewable fuels
- High quality, reliable power
- Exceptionally low/zero emissions
- Modularity/scalability/flexible installation
- Not dependent on the power grid
- Silent operation
- Lightweight
- Rugged
- Can be used with or instead of batteries and diesel generators
- Can partner with solar, wind, and other renewable technologies
- Increased productivity
- Cost savings via high electrical and overall efficiency

Fuel cells are operating in several market segments today, with major customers making large volume and repeat purchases.

To learn more about fuel cells, please visit www.fuelcells.org.

Each was recognized for different reasons – some for multiple stationary installations, vehicle demonstrations, and hydrogen fueling stations; others for taking the lead by providing grants and funding; supporting research and development; attracting business and jobs; or putting regulations in place to facilitate demonstrations and installations.

For this report, we decided to delve a little deeper and break up our overall criteria into separate Top 5 lists, so readers can see the best of the best in different categories and how they arrived there.

If a state did not break into any of the Top 5 lists, it is not for lack of any fuel cell policy, activity, or industry advancement happening there. We are seeing all kinds of progress around the country, including two of the largest non-utility installations coming down the pike – a 4.8-MW fuel cell installation for an Apple data center in Maiden, North Carolina, and a 6-MW installation in Utah at eBay's flagship data center.

The new Top 5 categories we've focused on include: Fuel Cell Vehicles (Deployed), Fuel Cell Buses, Fuel Cell Forklifts (Deployed or Ordered), Hydrogen Fueling Stations, Telecom Backup Systems, Stationary Systems (Installed), Stationary Systems (Planned), Fuel Cell Patents, and Successful Fuel Cell Policies.

Past "Top 5 Fuel Cell States" Winners

2010 and 2011

California

- Progressive policy, worldwide leader in fuel cell cars and buses, hydrogen stations, numerous stationary installations

Connecticut

- Home to major manufacturers, high profile installations, supportive funding policies

New York

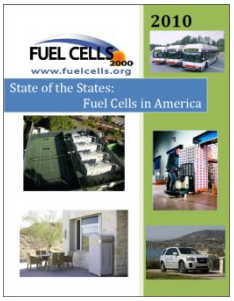
- High profile and long-running installations, supportive funding policies

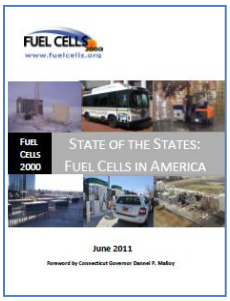
Ohio

- Focus on business attraction and development, building supply chain and manufacturing base

South Carolina

- Numerous forklift demonstrations and deployments, hydrogen permitting leading to hydrogen stati ons, business development





Rising Stars – 2011

Delaware

- Added non-renewable fuel cells to net metering, two fuel cell buses operating with more on the way, home to major fuel cell component suppliers, Bloom Energy opening East coast facility

Florida

- Cleantech Industry Cluster includes fuel cells, more than 100 university hydrogen and fuel cell research projects, business attraction/development policies that target the hydrogen industry

Hawaii

- Fuel cell vehicles, hydrogen station at Hickam Air Force Base, recently launched Hawaii Hydrogen Initiative with DOE, GM, TGC to install 25 hydrogen stations in Oahu

Maryland

- FuelWorks research center opened at University of Maryland, Whole Foods forklift fleet among nation's largest, attracted North American headquarters of German fuel cell manufacturer SFC

Texas

- Fuel cell forklift deployments by several major corporations at state facilities, University of Austin fuel cell vehicle projects

The 2012 Fuel Cell Power Rankings

Fuel Cells 2000's Top 5 Lists of Everything Fuel Cells in the U.S.

With so much activity in the various applications and market sectors for fuel cells, it has become a difficult task choosing between all the different tactics states are taking to move the fuel cell and hydrogen industry forward and keeping the U.S. ahead of the rest of the world. To help ease the burden, we have divided our Top 5's into different categories and selected the top states for each, along with a short explanation as to why.

The numbers are based on public records and information received directly from companies and industry organizations – there are some instances of even more orders, installations, and deployments out there, so these represent a baseline foundation of publicly disclosed numbers. Photo credits can be found on page 12.

Fuel Cell Vehicles (Deployed)

1st	**CALIFORNIA**	200+ mix of vehicles on road; includes Honda FCX Clarity and Daimler F-CELL leases (20 and 44 respectively)
2nd	**HAWAII**	16 General Motors Equinox fuel cell vehicles
3rd	**NEW YORK**	15 Toyota FCHV-adv vehicles
4th	**CONNECTICUT**	10 Toyota FCHV-adv vehicles
5th	**MICHIGAN**	3 Ford Focus fuel cell vehicles



Fuel Cell Buses

1st	**CALIFORNIA**	15 active, including 12 at AC Transit; 2 at SunLine Transit, 1 at BurbankBus, 7 planned
2nd	**CONNECTICUT**	6 active at CTTransit
3rd	**DELAWARE**	2 active at the University of Delaware, 3 planned
4th	**TEXAS**	1 active at Capital Metro (Austin) , 1 planned
5th	**HAWAII** and **WASHINGTON**	Hawaii – 1 active (Hickam Air Force Base) Washington – 1 active (Joint Base Lewis-McChord)

More fuel cell buses are on the way.[1] The following states have plans to receive fuel cell buses in 2012/2013: Alabama (1), Washington, DC (1), Illinois (1), Massachusetts (1), Michigan (1), Ohio (2-3), South Carolina (1), Tennessee (1).

[1] See http://www.nrel.gov/hydrogen/proj_fc_bus_eval.html to learn more.

Fuel Cell Forklifts (Deployed or Ordered)

1st	**CALIFORNIA**	762+ by Unified Grocers, Proctor & Gamble, Sysco Riverside, WinCo Foods, Coca-Cola, Martin-Brower, Kroger
2nd	**PENNSYLVANIA**	296 by Sysco Philadelphia, DLA, East Penn, Wegmans
3rd	**ILLINOIS**	274 by Central Grocers, Golden State Foods, Testa Produce
4th	**TEXAS**	257 by Nestle Waters, Coca-Cola, Sysco Houston, Sysco San Antonio, H-E-B
5th	**SOUTH CAROLINA**	255 by BMW, Kimberly-Clark

Cool fact – Crown Equipment Corporation, based in New Breman, Ohio, controls more than 50% of the fuel cell lift truck manufacturing and integration market in the U.S., with 1,500 fuel cell lift trucks assembled in Ohio by the end of the year.

To see a complete list of fuel cell forklifts in the U.S., please see Appendix 5.

Hydrogen Fueling Stations

1st	**CALIFORNIA**	8 public stations; 14 new or upgraded stations in development; 15 private stations
2nd	**MICHIGAN**	9 private stations
3rd	**NEW YORK**	8 private stations, including a wind-to-hydrogen station in Hempstead
4th	**NEVADA**	2 private stations, 1 planned
5th	**SOUTH CAROLINA**	2 private stations, including the first multi-use station at an industrial park

Cool fact #1 - The world's first "tri-generation" fuel cell facility recently opened in California, producing electricity, heat, and hydrogen from bio-gas produced at the Orange County Sanitation District's wastewater treatment plant in Fountain Valley. The fuel cell produces 250 kilowatts (kW) of electricity and enough hydrogen to supply up to 50 fuel cell vehicles per day.

Cool fact #2 – this list only focuses on hydrogen fueling stations for fuel cell cars or buses, but warehouses and distribution centers that are deploying fuel cell forklifts (as in the previous list) are also installing hydrogen generation systems and multiple dispensers around the facilities.



Telecom Backup Power Systems (Reported)

1st	**FLORIDA**	356 fuel cells at 140 MetroPCS sites, 1 AT&T site, T-Mobile sites
2nd	**CALIFORNIA**	77 Sprint sites, 43 AT&T sites, 1 T-Mobile site
3rd	**NEW YORK**	63 Sprint sites
4th	**MICHIGAN**	59 AT&T sites
5th	**NEW JERSEY**	45 Sprint sites

Sprint and ReliOn (AT&T) each received funding from the U.S. Department of Energy (DOE) via the American Recovery and Reinvestment Act (ARRA) to deploy nearly 900 kW of fuel cells for backup power at approximately 200 telecom sites. There are many other installations around the U.S. that are not yet publicly disclosed or that were in operation or testing prior to ARRA. Most recently, Altergy Systems received an order for 7.5 MW (1,000 fuel cell systems) to power a major upgrade to one of the nation's largest wireless telecom carriers.

Stationary Fuel Cell Systems (Installed)

1st	**CALIFORNIA**	46 MW+
2nd	**CONNECTICUT**	13 MW+
3rd	**NEW YORK**	6 MW+
4th	**OHIO**	1.0 MW
5th	**NEBRASKA**	800 kW

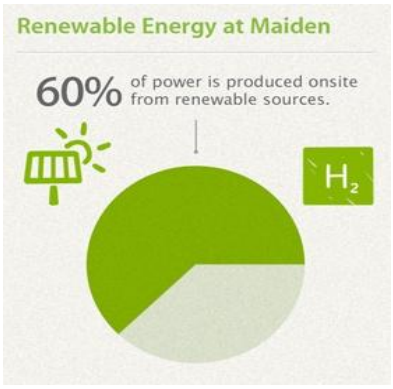
Fuel cells are providing clean and reliable power TODAY to a variety of end users around the country, including: grocery and retail establishments, hospitals, data centers, government buildings, corporate headquarters, wastewater treatment plants, jails, agricultural and beverage processing facilities, and wineries/breweries.



Stationary Fuel Cell Systems (Planned)

1st	**DELAWARE**	30.0 MW (could increase to 50 MW)
2nd	**CALIFORNIA**	25.8 MW
3rd	**CONNECTICUT**	20 MW
4th	**UTAH**	6 MW
5th	**NEW YORK** and **NORTH CAROLINA**	4.8 MW

Future announced installations include Delaware electric substations (Delmarva Power); at businesses, including AT&T, CBS Studios, eBay's flagship data center in Maiden, Utah, and Apple's new data center in North Carolina; Freedom Tower in New York City; universities in California and Connecticut.

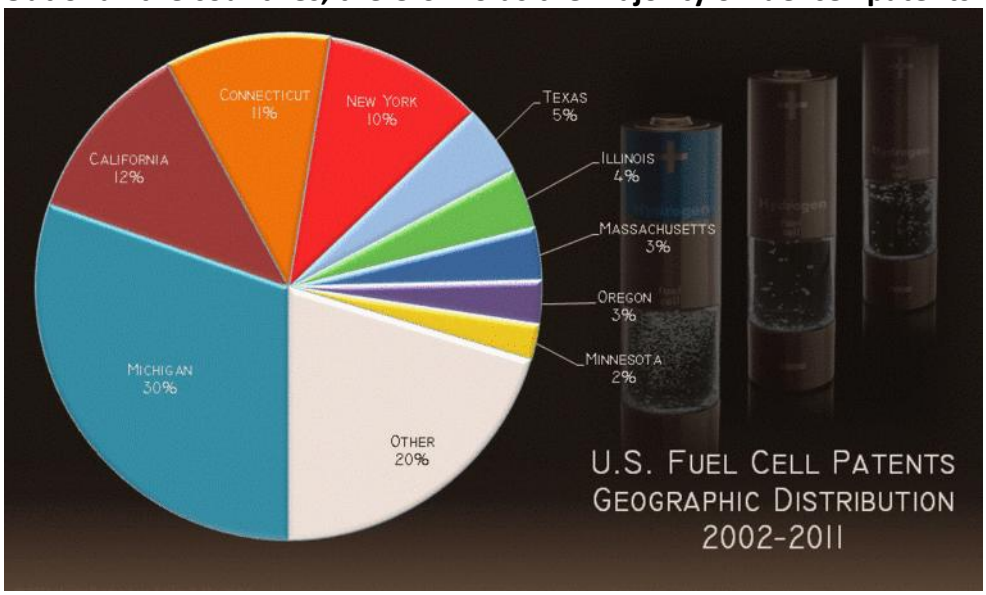


Share of U.S. Fuel Cell Patents (2002-2011)

1st	**MICHIGAN**	30%
2nd	**CALIFORNIA**	12%
3rd	**CONNECTICUT**	11%
4th	**NEW YORK**	10%
5th	**TEXAS**	5%

The next four include Illinois (4%), Massachusetts (3%), Oregon (3%) and Minnesota (2%). According to the Clean Energy Patent Growth Index published quarterly by the Cleantech Group at Heslin Rothenberg Farley & Mesiti P.C., the fuel cell sector accounted for the largest segment of U.S. patents for clean energy technologies in 2011, a title held for the entire span of the index (2002-2011).

Out of all the countries, the U.S. holds the majority of fuel cell patents.



Successful Fuel Cell Policies (Alphabetical, not ranked)

CALIFORNIA

The Public Utility Commission's Self-Generation Incentive Program (SGIP) provides financial incentives to support distributed energy resources, and has funded dozens of fuel cell installations. The Air Resources Board's Zero Emission Vehicles (ZEV) and Zero Emission Bus (ZEB) programs promote deployments of fuel cell vehicles and hydrogen fueling infrastructure.

DELAWARE

State legislators passed a bill permitting energy from Delaware-manufactured fuel cells to meet part of Delmarva Power's renewable energy production requirements. Bloom Energy, which is constructing a fuel cell manufacturing facility in the state (creating up to 1,500 new jobs), will be able to add 50 MW of fuel cell power to Delmarva's grid under the state's Renewable Portfolio Standard (RPS).

NEW YORK

The Public Service Commission approved sub-metering of tenants at New York City's Octagon, a residential building that uses a fuel cell system to generate power and heat for tenants. Sub-metering may encourage future fuel cell deployments at other multifamily residential buildings; this is notable since neighboring Connecticut does not permit sub-metering of residential fuel cells.

OHIO

The Third Frontier Fuel Cell Program has accelerated the development and growth of the fuel cell industry in Ohio, and played a role in attracting Rolls-Royce Fuel Cell Systems (now LG Fuel Cell Systems) to the state.

SOUTH CAROLINA

South Carolina is the only state in the U.S. to have uniform statewide permitting of hydrogen and fuel cell facilities.

Top 5 Photo Credits

From left to right:

Fuel Cell Vehicles – Toyota vehicles in Connecticut; GM fuel cell Equinox in Hawaii; Honda FCX Clarity outside Fuel Cells 2000 office in Washington, DC; Ford Focus fuel cell vehicle

Fuel Cell Forklifts – Plug Power fuel cells at Sysco Houston; Plug Power fuel cells at United Natural Foods; Oorja Protonics fuel cells on forklifts

Fuel Cell Buses – Fuel cell bus at AC Transit; University of Delaware fuel cell bus; CTTransit fuel cell bus

Hydrogen Fueling Stations – Air Products station in Hempstead, NY; AC Transit hydrogen fueling station; Sage Mill fueling station in South Carolina

Telecom Backup Power Systems – Altergy Systems fuel cell operating at MetroPCS site; ReliOn fuel cell system in field; ReliOn fuel cell system in field

Stationary Fuel Cell Systems (Installed) – Bloom Energy fuel cells at Fireman's Fund in California; FuelCell Energy fuel cell system at Central Connecticut State University; UTC Power fuel cell at Octagon in New York

Stationary Fuel Cell Systems (Estimated Planned) – eBay slide; UTC Power fuel cell delivered to Freedom Tower site in New York; Apple slide

Federal Overview

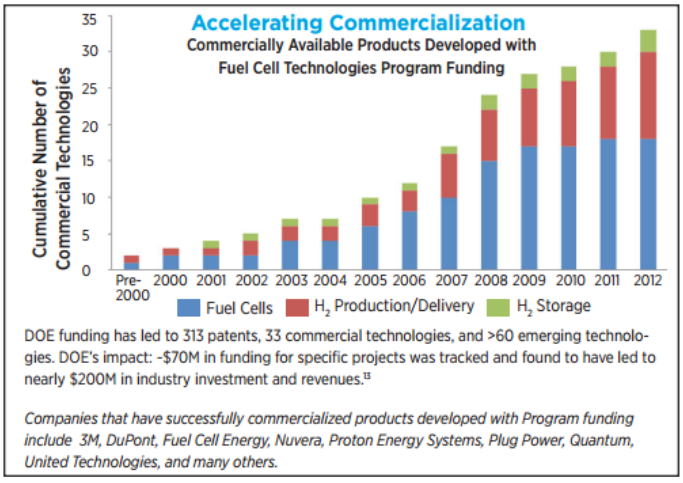
While fuel cells have historically received a lower level of federal funding support than other power generation technologies, the fuel cell and hydrogen program run by DOE has had tremendous success, leading to significant improvements in fuel cell reliability, durability and cost reduction – accomplished through innovative research, development and demonstration projects.

As the technology is proving itself in the real world, the wind is slowly shifting. Last year, President Obama announced a historic agreement with 13 major automakers to pursue the next phase in the Administration's national vehicle program, increasing fuel economy to 54.5 miles per gallon for cars and light-duty trucks by Model Year 2025. Fuel cell electric vehicles (FCEVs) were included under advanced technologies that represent "game changing" performance improvements.

The Technology Validation project at DOE, a six-year program that joined automakers with fuel providers to test FCEVs and hydrogen fueling in real-world settings, recently came to a close. DOE collected data from more than 180 vehicles that collectively made more than 500,000 trips, traveled 3.6 million miles, fueled up more than 33,000 times at 25 hydrogen stations, all while achieving more than twice the efficiency of today's gasoline vehicles. Most of the major automakers, whether involved in the Technology Validation project or not, have confirmed the 2014-2015 timeframe as the target for small-scale fuel cell vehicle commercialization.

To continue this success, DOE just announced a new $2.4 million investment in five projects to track the performance and technical progress of innovative refueling systems (at existing or planned hydrogen fueling stations) to find ways to lower costs and improve operation. The two-year projects have a 50% cost share and recipients are located in California, Illinois, and Connecticut.

DOE has nearly 300 research and development projects currently funded at companies, national labs, and universities or institutes. We've noted the most recent ones in each state's profile. Progress on DOE-funded projects is reported every year at the Annual Merit Review. Overall, DOE funding has led to 313 fuel cell patents, 33 commercial technologies and more than 60 emerging technologies. Approximately $70 million in DOE funding for specific projects has led to more than $200 million in industry investment and revenues.



Other federal departments have an interest in and programs that advance fuel cell R&D and deployment. The Department of Defense (DOD) has long been a supporter of fuel cells, running several stationary fuel cell demonstration programs in the 1990s and early 2000s, as well as funding and deploying fuel cell projects in the testing laboratories and on the battlefield.

Today, DOD, through the U.S. Army Corps of Engineers' Construction Engineering Research Laboratory (CERL), is working with DOE on a Federal-Wide Backup Power PEM (proton exchange membrane) Fuel Cell Project which is installing more than 200 kW of emergency back-up power fuel cells at nine federal facilities (see Appendix 4). Sixteen General Motors' fuel cell vehicles (FCVs), one of the largest fleets of FCVs in the U.S., are undergoing testing by various branches of the military in Hawaii.

Various branches of the U.S. military currently have active contracts with American fuel cell companies that develop portable fuel cells for soldiers, to use as battery chargers or to power communications and information systems. Some are even being field-tested by soldiers in Iraq and Afghanistan. Fuel cells are also being developed to power submarines and unmanned ground and aerial vehicles, which are breaking endurance records with long flight and power times. We've noted recent funding awards by DOD in the state profiles.

The U.S. Army also opened a new 30,000-square-foot lab in Detroit, Michigan, to develop cutting edge energy technologies for the next generation of combat vehicles for the Army Green Warrior Convoy, including fuel cells.

Fuel cell buses are receiving support from the Federal Transit Administration (FTA), which awarded $13.1 million for 11 research and demonstration projects in three states under its National Fuel Cell Bus Program. The funds are shared by CALSTART in Pasadena, California; the Center for Transportation and the Environment (CTE) in Atlanta, Georgia; and the Northeast Advanced Vehicle Consortium in Boston, Massachusetts. All three will engage in work to develop various fuel cell components, test American-made buses under real-world conditions powered by fuel cells, and conduct educational outreach.

As demonstrated in the quotes opening this report, fuel cells enjoy bipartisan support in the U.S. Congress. The fuel cell industry has clusters of activity in several states, and as the technology is deployed by major corporate customers at multiple sites (Walmart, for example, powers 27 retail stores using fuel cells and several warehouses operate fuel cell forklifts), fuel cells are spreading into new states and regions.

Business Attraction

Business attraction and job creation are critical strategies in today's tough economy. State Department of Development programs actively seek and assist both established and start-up firms to set up shop in their state, and many local governments are doing the same. Some create enterprise zones and industry clusters (such as technology and clean energy), and foster nascent industry with business incubators and business support resources and services. Most offer assistance in the form of business grants, low-interest loans, and tax incentives. In some cases, it is the combination of these incentives, as well as a strong university presence, which allows companies to tap into research funding dollars, a skilled labor force and equipment stream, which seals the deal.

Fuel cell companies and universities are partnering on research projects and deployments, and both groups, either jointly or separately, are attracting investment, both from federal agencies and venture capital companies. Some fuel cell companies are spin-offs from successful university research and investments. Venture capital and private equity investments in U.S. fuel cell companies grew by 553.5% between 2010 and 2011.

The fuel cell industry offers tremendous opportunity for manufacturing, engineering, and business development jobs, and once the supply chain, integrators, and service providers are factored in, could help the U.S. rebound and thrive in a competitive marketplace. Several states have focused on attracting fuel cell-related business and have been successful in the past few years, attracting some big names or international companies to their locale. Here are a few recent examples:

LG Fuel Cell Systems (formerly Rolls-Royce Fuel Cell Systems) – Ohio

"Ohio has done a very good job of creating an environment to develop an industry around fuel cells, from people to components, to systems and subsystems. It's unique." – Mark Fleiner, President of Rolls-Royce Fuel Cell Systems (now co-President of LG Fuel Cell Systems)

Ohio boasts a fuel cell cluster of 49 companies and 18 non-profits and universities located in different parts of the state, including fuel cell manufacturers, startups, and companies which are diversifying into the production of fuel cell materials and components, or working to incorporate fuel cell technology in their product lines. Employment in this cluster grew by 26.5% from 2004-2008. The Brookings Institution and Battelle in a comprehensive report, "Sizing the Clean Economy," estimate that Ohio's fuel cell industry accounted for 8.4% of U.S. establishments and 9.8% of U.S. employment. Since 2002, the Ohio Department of Development's (ODOD) Third Frontier Program has invested more than $80 million in a variety of fuel cell-related projects throughout the state. This investment has been leveraged with over $200 million in co-investment. The Ohio Third Frontier's $80 million investment is attributed to the filing of over 200 patents from 2005 - 2010

In 2006, Rolls-Royce Fuel Cell Systems, a subsidiary of the English jet engine manufacturing company, decided to set up shop in Ohio at Stark State College in North Canton. The college was constructing a $4.7 million Fuel Cell Prototyping Center and Rolls-Royce was a charter tenant, choosing Ohio over other states because of the state's support for fuel cell projects via the Third Frontier program and strong university partnerships with Stark State and Case Western University.

Recently, Rolls-Royce Fuel Cell Systems has become LG Fuel Cell Systems, with the Korean electronics giant investing $45 million, and acquiring 51% of the company. The Ohio location will be the global headquarters for LG Fuel Cell Systems which will continue Rolls-Royce's research, development, testing, and commercialization of solid oxide fuel cell technology aimed at large scale power generation for industrial, commercial, and utility markets.

Genport SRL – Indiana

In 2012, Genport SRL, a fuel cell manufacturer based in Italy, chose West Lafayette, Indiana, for its North American headquarters. Genport is spending $2 million to lease facilities at Kurz Purdue Research Park, an office and research facility home to more than a hundred technology-based companies, the largest cluster in the state. The company plans to partner on research efforts with the DOD and the Naval Surface Warfare Center in Crane.

Indiana's Economic Development Corporation offered Genport performance-based tax credits (as much as $225,000) and training grants (up to $21,000) which can be claimed as Genport creates new jobs – 20 high-wage jobs are anticipated by 2015. Additional incentives were provided to the company by Tippecanoe County and the city of West Lafayette.

"We chose to establish our U.S. subsidiary in West Lafayette to benefit from the tremendous environment of the Purdue Research Park and the state of Indiana. We look forward to networking with the electro-medical and defense industries as well to establish research cooperation with Purdue University." – Paolo Fracas, Genport SRL Chief Executive Officer

Bing Energy and Cella Energy – Florida

"We are on track to reach our QTI goal, and look forward to becoming a major employer in the region." - Dean Minardi, CFO for Bing Energy International, LLC

In early 2011, Bing Energy International moved its global headquarters and manufacturing facility from California to Tallahassee. The company is collaborating with a Florida State University professor Dr. James Zheng to bring his fuel cell – which uses carbon nanotube catalyst supports that reduce the need for expensive platinum – to market.

Bing received a $1.9 million award from the Florida Office of Tourism, Trade and Economic Development, in the form of a Qualified Target Industry (QTI) Refund linked to job creation. The city of Tallahassee and Leon County each provided a 10% match on the award. Bing will need to create at least 244 jobs, paying an average salary of $41,633, over the next seven years. The company has met the first year QTI goals in its first year of Florida operation, hiring 16 employees at an average salary of $41,661.

Cella Energy, a U.K.-based company specializing in hydrogen storage technologies, received a $1 million investment from Space Florida (part of a larger investment) that allowed Cella to expand to the U.S. and become an early tenant at Exploration Park, a research center now under construction at NASA Kennedy Space Center in the state. Cella already has offices in the Space Life Sciences Laboratory and the collaborative contract with NASA, called the Space Act Agreement, runs five years and can be extended.

Bloom Energy – Delaware

"The combination of Delaware's visionary political leadership and pro- business policies, an innovative state utility, a world class university, skilled talent pool, great infrastructure and proximity to the Northeast market made Delaware our clear number one choice for our new factory site. This is a powerful combination bringing 21st century innovation and jobs to Delaware." - Bill Kurtz, Chief Commercial Officer & Chief Financial Officer, Bloom Energy

Delaware is now the East Coast home to California-based SOFC manufacturer, Bloom Energy, which is expanding operations and building a 200,000 square-foot manufacturing facility on the University of Delaware campus in Newark. Bloom also plants to install 30 MW (possibly increasing to 50 MW) of fuel cells to deliver energy to the Delmarva Power electric grid. The state delivered both enabling legislation and regulatory approval to entice Bloom to their state, in part by redefining renewable energy to permit energy from Delaware-manufactured fuel cells, if capable of being powered by renewable fuels, to meet part of Delmarva Power's renewable energy production requirements. The state is also contributing $18 million in conditional incentives based on Bloom creating and maintaining jobs – an anticipated 900 jobs at Bloom's new facility. There is also the potential for an additional 600 new jobs to be created by Bloom suppliers, as well as and 350 temporary construction jobs at the new factory site.

There are also other older examples from around the country: Dantherm Power A/S, a Danish fuel cell manufacturer, opened its North American subsidiary in South Carolina, and German fuel cell company, SFC Energy, located its U.S. office in Rockville, Maryland.

Export Opportunity

With many of the major fuel cell manufacturers located in the U.S., companies in other countries are increasingly looking to collaborate and become international distributors and resellers of American-made fuel cell systems, and in some cases, with the goal of eventually taking over manufacturing as well.

The U.S. recently signed a new free trade agreement with South Korea, with the goal to increase U.S. exports. Fuel cells can contribute to this goal, as South Korea has made no secret of their desire for world leadership in fuel cell manufacturing and exports. Several U.S. manufacturers have entered agreements with Korea, including Connecticut's FuelCell Energy (FCE) and UTC Power, both manufacturers of large-scale fuel cell systems. FCE has already installed multi-MW power plants in the country through its partner POSCO Power and has orders for almost 200 MW more. The orders will have FCE exporting several MWs per month for the next few years. UTC Power already has 12 of its PureCell Model 400 fuel cell systems installed in Korea with 14 more recently ordered. Seven will be installed and operational by the fall of 2012. The remaining seven will be installed and operational by the fall of 2013, bringing the total to 26 systems and 10.4 MW exported to Korea by the end of 2013.

Oregon-based ClearEdge Power became the first fuel cell manufacturer to be awarded the Korean Gas Safety Corporation's (KGS) internationally recognized safety certification, which is mandatory to market fuel cells in Korea, and is recognized throughout Asia, including China, Japan, Thailand, Hong Kong, Singapore, Australia, Russia, and parts of Europe. In 2010, ClearEdge signed a three-year $40 million distribution agreement with Korean company LS Industrial Systems, in which LS agreed to purchase more than 800 ClearEdge5 (5 kW) fuel cell units.

U.S. companies are also entering agreements with other parts of the world. ClearEdge Power entered into a multi-phase $500 million agreement with Güssing Renewable Energy GmbH of Austria to deliver 8.5 MW of fuel cells to Güssing over 36 months, with the ultimate goal of 50 MW.

In December 2011, FCE signed a partnership agreement with Abengoa S.A. of Spain, to install a 300-kW unit at its headquarters in Seville, and to manufacture and market units targeting renewable biogas markets in Europe and Latin America. FCE also has a joint venture in Germany with Fraunhofer IKTS, creating a new company FuelCell Energy Solutions, GmbH, which recently sold its first 250-kW fuel cell system to BAM Deutschland AG for installation at the new Federal Ministry of Education and Research government complex in Berlin.

These partnerships aren't only for the stationary power market. With the U.S. being the undisputed champion in fuel cell-powered forklift deployments, other countries are looking to get in on the action. U.K.-based ITM Power, a supplier of electrolyzer-based hydrogen generation and refueling solutions, has signed an agreement with Infintium Fuel Cell Systems Inc. of Carrollton, Texas, to become its exclusive European distributor of fuel cell systems for materials handling equipment.

Latham, New York's Plug Power, the fuel cells materials handling market leader, has joined forces with Axane, an Air Liquide subsidiary, to create a joint venture in order to meet growing demand for its GenDrive® fuel cell products across the European forklift market. Initially, the GenDrive units would be manufactured at Plug Power's Latham headquarters and distributed through the sales and service channel provided by Axane, with the potential for European-based manufacturing at a later date.

State Profiles

Today, the United States is a world leader in fuel cell technology, with major companies headquartered across the country, a commanding lead in patents, and a record number of fuel cell forklifts deployed nationwide. When it comes to fuel cell technology, the U.S. is truly the sum of its parts – the states have led the way in research, deployments, and incentives, largely without a long-term national plan or stable federal funding.

The following section contains individual state profiles, detailing the latest fuel cell developments.[2] For each state, we have included the most recent installations and deployments - those implemented or announced since our last report of July 2011. Our new, "easy-read" state profiles also include icons to easily identify our summary sections, which include recent installations, policies, business, funding, and university/industry R&D within the states. You will find our Icon Key on the following page.

For more extensive descriptions of the policy, installations or demonstrations you find in the pages that follow, or to see where other active or decommissioned fuel cells once lived, please visit Fuel Cells 2000's State Fuel Cell and Hydrogen Database. You can also contact us at info@fuelcells.org for help connecting to industry and potential collaborators as well as for general fuel cell information. Please also refer to the Appendices for additional resources.

[2] Idaho and Iowa are not included in the profiles as we could find no recent hydrogen or fuel cell-related activity since our last report.

Icon Key

Fuel Cell Policy/Roadmaps – Includes all recent state legislation, policy, or roadmaps that focus on the deployment of hydrogen and fuel cells.

Funding Opportunities/Business Attraction – Includes funding, grants, or other incentives geared towards increasing fuel cell and hydrogen business, installations, or presence in the state

Stationary Power – Includes both large-scale (>200 kW) and small scale (5-100 kW) systems. Stationary power also encompasses fuel cell units used for telecommunications backup (1-20 kW). For telecommunications, we have included only the systems funded by ARRA or that are publicly disclosed.

Fuel Cell Forklifts – Includes materials handling vehicles being deployed at warehouses around the country. The U.S. is currently the world leader in fuel cell forklifts, with more than 4,000 units deployed and hundreds more on order.

Transportation – Includes fuel cell-powered automobiles, buses, trucks or other utility vehicles deployed, announced or funded in the last year.

Hydrogen Fueling – Includes hydrogen stations and dispensers that are being installed around the U.S. to fuel cars, buses, and forklifts powered by fuel cells. In some Transportation entries, the fueling information is included, rather than in a separate entry.

University Activity – All non-DOE funded activity or accolades from the past year.

DOE-Sponsored R&D – DOE funds numerous research and development projects at universities and companies throughout the U.S.

Alabama

Region: Gulf

Fuel Cell Forklifts
In July 2012, Mercedes Benz purchased and installed 72 Plug Power GenDrive® PEM fuel cell units to power forklifts at its Tuscaloosa vehicle production facility, replacing lead-acid battery units. The site also operates a 250-kW FuelCell Energy stationary fuel cell that was placed in service in 2000.

Transportation
The Birmingham-Jefferson County Transit Agency (BJCTA) will receive a fuel cell bus for a two-year demonstration, operating in regular transit service alongside the fleet of public buses. Air Liquide Industrial will supply the hydrogen fueling infrastructure.

DOE-Sponsored R&D
DOE efforts include fuel cell and hydrogen-related R&D projects at the University of Alabama, Tuscaloosa, and at Alabama-based companies, including CFD Research Corporation, and ESI US R&D.

Alaska

Region: Pacific

Stationary Power
In June 2012, a 1-kW Acumentrics propane-fueled PEM fuel cell was installed at the Exit Glacier Nature Center in Kenai Fjords National Park. The fuel cell will power all of the Center's electrical needs including lights, outlets, and other basic appliances. This is not the first fuel cell to be installed at the Nature Center – earlier versions of Acumentrics' fuel cells have operated at the Nature Center since 2003.

Arizona

Region: West

Stationary Power
AT&T has 18 telecom sites using fuel cells for backup power in Arizona.

DOE-Sponsored R&D
Arbsource of Tempe was recently awarded a Small Business Research and Development Grant to advance its biotechnology to generate hydrogen gas during the wastewater treatment process. Other DOE efforts include fuel cell and hydrogen-related R&D projects at Arizona State University, and at the University of Arizona.

Arkansas

Region: Mid-West

DOE-Sponsored R&D
DOE efforts include fuel cell and hydrogen-related R&D projects at the University of Arkansas, Little Rock.

California

Region: Pacific

A Top State for:

- Fuel Cell Vehicles
- Fuel Cell Buses
- Fuel Cell Forklifts
- H2 Fueling Stations
- Telecom Backup
- Stationary Systems (Installed & Planned)
- Fuel Cell Patents
- Fuel Cell Policies

Fuel Cell Roadmap

The California Fuel Cell Partnership has published a Roadmap detailing necessary hydrogen station deployments to support the emerging fuel cell vehicle market. Executive Order 6 (2012) also directs state agencies to support and facilitate the rapid commercialization of zero-emission vehicles with three specific milestones:

- 2015: Communities will be ready for plug-in and hydrogen vehicles and infrastructure
- 2020: California will have established adequate infrastructure to support one million zero-emission vehicles
- 2025: More than 1.5 million zero-emission vehicles will be on the road and the market continues to expand.

Stationary Power

In the past year, fuel cell manufacturers have sold more than 17 MW to customers in California, including big name corporations such as CBS (2.4 MW), AT&T (7.5 MW) and Kaiser Permanente (4 MW). Fuel cell manufacturer Bloom Energy, headquartered in Sunnyvale, has sold more than 26 MW in past year, with another 50 MW from Delmarva Power in Delaware planned in coming years. FuelCell Energy, a fuel cell manufacturer based in Danbury, Connecticut, has installed or sold more than 19 MW of fuel cells to utilities, wastewater treatment plants and universities in California.

ClearEdge Power has sold more than 100 kW of its ClearEdge5 fuel cell systems to customers in California in the past year, to provide power to customers such as Fresh & Easy for two supermarket sites and San Diego State University dormitories.

T-Mobile® installed an IdaTech ElectraGen™ ME Fuel Cell System on its network in California, and is using Bio-HydroPlus, a renewable fuel, to power the system.

Folsom-based Altergy Systems has more than 350 fuel cell systems installed in South Florida powering MetroPCS cellular phone and communications towers, as well as a system installed at Union Pacific Railroad's Stockton telecommunications facility. The company recently announced it has received an order for 1,000 of its 7.5-kW *Freedom Power* fuel cell systems to power a major upgrade to one of the nation's largest wireless telecom carriers.

Additionally, Sprint has 77 sites in California using fuel cells for backup power, and AT&T is doing the same at 43 sites in California.

Fuel Cell Forklifts

As is the case nationwide, companies in California are converting their battery-powered forklifts to fuel cell-powered forklifts at a rapid pace. In the past year, the following companies have announced new or additional orders of fuel cell forklifts:

- Coca-Cola – 37 fuel cell-powered forklifts and 19 pallet jacks at its bottling plants in San Leandro.
- Kroger – 161 Plug Power units for its Compton distribution center.
- Sysco – 80 Plug Power units for its Riverside distribution center.
- WinCo Foods – 184 Plug Power units for its Modesto distribution center.
- Proctor & Gamble has purchased 200 fuel cell forklifts for its warehouses in California, Louisiana, and North Carolina.

Transportation

Earlier this year, the Federal Transit Administration awarded $6.6 million to CALSTART, an alternative transportation consortium, for five projects to further the development of fuel cell buses.

Ballard Power Systems, BAE Systems and ElDorado National Inc., delivered a "Buy America"-compliant fuel cell bus to SunLine Transit Agency of Thousand Palms. SunLine now has three fuel cell buses in its fleet.

Vision Motor Corp. of Torrance delivered 100 Tyrano™ hydrogen fuel cell-electric class 8 heavy-duty trucks to Total Transportation Services, Inc. (TTSI) of Rancho Dominguez, with the potential for an additional three hundred trucks. The trucks are being deployed at the Ports of Long Beach and Los Angeles for demonstration and drayage testing. Vision also is joining with Cargotec USA on a fuel cell terminal tractor demonstration project to move containerized cargo within the two Port facilities.

There are currently 200 fuel cell passenger vehicles on the road in California. The California Fuel Cell Partnership estimates that there will be 53,000 FCEVs on the road in California in 2017.

Hydrogen Fueling

As of July 2012, there are eight public hydrogen fueling stations, and two more are slated to open soon. The state has committed $29 million to build more stations in advance of 2015 – the target date set by major automakers for the commercial launch of fuel cell electric vehicles.

The world's first tri-generation fuel cell and hydrogen energy station that will provide transportation fuel to the public and electric power to an industrial facility, was opened at the Orange County Sanitation District's (OCSD) wastewater treatment plant in Fountain Valley.

In April 2012, hydrogen supplier Linde opened a new fueling station at AC Transit's municipal bus operating division in Emeryville. The station is capable of fueling 12 fuel cell buses and 20 passenger vehicles per day.

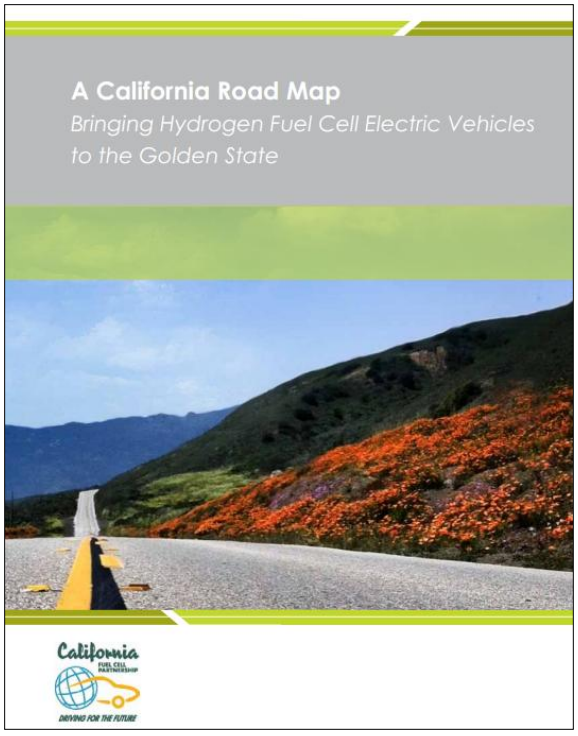
University Activity

San Diego State University was awarded $95,000 from the California Energy Commission to determine the feasibility of developing a system to transfer protons to make superior catalysts for conversion of water to oxygen. This project is part of developing a system for converting water to hydrogen fuel (and oxygen) using sunlight.

The California Institute of Technology (Caltech) was awarded $100,000 from the Gates Foundation for its "toilet of the future" that uses a solar panel to produce power for an electrochemical reactor that breaks down feces and urine into hydrogen gas, which can be stored in hydrogen fuel cells to provide a back-up energy source for night operation or use in low-sunlight conditions.

DOE-Sponsored R&D

DOE efforts include fuel cell and hydrogen-related R&D projects at Lawrence Livermore National Laboratory, Lawrence Berkeley National Laboratory, NASA's Jet Propulsion Laboratory, Stanford University, California State University at Los Angeles, Humboldt State University, and the University of California (Berkeley, Davis, and Irvine campuses), and at California-based companies, including Altergy Systems, Electricore, Jadoo Power, Honeywell Aerospace, and Oorja Protonics.



Colorado

Region: West

Stationary Power

Cheyenne Mountain Air Force Station was one of eight military sites selected under a DOD/DOE joint project, the PEM Fuel Cell Backup Demonstration Program. The base deployed three ReliOn fuel cells (4 kW, 8 kW and 12 kW) to provide emergency backup power to a 911 Call Center, ensuring that computers, lighting, and telecom equipment will retain power during grid outages.

AT&T has 7 telecom sites in Colorado using fuel cells for backup power.

Transportation

Ball Aerospace & Technologies Corporation, based in Boulder, will work with UTC Aerospace Systems and UTC Power to develop an air independent PEM fuel cell power system for an undersea vehicle for the Office of Naval Research.

DOE -Sponsored R&D

DOE efforts include fuel cell and hydrogen-related R&D projects at the National Renewable Energy Laboratory, Colorado School of Mines, and University of Colorado, and at Colorado-based companies, including MVSystems, Synkera Technologies, BekkTech, Versa Power Systems, FP2 Fire Protection Engineering, MorEvents, National Conference of State Legislatures, Allegiance Consulting, Alumni Consulting, TDA Research, and Front Range Wireless.

Connecticut

Region: Northeast

A Top State for:
- Fuel Cell Vehicles
- Fuel Cell Patents
- Fuel Cell Buses
- Stationary Power (Installed & Planned)

Fuel Cell Roadmap

The Connecticut Hydrogen and Fuel Cell Deployment Plan was published in 2012, developed by the Northeast Electrochemical Energy Storage Cluster (NEESC), with funding provided by DOE and the Small Business Administration (SBA). The report states that:

- There is the potential to generate 938,000 megawatt-hours (MWh) of electricity each year through the development of 119-158 MW of fuel cell generating capacity.
- There are approximately 600 companies in the state that are involved in the hydrogen and fuel cell supply chain. Eight of these companies are original equipment manufacturers (OEMs) of hydrogen and/or fuel cell systems, and were responsible for supplying 1,074 direct jobs and $254 million in direct revenue and investment in 2010.

Funding Opportunities

Connecticut's Alpha Program, administered by the state's Clean Energy Finance and Investment Authority (CEFIA), offers funding of up to $200,000 per project for early-stage clean energy technology development. Eligible projects can be full systems, system components or manufacturing innovations in technology areas, and include fuel cells and hydrogen production.

Stationary Power

Since our last report, there have been several fuel cell installations in Connecticut including:

- Whole Foods (Fairfield) – 400 kW fuel cell from UTC Power (this is the second Whole Foods in the state using fuel cell power)
- CTTransit (Hartford) – 400 kW fuel cell from UTC Power
- University of Connecticut Depot Campus – 400 kW UTC Power fuel cell
- Central Connecticut State University (New Britain) – 1.4 MW FuelCell Energy fuel cell (the largest fuel cell operating on any college campus in northeast)
- Eastern Connecticut State University (Willimantic) – 400 kW fuel cell from UTC Power
- St. Francis Hospital (Hartford) – 400 kW fuel cell from UTC Power (this is the hospital's second fuel cell; the first was installed in 2003)
- New Haven City Hall – 400 kW fuel cell from UTC Power

Sprint has 32 telecom sites in Connecticut that use fuel cells for backup power.

Transportation

In early April 2012, the U.S Department of Transportation (DOT) and FTA announced a $3.3 million grant for CTTransit – the statewide bus system – to deploy a next generation hydrogen fuel cell bus for its Hartford-area fleet. The bus is expected to begin service by the end of 2013. CT Transit currently operates five fuel cell buses around the state and is pursuing two more including this one. By the end of 2013, the state is expected to have seven fuel cell buses in operation.

UTC Aerospace Systems and UTC Power will work with Ball Aerospace & Technologies Corporation to develop an air independent PEM fuel cell power system for an undersea vehicle for the Office of Naval Research.

Hydrogen Fueling

In 2012, Connecticut's Proton OnSite installed its hydrogen refueling equipment in three hydrogen fueling stations, including an automobile fueling station in Freiburg, Germany and a bus fueling station at the Flint Mass Transportation Authority in Flint, Michigan. The same electrolyzer fuels the military's fleet of fuel cell vehicles on the historic Joint Base Pearl Harbor/Hickam in Hawaii.

University Activity

Connecticut's universities have been both innovators and early adopters of fuel cell technology. In the past year, large stationary fuel cell systems have been planned or installed at the following campuses:

- University of Connecticut (UConn) Depot campus – a 400 kW UTC Power fuel cell provides electricity and heat to research labs and offices on campus.
- Western Connecticut State University (WCSU) – UTC Power will install a 400 kW fuel cell by the end of the year, and which will provide 100% of the electrical and hot water needs of the university's new science building.
- Central Connecticut State University (CCSU) – a 1.4 MW FuelCell Energy system was installed in early July. The fuel cell system provides one third of the energy needed to run the entire campus.

Earlier this year, researchers at UConn's Center for Clean Energy Engineering were recognized for developing a fuel cell manufacturing process that uses 10 times less catalyst material.

DOE-Sponsored R&D

DOE efforts include fuel cell and hydrogen-related R&D projects at the University of Connecticut and Worcester Polytechnic Institute, and at Connecticut-based companies, including FuelCell Energy, United Technologies Research Center, and Proton OnSite.

Delaware

Region: Mid-Atlantic

A Top State for:
- Fuel Cell Buses
- Stationary Power (Planned)
- Fuel Cell Policies

Business Attraction

Through the efforts of state authorities and legislators, Delaware was successful in its bid to bring fuel cell manufacturer, Bloom Energy, to the state. Bloom will build its new, East Coast fuel cell manufacturing facility in Newark, creating up to 1,500 new fuel cell related jobs, and will provide as much as 50 MW of fuel cell generating capacity to the Delmarva electric grid. The state is already home to Dupont Fuel Cells, Gore Fuel Cell Technologies, and Ion Power.

Stationary Power

Regional energy provider, Delmarva Power, plans to add up to 50 MW of Bloom Energy fuel cells to its power system. This will include 3 MW (15 Bloom Energy Servers) located at its Brookside electric substation, and up to 47 MW (235 Bloom Energy Servers) at the Red Lion Energy Center that will be connected to the PJM electrical grid. The Red Lion project will be built in phases, with the first phase comprised of 27 MW of capacity, and the second phase an additional 20 MW.

Transportation

The University of Delaware operates two fuel cell buses. Three additional fuel cell buses are planned.

DOE-Sponsored R&D

DOE efforts include fuel cell and hydrogen-related R&D projects at the University of Delaware and Delaware State University, and at Delaware-based companies, including E.I. du Pont de Nemours and Company, and Ion Power.

Florida

Region: Gulf

A Top State for:
- Telecom Backup Power

Business Attraction

Since 2004, Florida has designated hydrogen as a Qualified Target Industry (QTI), meaning financial incentives are available to companies that create jobs in the hydrogen supply chain throughout the state. In 2011, Bing Energy received a $1.9 million QTI tax refund after relocating to the state from California and has already hired 16 employees.

Cella Energy, a UK-based company specializing in hydrogen storage technologies, received a $1 million investment from Space Florida (part of a larger investment) that allowed Cella to expand to the U.S. and become an early tenant at Exploration Park, a research center now under construction at NASA Kennedy Space Center. Cella recently entered a cooperative research agreement with NASA, called a Space Act Agreement, which runs five years and can be extended.

Stationary Power

Metro PCS, a wireless telecommunications provider, installed 356 Altergy Systems fuel cell units at 140 sites in South Florida in 2011. The units provide backup power to telecommunications relays across the southern coast of Florida during grid outages caused by hurricanes and other extreme weather events. The Metro PCS installation is the largest of its kind, and is delivering reliable, high quality power and benefits. Metro PCS reported that the combined system is saving the company time and money; maintenance costs for the company's generators were $1,024 per site in 2010, while those for the fuel cells were $571 per site – a savings of roughly 55%.

AT&T has one site using fuel cells for backup power.

DOE-Sponsored R&D

DOE efforts include fuel cell and hydrogen-related R&D projects at the University of Central Florida, University of North Florida, University of Florida, University of South Florida, and Florida Institute of Technology, and at Florida-based companies, including Bing Energy, Enerfuel, SRT Group, Addison Bain, BetaCom, and United Commercial Real Estate Services, Inc.

Georgia

Region: South

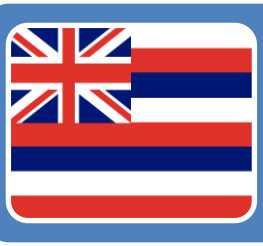
Transportation

The Center for Transportation and the Environment (CTE) in Atlanta was appointed to manage several National Fuel Cell Bus Program research projects, including international outreach and communications, technology development and enhancement, and full-scale fuel cell bus demonstrations.

CTE recently completed a successful 12-month operational demonstration of two extended range fuel cell utility vehicles at the Defense Distribution Depot Warner Robins, Georgia.

DOE-Sponsored R&D

DOE efforts include fuel cell and hydrogen-related R&D projects at the University of Georgia, and at the Georgia Institute of Technology's Georgia Tech Research Corporation.



Hawaii

Region: Pacific

A Top State for:
- Fuel Cell Vehicles
- Fuel Cell Buses

Funding Opportunities

Hawaii's Hydrogen Investment Capital Special Fund was established in 2006 to provide seed capital for and venture capital investments in hydrogen initiatives. This includes both private and public sector projects for research, development, testing, and program implementation of fuel cells.

Transportation

The U.S. Army Pacific unveiled the world's first military fleet of FCEVs – 16 General Motors Equinox FCEVs for real-world evaluation at Fort Shafter.

Hydrogenics Corporation has received orders for five HyPM™ HD Series fuel cell power modules from US Hybrid of Torrance, California, to be used in a dump truck, a step van and several buses for a variety of end users in Hawaii. The vehicles are part of a government funded program managed by the High Technology Development Corporation's Hawaii Center for Advanced Transportation Technologies.

FTA recently awarded Hawai'i Volcanoes National Park a research and development grant of $989,000 to test the feasibility and performance of a hybrid battery/hydrogen-fueled shuttle system.

H2 Technologies, a Hawaii-based company, is working with Taiwan fuel cell manufacturer Asia Pacific Fuel Cell Technologies to deploy fuel cell scooters in Hawaii.

Hydrogen Fueling

Proton OnSite was awarded a purchase order from HydraFLX Systems Ltd. to install a FuelGen® C30 proton exchange membrane electrolyzer to generate hydrogen at the Joint Base Pearl Harbor-Hickam (JBPHH) facility outside Honolulu. The station is being upgraded in cooperation with the Hawaii Center for Advanced Transportation Technologies (HCATT) and the Air Force Research Laboratory.

DOE-Funded R&D

DOE efforts include fuel cell and hydrogen-related R&D projects at the University of Hawaii in Honolulu. The Hawaii Natural Energy Institute of the University of Hawaii at Manoa is also involved with several DOE projects including fuel cell durability and the Hawaii Hydrogen Power Park. The Power Park is supporting the testing and validation of hydrogen fueling system technologies on the Big Island of Hawaii and Oahu.

Illinois

Region: Mid-West

A Top State for:
- Fuel Cell Forklifts

Stationary Power
AT&T has two sites using fuel cells to back up telecom sites in Illinois.

Transportation
Under the FTA's Fuel Cell Bus Program, the Chicago Transit Authority (CTA) will demonstrate a fuel cell bus in public transit service in 2013.

Fuel Cell Forklifts
There are several facilities in Illinois using fuel cell-powered forklifts, including Central Grocers, which has 234 running (from two separate purchases), Golden State Foods and Testa Produce.

Hydrogen Fueling
The City of Naperville, Illinois, opened its new "Green Fuels Depot" gasifier facility, located at the City's Springbrook Waste Facility, which converts wood chips from the City's yard waste into three fuels: electricity, hydrogen, and ethanol. The fuels will be used for the City's vehicle fleet and other municipal uses.

DOE-Sponsored R&D
DOE efforts include fuel cell and hydrogen-related R&D projects at the University of Illinois at Urbana-Champaign, Northwestern University, the University of Chicago, Illinois Institute of Technology, Southern Illinois University, Carbondale, and Argonne National Laboratory, and at Illinois-based companies, including Gas Technology Institute, Orion Industries, and RCF Economic and Financial Consulting.

Indiana

Region: Mid-West

Fuel Cell & Hydrogen Policy
Indiana enacted the Clean Energy Portfolio Standard (CPS) which sets a voluntary goal of 10% clean energy by 2025, based on 2010 levels. Fifty percent of qualifying energy obtained by Indiana utilities participating in the CPS must come from within the state. Fuel cell and hydrogen technologies are eligible. Only public utilities may participate in the program.

Business Attraction
Italy-based Genport SRL, a manufacturer of high-energy electric generators and batteries, will invest in a $2 million North American headquarters at Purdue Research Park in West Lafayette. The plant will house the company's hybrid fuel cell research.

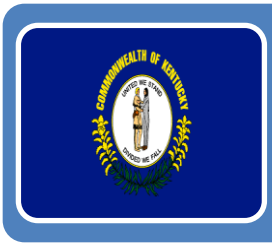
Stationary Power
AT&T has 19 telecom sites using fuel cells for backup power in Indiana.

DOE-Sponsored R&D
DOE efforts include fuel cell and hydrogen-related R&D projects at Purdue University and with Indiana-based businesses, including Fortune Wireless.

Kansas

Region: Mid-West

DOE-Sponsored R&D
DOE efforts include fuel cell and hydrogen-related R&D projects at Kansas-based businesses, including Black & Veatch Corporation and Ericsson Services, Inc.



Kentucky

Region: South

Stationary Power
AT&T has 17 telecom sites using fuel cells for backup power in Kentucky.

Louisiana

Region: Gulf

Stationary Power
Sprint has 12 telecom sites using fuel cells for backup power in Louisiana.

Fuel Cell Forklifts
The Procter & Gamble Company is converting its battery-operated forklift fleets at three facilities to ones powered with hydrogen fuel cells, including one in Pinesville. The first three sites will see more than 200 forklifts powered with hydrogen fuel cells.

Maine

Region: New England

Fuel Cell Roadmap

The Maine Hydrogen and Fuel Cell Deployment Plan was published in 2012, developed by the Northeast Electrochemical Energy Storage Cluster (NEESC), with funding provided by DOE and the Small Business Administration (SBA). The report states that:

- There is the potential to generate 473,000 MWh of power in Maine annually through the development of 58-77 MW of fuel cell generation capacity.
- The state is home to at least 28 companies that are part of the Northeast hydrogen and fuel cell supply chain. These companies have realized about $2 million in revenue and investment, contributed more than $13,000 in state and local revenue, and generated more than $2.9 million in gross state product from their participation in the regional energy cluster during 2011.

Maryland

Region: Mid-Atlantic

Stationary Power

Eight fuel cells (43 kW total capacity) were deployed at the U.S. Army's Aberdeen Proving Grounds under the DOD/DOE PEM Fuel Cell Backup Demonstration Program.

University Activity

University of Maryland (UMD) students recently received several fuel cell-related honors. The Grand Prize for the Hydrogen Education Foundation's 2012 Hydrogen Student Design Contest was awarded to UMD. Participating universities were required to design a tri-generation system that produces electricity, heat, and hydrogen for their university campus. UMD's concept included the use of organic and municipal solid waste, via gasification, and anaerobic digestion technology, which would be used to provide the campus with electricity and heating, and fuel for 20 buses. In addition, a UMD Clark School of Engineering graduate student was awarded a 2012-2013 Achievement Rewards for College Scientists (ARCS) Hesse Endowment Fellowship for his proposal to improve the fuel flexibility of low-temperature SOFCs.

DOE-Sponsored R&D

DOE efforts include fuel cell and hydrogen-related R&D projects at Johns Hopkins University, the University of Maryland, and the National Institute of Standards and Technology, and at Maryland-based businesses, including Energetics, W. L. Gore & Associates, and General Physics Corporation.

Massachusetts

Region: New England

Fuel Cell Roadmap

A Massachusetts Hydrogen and Fuel Cell Deployment Plan was published in 2012, developed by the Northeast Electrochemical Energy Storage Cluster (NEESC), with funding provided by DOE and the Small Business Administration (SBA). The report states that:

- There is the potential to generate 2.38 million MWh of power in Massachusetts annually through the development of 301-401 MW of fuel cell generation capacity.
- The state is home to more than 300 companies that are part of the Northeast hydrogen and fuel cell supply chain. These companies have realized about $171 million in revenue and investment, contributed more than $9.8 million in state and local revenue, and generated more than $147 million in gross state product from their participation in the regional energy cluster during 2010. Nine of these companies are fuel cell or hydrogen system OEMs supplying 346 direct jobs and $59.4 million in direct revenue and investment in 2010.

Fuel Cell Forklifts

Sysco has converted its entire Boston warehouse facility forklift fleet to run using hydrogen-powered fuel cells (170 in total).

Transportation

Nuvera Fuel Cells, based in Billerica, was awarded a $4.875 million grant from the Federal Transit Authority (FTA) through the Northeast Advanced Vehicle Consortium (NAVC) for a hydrogen fuel cell bus and refueling demonstration project at Logan International Airport. Nuvera will provide an 82-kW fuel cell power module for integration into a Massachusetts Port Authority (Massport) shuttle bus. Additionally, Nuvera is providing a Powertap™ hydrogen generation system to provide an on-site hydrogen infrastructure to the fuel cell bus.

DOE-Sponsored R&D

DOE efforts include fuel cell and hydrogen-related R&D projects at Massachusetts Institute of Technology, Boston University, and Northeastern University, and at Massachusetts-based businesses, including Giner Electrochemical Systems, LLC, Concepts NREC, PoroGen, LLC, Kidde-Fenwal, TIAX, LLC, Nuvera Fuel Cells, Tech-Etch, Ballard Material Products, Nuvera Fuel Cells, Protonex, Acumentrics Corporation, Firexplo, Ameresco, and Energy Insights.

Michigan

Region: Mid-West

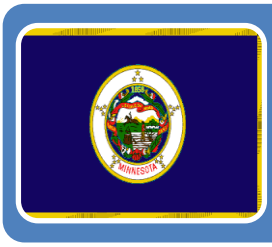
A Top State for:
- Fuel Cell Vehicles
- Telecom Backup Power
- Fuel Cell Patents

Stationary Power
AT&T has 59 telecom sites using fuel cells for backup power in Michigan.

Transportation
The Mass Transportation Authority in Flint is leasing a hydrogen fuel cell bus from UTC Power. The transportation utility will test the vehicle on different routes and report the data back to UTC. Air Products provided the hydrogen station for the bus.

DOE-Sponsored R&D
DOE efforts include fuel cell and hydrogen-related R&D projects at Kettering University, Michigan State University, Michigan Technological University, University of Detroit Mercy, and University of Michigan, and at Michigan-based businesses, including Delphi Automotive Systems, DTE Energy, Ford, General Motors, NextEnergy, Nissan Technical Center, Ovonic Hydrogen Systems, SAE International, Sloane Solutions, and Telecom, Tower and Power, LLC.

DOE also awarded $2 million to Eaton Corporation to develop an efficient and low cost air management system by leveraging their roots blower advancements.



Minnesota

Region: Mid-West

Fuel Cell & Hydrogen Policy
Under Minnesota's 2011 Model Sustainability Plan, state agencies should reduce dependence on petroleum based fuels used in transportation. One suggested method is by increasing the use of renewable transportation fuels derived from agricultural products, including ethanol, biodiesel fuel, hydrogen fuels, and fuels derived from waste products.

DOE-Sponsored R&D
DOE efforts include fuel cell and hydrogen-related R&D projects at the University of Minnesota, and at Minnesota-based businesses, including Entegris and the Toro Company.

St. Paul-based fuel cell component supplier 3M has several awards for advanced catalyst and membrane research projects – in March 2012, 3M received a $3 million grant from DOE to develop a membrane electrode assembly by integrating state-of-the-art components in order to improve the performance and lower the overall cost of the fuel cell system.

Mississippi

Region: Gulf

Stationary Power
Sprint has two telecom sites using fuel cells for backup power in Mississippi.

DOE-Sponsored R&D
DOE efforts include fuel cell and hydrogen-related R&D projects at the University of Southern Mississippi.

Missouri

Region: Mid-West

Fuel Cell Forklifts

In 2010, FedEx received ARRA funding to convert its entire 35-strong forklift fleet at its Springfield facility to fuel cell power. FedEx later decided to purchase an additional five fuel cells (without any DOE funding) to increase the fleet, for a total of 40 fuel cell-powered forklift units currently operating at this facility.

DOE-Sponsored R&D

DOE efforts include fuel cell and hydrogen-related R&D projects at the University of Missouri and the Midwest Research Institute.

Montana

Region: West

Fuel Cell Roadmap

The Benchmarking and Best Practices Center of Excellence (B2PCOE), managed by ACI Technologies, recently completed the Manufacturing Fuel Cell Manufacturing Manhattan Project (MFCMP). Utilizing experts from industry, government, and academia, the B2PCOE, in conjunction with Montana Tech of The University of Montana (MTT) determined the major fuel cell manufacturing cost drivers, gaps, and best practices. As a result, the subject matter experts produced a roadmap to address the various manufacturing issues that were important for the cost reduction of fuel cells to the Navy and DOD.

Transportation

The 2012 ecoDemonstrator program, a partnership between Boeing, American Airlines, and the U.S. Federal Aviation Administration (FAA), will use a Next-Generation 737-800 aircraft as a flying test bed for advanced environmental technologies that reduce fuel consumption and community noise. A regenerative fuel cell is one of the technologies being tested, to provide electricity for airplane systems and for energy storage during periods of low electrical demand. The ecoDemonstrator aircraft will undergo a month of intense flight testing in Montana.

Nebraska

Region: Mid-West

A Top State for:
- Stationary Power (Installed)

DOE-Sponsored R&D
DOE efforts include fuel cell and hydrogen-related R&D projects at the University of Nebraska, Omaha, and at Nebraska-based companies, including Lincoln Composites and Vertical Horizons Contracting.

Nevada

Region: West

A Top State for:
- H2 Fueling Stations

Hydrogen Fueling
H2 Technologies Group announced it will build a hydrogen station in Carson City in the next year that will be able to fuel up to 80 cars per day. The company is receiving a $1.1 million loan from the state of Nevada for the station.

DOE-Sponsored R&D
DOE efforts include fuel cell and hydrogen-related R&D projects at the University of Nevada, Las Vegas and the University of Nevada, Reno.

New Hampshire

Region: New England

Fuel Cell Roadmap

The New Hampshire Hydrogen and Fuel Cell Deployment Plan was published in 2012, developed by the Northeast Electrochemical Energy Storage Cluster (NEESC), with funding provided by DOE and the Small Business Administration (SBA). The report states that:

- There is the potential to generate 378,000 MWh of power in New Hampshire annually through the development of 48-64 MW of fuel cell generation capacity.
- The state is home to at least 25 companies that are part of the Northeast hydrogen and fuel cell supply chain. These companies have realized about $6 million in revenue and investment, contributed more than $337,000 in state and local revenue, and generated more than $8.5 million in gross state product from their participation in the regional energy cluster during 2011.

State Fuel Cell Funding

In February 2012, the New Hampshire Public Utilities Commission (PUC) issued a Request for Proposals (RFP) for funding of thermal or electric renewable energy projects located in New Hampshire. Projects must utilize grant funds primarily for capital investments in new renewable energy facilities, upgrades to existing facilities to increase renewable energy production, or upgrades to existing renewable energy facilities that will qualify them as a "renewable source" for the production of NH Renewable Energy Certificates. Renewable energy includes hydrogen derived from biomass fuels or methane gas. Projects must be in the nonresidential sector in New Hampshire. Total funding available under the RFP is $1 million.

New Jersey

Region: Mid-Atlantic

A Top State for:
- Telecom Backup Power

Fuel Cell Roadmap

The New Jersey Hydrogen and Fuel Cell Deployment Plan was published in 2012, developed by the Northeast Electrochemical Energy Storage Cluster (NEESC), with funding provided by DOE and the Small Business Administration (SBA). The report states that:

- There is the potential to generate 2.30 million MWh of power in New Jersey annually through the development of 292-390 MW of fuel cell generation capacity.
- The state is home to at least 8 companies that are part of the Northeast hydrogen and fuel cell supply chain. These companies have realized about $26.5 million in revenue and investment, contributed more than $1 million in state and local revenue, and generated more than $18.6 million in gross state product from their participation in the regional energy cluster during 2011.

State Fuel Cell Funding

The New Jersey Economic Development Authority (EDA) and the New Jersey Board of Public Utilities (BPU) launched the Large Scale Combined Heat and Power (CHP) and Fuel Cell Grant Program. The state will be providing up to $55 million in grants to encourage CHP and fuel cell installations to encourage energy savings.

Stationary Power

Sprint has 45 telecom sites using fuel cells for backup power in New Jersey.

Fuel Cell Forklifts

193 fuel cell forklifts are now operating at Wakefern Food Corp/Newark Farmer's Market. Air Liquide provides the hydrogen to fuel the vehicles.

DOE-Sponsored R&D

DOE efforts include fuel cell and hydrogen-related R&D projects at Princeton and at Rutgers University, and at New Jersey-based companies, including BASF Fuel Cells, TreadStone Technologies, and Linde North America.

New Mexico

Region: West

Stationary Power

A fuel cell system will be part of an onsite hybrid microgrid at the Mesa Del Sol planned community in Albuquerque. The onsite Smart Grid hybrid system features an 80-kW fuel cell operating alongside a 50-kW solar PV system, a 240-kW natural gas-powered generator and a 160 kW/hr battery storage system. Project partners include Japan's New Energy and Industrial Technology Development Organization (NEDO) which invested $22 million in the system, as well as PNM Prosperity Energy Storage Project, Sandia National Laboratories, the University of New Mexico, and nine major Japanese companies. The Smart Grid system will power the community's 78,000-sq. ft. Aperture Center, which will draw up to 400 kW of peak power.

DOE-Sponsored R&D

DOE efforts include fuel cell and hydrogen-related R&D projects at Los Alamos National Laboratory, Sandia National Laboratories, and the University of New Mexico.

New York

Region: Mid-Atlantic

A Top State for:
- Fuel Cell Vehicles
- H2 Fueling Stations
- Telecom Backup
- Stationary Power (Installed & Planned)
- Fuel Cell Patents
- Fuel Cell Policies

Fuel Cell Roadmap

The New York Hydrogen and Fuel Cell Deployment Plan was published in 2012, developed by the Northeast Electrochemical Energy Storage Cluster (NEESC), with funding provided by DOE and the Small Business Administration (SBA). The report states that:

- There is the potential to generate approximately 3.89 million MWh of electricity each year through the development of 494-659 MW of fuel cell generation capacity.
- New York has more than 180 companies that are part of the hydrogen and fuel cell industry supply chain in the Northeast. Eight of these companies are OEMs of hydrogen and/or fuel cell systems, and were responsible for supplying 808 direct jobs and $119 million in direct revenue and investment in 2010.

Funding Opportunities

The New York State Energy Research & Development Authority (NYSERDA) offers incentives for the purchase, installation, and operation of customer-sited tier fuel cell systems used for electricity production. Large systems (>25 kW) and small systems (up to 25 kW) are eligible for up to $1 million. Performance and bonus capacity incentives also offered to small and large fuel cell systems.

Stationary Power

UTC Power installed a PureCell 400 fuel cell at Beacon Capital Partners, LLC's 1211 Avenue of the Americas building in New York City to provide News Corporation, the building's major tenant, a significant portion of its electricity for TV studios and its hot water needs. This fuel cell installation was made possible through a NYSERDA grant.

Sprint has 63 telecom sites using fuel cells for backup power in New York.

Fuel Cell Forklifts

Baldor Specialty Foods, one of the largest importers and distributors of fresh produce and specialty foods in the Northeast, installed 50 Oorja Protonics OorjaPac direct methanol fuel cell (DMFC) systems to its fleet of battery operated materials handling equipment at its 180,000 sq. ft. Bronx facility.

Sysco is deploying 42 fuel cell-powered forklifts at its Long Island distribution center.

Plug Power, based in Latham, controls more than 85% of the fuel cell market in the materials handling industry with major sales and customers and is now partnering with Axane, an Air Liquide subsidiary, to better penetrate the European forklift market. Under the partnership, Plug Power will continue manufacturing in Latham and Axane will provide sales and distribution support.

Hydrogen Fueling

The Town of Hempstead in Long Island boasts a state-of-the-art hydrogen fueling station at the Conservation and Waterways Department in Point Lookout that incorporates a 100-kW wind turbine that is capable of generating up to 180 megawatts of power per year. The hydrogen generated is used to power Toyota fuel cell vehicles operated by the town, as well as a hydrogen/natural gas bus.

DOE-Sponsored R&D

DOE efforts include fuel cell and hydrogen-related R&D projects at Brookhaven National Laboratory (BNL). Researchers at BNL recently won one of only 100 awards given out this year by R&D Magazine for the most outstanding technology developments with promising commercial potential. DOE-sponsored R&D projects are also under way at several New York universities, including the Rochester Institute for Technology, Stony Brook University, and Rochester University, and at New York-based companies, including Plug Power, H2Pump, LLC, and Pall Corporation.

North Carolina

A Top State for:
- Stationary Power (Planned)

Region: South

Stationary Power
For its new Maiden data center, Apple plans to install 4.8 MW of fuel cells that will be powered 100% by biogas. The fuel cells will work with 200 MW of solar PV panels to provide 60% of the power needed to run the data center. Apple will register the renewable energy generated by the solar arrays and fuel cell installation with the North Carolina Renewable Energy Tracking System (NC-RETS) established by the North Carolina Utilities Commission.

Fuel Cell Forklifts
The Procter & Gamble Company is converting its battery-operated forklift fleets at three facilities to ones powered with hydrogen fuel cells, including one in North Carolina. The first three sites will see over 200 forklifts powered with hydrogen fuel cells.

DOE-Sponsored R&D
DOE efforts include fuel cell and hydrogen-related R&D projects at the University of North Carolina.

North Dakota

Region: Mid-West

DOE-Sponsored R&D
DOE efforts include fuel cell and hydrogen-related R&D projects at the University of North Dakota.

Ohio

Region: Great Lakes

A Top State for:
- Stationary Power (Installed)
- Fuel Cell Policies

Fuel Cell Roadmap

NorTech Energy Enterprise created a Fuel Cell Roadmap for Ohio that catalogs current fuel cell assets; identifies the subsectors where the region has a strong position; quantifies the growth potential of those subsectors over the next seven years; and finally, assesses the region's competitive position compared to other regions and states across the country. The roadmap quantified credible market growth opportunities, which could have the potential to create 1,650 new direct jobs in Ohio's fuel cell industry by 2019.

Business Attraction

In 2006, Ohio was successful in attracting Rolls Royce Fuel Cell Systems, which established its North American headquarters at Stark State College of Technology's Fuel Cell Prototyping Center in North Canton. In June 2012, Rolls Royce sold a 51% interest in the fuel cell company to the Korean conglomerate, LG, and has renamed the company LG Fuel Cell Systems.

Two Ohio companies, Lockheed Martin and Technology Management Inc. (TMI) were recently awarded a $3 million contract from the Office of Naval Research to incorporate solar panels with solid oxide fuel cells to provide portable power for electronics and equipment in the field.

Stationary Power

The U.S. Army National Guard site in Columbus is one of eight military sites selected under a DOD/DOE joint project to demonstrate fuel cells, under the PEM Fuel Cell Backup Demonstration Program. Four fuel cell units are located at the Command Headquarters and one fuel cell is at the Civil Support Administration.

American Electric Power installed a 1-kW fuel cell at its technology center in 2011.

Transportation

Two fuel cell buses will be heading to Ohio. The EcoSaver IV Hybrid Electric fuel cell bus will be deployed in a 24-month demonstration at The Ohio State University (Columbus), and Cleveland's Regional Transit Authority will operate a fuel cell bus in partnership with the NASA Glenn Research Center, which will be fueled using hydrogen generated by electrolysis.

DOE-Sponsored R&D

DOE efforts include fuel cell and hydrogen-related R&D projects at the University of Cincinnati, Ohio State University, University of Toledo, Case Western Reserve University, Wright State University, University of Akron, and Stark State College of Technology.

Oklahoma

Region: Mid-West

DOE-Sponsored R&D
DOE efforts include fuel cell and hydrogen-related R&D projects at the University of Oklahoma.

Oregon

Region: Pacific

Stationary Power
Portland Community College in Sylvania installed two fuel cells totaling 10 kW from ClearEdge Power, a fuel cell manufacturer based in Hillsboro. Pacific Northwest National Laboratory will analyze the technical, economic and environmental performance of the two systems during the next several years.

Since our last report, ClearEdge has sold more than 100 kW of fuel cell systems, mostly to customers in California.

Bend fuel cell manufacturer IdaTech (recently purchased by Ballard Power Systems) introduced its ElectraGen™ ME fuel cell system that can run off of Bio-HydroPlus, a renewable fuel. T-Mobile® installed the first system on its network in California. An ElectraGen™ ME provided power to a Base Transceiver Site (BTS) that supplied cellular phone coverage during the United Nations Climate Change Conference (COP 17) that took place last winter in Durban, South Africa. The company also provided fuel cells for the DOD/DOE PEM Fuel Cell Backup Demonstration Program.

DOE-Sponsored R&D
DOE efforts include fuel cell and hydrogen-related R&D projects at Oregon State University, the University of Oregon, and at Oregon-based companies, including ATI Wah Chang, and IdaTech.

Pennsylvania

A Top State for:
- Fuel Cell Forklifts

Region: Mid-Atlantic

Stationary Power

In 2011, the Society of Cable Telecommunications Engineers (Exton) installed a CommScope fuel cell system (which uses a Hydrogenics fuel cell) to supply 64 hours of backup power to the facility. The 19.7-kW hybrid power system combines the CommScope fuel cell with a 2.8-kW grid interactive solar array and 20-hour runtime storage batteries. This system will provide redundant power for disaster recovery and offset utility costs using renewable energy.

Hydrogen Fueling

Air Products and Chemicals, headquartered in Allentown, is helping bring the hydrogen to fuel cell cars, buses and forklifts around the world. Most recently, the company has provided fueling equipment to stations and dispensers in Flint, Michigan, Hempstead, New York, and London, England. Overall, the company has placed over 150 hydrogen fueling stations in the United States and 19 countries worldwide.

Warminster-based PDC Machines is playing a major role in the hydrogen infrastructure, providing hydrogen compressors to many of the dispensers and fueling stations being built around the world, including recent ones at Coca-Cola, the Orange County Sanitation District (OCSD), and in Holstebro, Denmark. The company started as a one-man enterprise in a garage and now has 54 employees occupying two facilities and more than 50,000 square feet of manufacturing space.

DOE-Sponsored R&D

DOE efforts include fuel cell and hydrogen-related R&D projects at Pennsylvania State University, University of Pennsylvania, Lehigh University, and the University of Pittsburgh, and at Pennsylvania-based companies, including Power & Energy, Media and Process Technology, Schott North America, Air Products and Chemicals, GENCO Infrastructure Solutions, Bethlehem Hydrogen, SAE International, Dynalene, and Arkema.

Rhode Island

Region: New England

Fuel Cell Roadmap

A Rhode Island Hydrogen and Fuel Cell Deployment Plan was published in 2012, developed by the Northeast Electrochemical Energy Storage Cluster (NEESC), with funding provided by DOE and the Small Business Administration (SBA). The report states that:

- There is the potential to generate 341,000 MWh of power in Rhode Island annually through the development of 40-54 MW of fuel cell generation capacity.
- The state is home to at least 15 companies that are part of the Northeast hydrogen and fuel cell supply chain. These companies have realized about $5 million in revenue and investment, contributed more than $264,000 in state and local revenue, and generated more than $6.9 million in gross state product from their participation in the regional energy cluster during 2010.

Renewable Portfolio Standard

In 2011, Rhode Island established a feed-in tariff for distributed renewable energy generation, for which fuel cells are eligible. Power companies must purchase an aggregate 40 MW or more of clean power generation by the end of 2014.

DOE-Sponsored R&D

DOE efforts include fuel cell and hydrogen-related R&D projects at Brown University.

South Carolina

Region: South

A Top State for:
- Fuel Cell Forklifts
- H2 Fueling Stations
- Fuel Cell Policies

Business Attraction

Aiken County's 60,000-sq. ft. Center for Hydrogen Research, which opened in 2006, is receiving a $3 million, 6,435-sq. ft. expansion and will be renamed the Applied Research Center. The facility houses the Savannah River National Laboratory's 24,400-sq. ft. Hydrogen Technology Research Laboratory. The expansion will be privately funded, via a $3,000,000 expenditure authorized by the board of directors of Savannah River Nuclear Solutions (SRNS).

LOGANEnergy opened a new business unit at Midlands Technical College's (MTC) Enterprise Campus in Columbia.

Fuel Cell Forklifts

BMW recently purchased additional fuel cells to power its material handling vehicles at its Spartanburg manufacturing facility, bringing the total number there to more than 230.

Hydrogen Fueling

BMW also announced plans to launch a $1 million multi-phase project aimed at converting some of the methane it collects from Waste Management's Palmetto Landfill in Wellford into hydrogen.

University Activity

The University of South Carolina and City of Columbia collaborative announced the launch of the fifth Fuel Cell Challenge in June 2012. The program awards grants to student teams who devise innovative ways to commercialize hydrogen fuel cell technology, and allows members of the industry to submit a challenge to university members who are interested in solving it.

DOE-Sponsored R&D

DOE efforts include fuel cell and hydrogen-related R&D projects at the University of South Carolina, Clemson University, and Savannah River National Laboratory, and the South Carolina Hydrogen and Fuel Cell Alliance, and at South Carolina-based companies, including John Deere.

South Dakota

Region: Mid-West

DOE-Sponsored R&D
DOE efforts include fuel cell and hydrogen-related R&D projects at the University of South Dakota, and South Dakota School of Mines and Technology.

Tennessee

Region: South

Transportation
A Generation III Georgetown University fuel cell bus will be demonstrated in revenue operations in Chattanooga.

DOE-Sponsored R&D
DOE efforts include fuel cell and hydrogen-related R&D projects at the University of Tennessee, Vanderbilt University, and Oak Ridge National Laboratory, and at Tennessee-based companies, including Eastman Chemical Co.

Texas

Region: South

A Top State for:
- Fuel Cell Buses
- Fuel Cell Forklifts
- Fuel Cell Patents

Business Attraction

U.K.-based ITM Power, a supplier of electrolyzer-based hydrogen generation and refueling solutions, has signed an agreement with Infintium Fuel Cell Systems Inc. of Carrollton to become its exclusive European distributor of fuel cell systems for materials handling equipment.

Stationary Power

As part of the DOD/DOE PEM Fuel Cell Backup Demonstration Program, three units totaling 19 kW were installed at Fort Hood to power a wastewater treatment plant.

Sprint has 29 telecom sites using fuel cells for backup power in Texas.

Fuel Cell Forklifts

Sysco has expanded its fuel cell forklift fleet in Texas beyond Houston (98) and deployed 113 at Sysco San Antonio.

Transportation

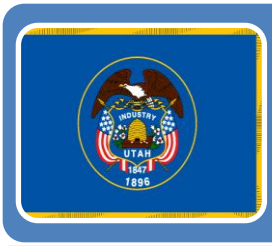
The Center for Transportation and the Environment (CTE) and its project team delivered a Proterra fuel cell-powered bus to Austin to join Capital Metro's fleet in daily transit service operation. The Proterra fuel cell bus, which was previously operated in Columbia, South Carolina in 2010, is unique in that it was purpose built from the ground up as a zero emission bus, unlike most fuel cell buses, which are retrofitted using a standard diesel bus chassis.

University Activity

University of Texas at Austin-Center for Electromechanics (UT-CEM) worked with Gas Technology Institute (GTI), Hydrogenics, and Columbia ParCar, on a new hybrid fuel cell utility vehicle that was developed for DOD. The vehicle features an 8.5-kW hydrogen fuel cell, hydrogen storage, and ultracapacitors for load leveling and range extension to achieve a demonstrated driving range of more than 300 miles.

DOE-Sponsored R&D

DOE efforts include fuel cell and hydrogen-related R&D projects at the University of Texas at Austin, Texas A&M University, and Southwest Research Institute, and at Texas-based companies, including BCS Fuel Cells, and Sysco of Houston.



Utah

Region: West

A Top State for:
- Stationary Power (Planned)

Stationary Power
Online auction giant eBay has announced that its new flagship data center in South Jordan will be powered by 30 Bloom Energy fuel cells totaling 6 MW of power, the largest non-utility installation in the country.

AT&T has 11 telecom sites using fuel cells for backup power in Utah.

DOE-Sponsored R&D
DOE efforts include fuel cell and hydrogen-related R&D projects at Utah-based companies, including HyPerComp Engineering MegaStir Technologies, and Big-D Construction.

Vermont

Region: New England

Fuel Cell Roadmap
A Vermont Hydrogen and Fuel Cell Deployment Plan was published in 2012, developed by the Northeast Electrochemical Energy Storage Cluster (NEESC), with funding provided by DOE and the Small Business Administration (SBA). The report states that:

- There is the potential to generate 94,600 MWh of power in Vermont annually through the development of 12-16 MW of fuel cell generation capacity.
- The state is home to at least five companies that are part of the Northeast hydrogen and fuel cell supply chain. These companies have realized about $2.5 million in revenue and investment, contributed more than $142,000 in state and local revenue, and generated more than $3.3 million in gross state product from their participation in the regional energy cluster during 2011.

Comprehensive Energy Plan
Vermont's Comprehensive Energy Plan (2011) includes several recommendations to assess, introduce and utilize fuel cells in vehicles and stationary power.

Virginia

Region: South

Stationary Fuel Cells

In 2011, Washington Gas installed a 200-kW Bloom Energy fuel cell system at its Springfield site, operating round-the-clock to provide approximately 35% of the Washington Gas baseload power needs for the entire facility.

Fuel Cell Forklifts

Sysco Corporation now operates 112 fuel cell-powered materials handling vehicles at its Northeast Regional Distribution Center located in Front Royal.

Stihl Inc. has ordered Plug Power GenDrive fuel cells for forklift use at its site in Norfolk, Virginia. The deployment will serve as a benchmark for future conversions to fuel cell-powered forklifts at the company's European facilities.

DOE-Sponsored R&D

DOE efforts include fuel cell and hydrogen-related R&D projects at Virginia Polytechnic Institute and State University and James Madison University, and at Virginia-based companies, including Directed Technologies.

Washington

A Top State for:
- Fuel Cell Buses

Region: Pacific

Stationary Power
ReliOn, a fuel cell manufacturer based in Spokane, has 4.3 MW of fuel cells installed at more than 1,400 sites serving customers in 42 U.S. states and 34 countries. Recently, Alpha Energy is integrating a ReliOn E-2500™ fuel cell system into its state-of-the-art Hybrid Power System (HPS) Test Facility in Bellingham.

Fuel Cell Bus and Forklifts, Hydrogen Fueling
At Joint Base Lewis-McChord (Fort Lewis), hydrogen is being generated onsite using digester gas (methane) as a byproduct at the installation's wastewater treatment plant. The hydrogen is used to fuel 19 fuel new cell-powered forklifts that are being used at a base warehouse, and a fuel cell hybrid shuttle bus that transports staff around Ft. Lewis and between Ft. Lewis and McChord AFB.

DOE-Sponsored R&D
DOE efforts include fuel cell and hydrogen-related R&D projects at the University of Washington, Washington State University, and Pacific Northwest National Laboratory, and at Washington-based companies, including ReliOn, Boeing, Prometheus Energy, and Innovatek.

West Virginia

Region: South

Funding Opportunities
In 2011, West Virginia made available new Alternative Fuel Vehicle (AFV) and AFV Infrastructure Tax Credits. The credits, which include hydrogen, are available through 2021.

Hydrogen Fueling
West Virginia University's National Alternative Fuels Training Consortium will build a hydrogen fueling station in Morgantown. The project is funded with a $1.15 million grant from the U.S. Department of Energy.

DOE-Sponsored R&D
DOE efforts include fuel cell and hydrogen-related R&D projects at West Virginia University.

Wisconsin

Region: Mid-West

University Activity
In June 2012, University of Wisconsin-Milwaukee researchers announced that they had identified a fuel cell catalyst that offers the same level of efficiency in microbial fuel cells as a platinum catalyst, but at just 5% of the cost.

DOE-Sponsored R&D
DOE efforts include fuel cell and hydrogen-related R&D projects at the University of Wisconsin, Madison.

Wyoming

Region: West

University Activity
A University of Wyoming chemistry student received the Nielson Excellence Fellowship in Energy Studies for the 2012-13 academic year for her research on producing a catalyst that creates the best way to use hydrogen as a substitute for fossil fuels.

DOE-Sponsored R&D
DOE efforts include fuel cell and hydrogen-related R&D projects at the University of Wyoming.

Appendix 1 – Additional Resources

Fuel Cells 2000

Fuel Cells 2000 is a non-profit education and outreach program of the Breakthrough Technologies Institute and offers numerous resources on its website, www.fuelcells.org for any audience.

In addition to the basics such as how a fuel cell works, markets, benefits, Fuel Cell Library and a free monthly industry newsletter, the website includes:

- State Fuel Cell and Hydrogen Database, which includes all U.S. fuel cell installations, vehicle demonstrations, hydrogen fueling stations and state legislation and policies.
- Comprehensive charts, including Fuel Cell Vehicles, Fuel Cell Forklifts, Specialty Vehicles, Fuel Cell Buses, Worldwide Hydrogen Fueling Stations and Fuel Cell Equity and Investment
- A searchable "Fuel Cell Top 200" directory of the most active companies in the fuel cell industry.
- Links to other resources mentioned in this report, such as regional, state and international organizations and alliances and financing information.

Database of State Incentives for Renewables & Efficiency

DSIRE is a comprehensive source of information on state, local, utility and federal incentives and policies that promote renewable energy and energy efficiency. Established in 1995 and funded by the U.S. Department of Energy (DOE), DSIRE is an ongoing project of the N.C. Solar Center and the Interstate Renewable Energy Council. www.dsireusa.org

State and Regional Fuel Cell and Hydrogen Associations/Coalitions

California Fuel Cell Partnership – www.cafcp.org
California Hydrogen Business Council - www.californiahydrogen.org
California Stationary Fuel Cell Collaborative - www.casfcc.org
CT Hydrogen-Fuel Cell Coalition - www.chfcc.org
Fuel Cell and Hydrogen Energy Association – www.fchea.org
Ohio Fuel Cell Coalition - www.fuelcellcorridor.com
South Carolina Hydrogen and Fuel Cell Alliance - www.schydrogen.org

DOE Efficiency and Renewable Energy Fuel Cell Technologies Program

The DOE Fuel Cell Technologies Program conducts comprehensive efforts to overcome the technological, economic, and institutional obstacles to the widespread commercialization of fuel cells and related technologies.
http://www1.eere.energy.gov/hydrogenandfuelcells

For more information about any of the information included in this report, please contact Fuel Cells 2000 at info@fuelcells.org.

Appendix 2 – Fuel Cell Customers in the U.S.

(Mobile and Stationary Applications)

Major Companies Are Purchasing Fuel Cells…

Ace Hardware
Adobe
Albertsons Supermarket
Apple
ASHTA Chemicals
AT&T
Baldor Specialty Foods
Bank of America
Becton Dickinson (BD)
BMW
Bridgestone-Firestone
Cabela's Sporting Goods
Carla's Pasta
Cache Creek Casino Resort
CBS
Cellcom
Central Grocers
Chevron
Coca-Cola
Cox Communications
CVS
Diversey
EARP Distribution
East Penn Manufacturing Co.
eBay
FedEx
Fireman's Fund
First National Bank of Omaha
Fresh & Easy
Fujitsu
Gills Onions
Golden State Foods
Google
Guaranty Savings & Loan
Hartford Life
H-E-B
Hilton Hotels
Inland Cold Storage
Kaiser Permanente
Kimberly-Clark
Kroger
Lafayette Hotel
Lowe's
Martin-Brower
Mercedes-Benz
MetroPCS
Napa Wine Company
NBCUniversal
Nestlé Waters
News Corp.
NTT Communications
Odwalla
Owens Corning
Pepperidge Farm
Pratt & Whitney
Price Chopper
Proctor & Gamble
Safeway
Sierra Nevada
Shark's Ice
Sheraton
Sprint Nextel
Staples
Star Market
Stone Edge Farm
Stop & Shop
Super Store Industries (SSI)
Sutter Home Family Vineyards
Sysco
Testa Produce
The Palace Hotel
Time-Warner Cable
T-Mobile
Union Pacific Railroad
United Natural Foods Inc. (UNFI)
United Parcel Service (UPS)
Universal Studios Hollywood
US Foodservice
Verizon
Virgin Airways
Wakefern Food Corp.
Walmart
Wegmans
Westin Hotels
Whole Foods Market
WinCo

State and Local Governments Also Recognize the Value of Fuel Cells…

City of Columbia Radio Network (SC)
Dublin San Ramon Services District Regional Wastewater Treatment Facility (CA)
East Anaheim Police Department/Community Center (CA)
Eastern Municipal Water District – Moreno Valley & Perris Valley Regional Water Reclamation Facilities (CA)
Fairfield Water Pollution Control Authority (CT)
Hartford Public Safety Complex (CT)
New Haven City Hall and Hall of Records (CT)
New Haven Water Pollution Control Authority (CT)
New York City – Central Park Police Precinct (NY)
New York City – City Hall (NY)
New York Power Authority Office Building (NY)

New York Power Authority – 26th Street, Hunt's Point, Oakwood Beach, & Red Hook Water Pollution Control Plants (NY)
Orange County Sanitation District – Fountain Valley Wastewater Treatment Plant (CA)
Perry B. Duryea, Jr. State Office Building (NY)
Point Loma Wastewater Treatment Plant (CA)
Port Authority of New York and New Jersey – Freedom Tower (NY)
Rialto Wastewater Treatment Plant (CA)
Riverside Water Quality Control Plant (CA)
San Jose/Santa Clara Water Pollution Control Plant (CA)
Santa Rita Jail (CA)
Sonoma County Administration Building (CA)
Sonoma County Water Agency (CA)
South Bay Water Reclamation Plant (CA)
Suffolk State Office Building (NY)
Tulare Wastewater Treatment Plant (CA)
Turlock Wastewater Treatment Plant (CA)

Stationary and Mobile Fuel Cells Are Operating or Planned at Schools, Utilities, Hospitals, Museums, Federal Agencies, and Transit Agencies…

Universities/Colleges/Schools:
California Institute of Technology
California State University
Central Connecticut State University
East Rochester Elementary School (NY)
Hamden High School (CT)
Liverpool High School (NY)
Middletown High School (CT)
Pasadena City College (CA)
Portland Community College (OR)
Roberto Clemente Leadership Academy & Hill Central School (CT)
San Diego State University (CA)
San Francisco State University (CA)
South Windsor High School (CT)
State University of New York (NY)
Union College (NY)
University of California
University of Connecticut
University of Delaware
University of South Carolina
Western Connecticut State University
Woodbridge High School (CA)
Yale University (CT)

***Utilities/Power Generation*:**
American Electric Power (OH)
Delmarva Power (DE)
Dominion Power (VA)
Edgecombe-Martin Electric Membership Cooperative (NC)
Electric Power Board (TN)
FirstEnergy Corp. (OH)
Inland Empire Utilities Agency (CA)
NextEra Energy Resources (CA)
Pepco (MD)
Pacific Gas & Electric (PG&E) (CA)
Piedmont Electric Membership Cooperative (NC)
Southern California Gas (CA)
Washington Gas (VA)

***Hospitals*:**
Stamford Hospital (CT)
St. Francis Hospital (CT)
St. Helena Hospital (CA)
Waterbury Hospital (CT)

***Museums/Zoos/Conservatories/Science Centers*:**
Bronx Zoo (NY)
Chewonki Center for Environmental Education (ME)
Connecticut Science Center
Henry Doorly Zoo (NE)
New York Aquarium
Phipps Conservatory and Botanical Garden (PA)
Yale Peabody Museum (CT)

Federal Agencies:

Argonne National Laboratory/U.S. Department of Energy
Defense Logistics Agency/U.S. Department of Defense
Federal Aviation Agency/U.S. Department of Transportation
NASA
National Park Service/U.S. Department of the Interior
U.S. Air Force
U.S. Army
U.S. Marine Corps
U.S. Navy

Transit Agencies/Shuttle Operators:

AC Transit (CA)
Birmingham-Jefferson County Transit Authority (AL)
BurbankBus (CA)
Capital Metro (TX)
Chicago Transit Authority (IL)
CTTransit (CT)
Greater Cleveland Regional Transit Authority (OH)
Marin Transit (CA)
Massachusetts Port Authority
Ohio State University
Santa Clara Valley Transportation Authority (CA)
SunLine Transit (CA)
University of Delaware

This list is not a comprehensive list of U.S. fuel cell installations. To learn more about these fuel cells and others, please visit Fuel Cells 2000's free, searchable State Fuel Cell and Hydrogen Database (http://www.fuelcells.org/fuel-cell-databases).

Appendix 3 – 2011 Policy Activity WrapUp

This wrap-up includes 2011 legislation and policy only. Visit Fuel Cells 2000's free searchable State Fuel Cell and Hydrogen database at http://www.fuelcells.org for a comprehensive compilation of all state fuel cell and hydrogen policies, initiatives and incentives as well as stationary fuel cell installations, fuel cell vehicle demonstrations and hydrogen fueling stations.

CALIFORNIA

Clean Energy Update Program – Assembly Bill 14 (2011) requires California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA) to administer a Clean Energy Upgrade Program to be developed by the State Energy Resources Conservation and Development Commission. The Program will reduce overall costs to the property owners of a loan provided by an applicant to finance the installation of distributed generation renewable energy sources, electric vehicle charging infrastructure, or energy or water efficiency improvements on real property, by providing a reserve or other financial assistance. Instead of direct subsidies to property owners, the program will provide a reserve or other credit enhancements to qualified lenders, in order to decrease risk for lenders and reduce interest rates for borrowers. Improvements financed by the program are for residential projects of three units or fewer or a commercial project that costs less $25,000 in total.

In addition, AB 14 amends the definitions of "renewable energy" and "advanced transportation technologies" in the Public Resources Code:

- "Renewable energy" means a device or technology that conserves or produces heat, processes heat, space heating, water heating, steam, space cooling, refrigeration, mechanical energy, electricity, or energy in any form convertible to these uses, that does not expend or use conventional energy fuels. This definition includes ultra low-emission equipment for energy generation based on thermal energy systems such as natural gas turbines and fuel cells.
- "Advanced transportation technologies" means emerging commercially competitive transportation-related technologies identified by the authority as capable of creating long-term, high value-added jobs for Californians while enhancing the state's commitment to energy conservation, pollution reduction, and transportation efficiency. In the definition, advanced transportation technologies include fuel cells.

Clean Technology and Renewable Energy Job Training – Senate Bill 148 (2011) calls for the creation of partnership academies that will lead to the creation of good paying jobs in industries and businesses that are in compliance with the state's environmental protection laws and regulations. It will also prepare young people to work in clean technology businesses or renewable energy businesses, and provide skilled workforces for the products and services for energy or water conservation, renewable energy, pollution reduction, or other technologies that improve the environment in furtherance of state environmental laws. The definition of "renewable energy business" includes the installation, repair, maintenance, or related activities necessary to produce energy from wind, photovoltaic, solar thermal, geothermal, biomass, including cellulosic ethanol, biodiesel, and biomass power, green waste, and fuel cells.

Renewable Auction Mechanism (RAM) – RAM is a simplified and market-based procurement mechanism for renewable distributed generation (DG) projects up to 20 MW on the system side of the meter. RAM streamlines the procurement process for developers, utilities, and regulators, allowing

bidders to set their own price, providing a simple standard contract for each utility, and allowing all projects to be submitted to the CPUC through an expedited regulatory review process. To begin the program, the California Public Utilities Commission (CPUC) authorized utilities to procure 1,000 MW through RAM. Fuel cells using renewable fuels are eligible.

Self-Generation Incentive Program (SGIP) – Initiated in 2001, SGIP offers incentives to customers generating their own electricity. Technologies that achieve reductions of greenhouse gas (GHG) emissions are eligible for the program, including wind turbines, fuel cells, organic rankine cycle/waste heat capture, pressure reduction turbines, advanced energy storage, and CHP gas turbines, micro-turbines, and internal combustion engines. Participants receive up-front and performance-based incentives. These incentives apply only to the portion of the generation that serves a project's on-site electric load. Set to expire at the end of 2011, CPUC approved a proposed decision implementing various program changes required by SB 412, allowing incentives to be available through the end of 2015.

CONNECTICUT

Alpha Program – Launched in March 2011 by the Connecticut Clean Energy Fund (which became part of the newly created Clean Energy Finance and Investment Authority in July 2011)**,** the Alpha Program funds development and testing of emerging clean energy technologies to establish their technical viability and commercial potential. Companies undertaking early-stage clean energy technology development can apply for funding of up to $200,000 per project. Eligible projects can be full systems, system components or manufacturing innovations in technology areas, and include fuel cells and hydrogen production.

Connecticut Hydrogen and Fuel Cell Deployment Transportation Strategy: 2011-2050 – In accordance with Public Act 09-186, the Connecticut Department of Transportation (ConnDOT) and the Connecticut Center for Advanced Technology, Inc. (CCAT) submitted to the joint standing committees of the General Assembly a strategic plan entitled, *"Connecticut Hydrogen and Fuel Cell Deployment Transportation Strategy: 2011-2050."* Information in the Plan suggests that a transition to a hydrogen economy and deployment of zero-emission, hydrogen fuel cell buses state-wide will increase transportation efficiency, improve environmental performance, increase economic development, and create new jobs. The technical and financial arrangements needed for transition from conventional vehicles and bus fleets will require initial investment by the state and federal government and private industry; however, the report indicates that this investment is well justified and will become a necessity as concerns about public health and climate change increase, and the supply of conventional fuels becomes more limited. In addition, the report suggests that there are many specific locations for hydrogen refueling stations along state highways or at locations that could potentially be utilized by state fleets or other public or private-sector fleets.

Local Option to Exempt Building Permit Fees for Renewable Energy Projects – Connecticut has authorized municipalities to pass a local ordinance to exempt "Class I" renewable energy projects from paying building permit fees. Class I renewable energy projects include energy derived fuel cells using renewable or non-renewable fuels. Emissions limits apply to electricity generated by sustainable biomass facilities.

DELAWARE

Delaware-made fuel cells eligible for state's Renewable Portfolio Standard – Senate Bill 124, passed in June 2011, permits energy from Delaware-manufactured fuel cells to meet part of Delmarva Power's renewable energy production requirements. The fuel cells must be capable of being powered by renewable fuels.

INDIANA

Clean Energy Portfolio Standard (CPS) – The Standard sets a voluntary goal of 10% clean energy by 2025, based on 2010 levels. Fifty percent of qualifying energy obtained by Indiana utilities participating in the CPS must come from within the state. Fuel cell and hydrogen technologies are eligible. Only public utilities may participate in the program.

MINNESOTA

Strengthening State Agency Environmental, Energy and Transportation Sustainability – Executive Order 11-13 (2011) requires state departments and agencies to develop sustainability goals, programs and policies that reduce greenhouse gas emissions and reduce petroleum consumption by state vehicles. Under the Act's "Model" Sustainability Plan, state agencies should reduce dependence on petroleum based fuels used in transportation. One suggested method is by increasing the use of renewable transportation fuels derived from agricultural products, including ethanol, biodiesel fuel, and hydrogen fuels, and fuels derived from waste products.

MISSOURI

Motor Vehicle Emissions Inspection Program Exemption – Under House Bill No. 354, vehicles powered exclusively by electric or hydrogen power, or by fuels other than gasoline, are exempted from motor vehicle emissions inspection.

Renewable Energy Generation Zone Property Tax Abatement – As of August 2011, local areas can be designated as Renewable Energy Generation Zones and receive property tax abatements as part of the Enhanced Enterprise Zone program. An eligible business must be located in a Missouri Enhanced Enterprise Zone (EEZ). Individual business eligibility will be determined by the zone, based on creation of sustainable jobs in a targeted industry or demonstrated impact on local industry cluster development. Targeted industries include the renewably-powered fuel cell industry.

NEVADA

Alternative Fuel Vehicle HOV Lane and Parking Fee Exemptions – Assembly Bill No. 511 (2011) requires that, with limited exceptions, each local authority establish a parking program for qualified alternative fuel vehicle, permitting the vehicle to park without the payment of a parking fee at certain times in certain public parking lots, parking areas and metered parking zones. The bill also authorizes the use of a qualified alternative fuel vehicle in high-occupancy vehicle lanes irrespective of the occupancy of the vehicle, if the Department of Transportation has adopted the necessary regulations. The Bill defines the term "qualified alternative fuel vehicle" to include both plug-in vehicles powered by an electric motor, and vehicles which are powered by an alternative fuel and meet specified federal emissions standards.

The definition of “Qualified alternative fuel” is defined to mean hydrogen, compressed natural gas, or propane.

NEW JERSEY

Edison Innovation Green Growth Fund – The Fund offers loans up to $1 million with a performance grant component to support technology companies with Class I renewable energy or energy efficiency products or systems that have achieved "proof of concept" and successful independent beta results, have begun generating commercial revenues, and will receive 1:1 match funding by time of loan closing. Companies working on renewably-powered fuel cells are eligible.

NEW YORK

Alternative Fuel Tax Exemption and Rate Reduction – E85, compressed natural gas, and hydrogen fuel that is used exclusively to operate a motor vehicle engine is exempt from state sales and use taxes.

New York State Energy Research and Development Authority (NYSERDA) fuel cell funding – NYSERDA has announced an incentive program for businesses, hospitals or other large power consumers interested in installing fuel cells that will provide as much as $21.6 million through 2015. The program provides an incentive toward the cost of fuel cell installation, plus payments over the first three years of operation based on power produced. Companies can collect a total payment of up to $1 million for fuel cells, based on the size of the project. The program is funded under the state’s Renewable Portfolio Standard (RPS), which is administered by NYSERDA using funds collected from utility ratepayers. Funding is available to New York ratepayers who pay the RPS charge, but is primarily intended for businesses, government facilities, apartment complexes or other large enterprises. Extra incentives are available to sites that serve a public benefit, such as hospitals, police stations or disaster shelters.

OHIO

2011 Long-Term Renewable Energy Credits – The Cleveland Electric Illuminating Company, Ohio Edison Company and The Toledo Edison Company (FirstEnergy Ohio Utilities) are soliciting proposals for long term contracts for Renewable Energy Credits (RECs) in compliance with the state’s renewable energy resource requirements. Navigant Consulting Inc is administering the Request for Proposals (RFP), establishing the right to purchase from qualified proposers 20,000 RECs in each calendar year beginning in 2011 through 2020 from Public Utilities Commission of Ohio (PUCO)-certified (or eligible to be PUCO certified), non-solar, renewable energy resource generating facilities within the State of Ohio. No energy or capacity will be purchased under the RFP. Ohio’s definition of “advanced energy resource” includes any fuel cell used in the generation of electricity, including, but not limited to, a proton exchange membrane fuel cell, phosphoric acid fuel cell, molten carbonate fuel cell, or solid oxide fuel cell.

Alternative Fuel Transportation Grant Program – The program funds up to 80% of the cost of purchasing and installing fueling facilities offering E85 and fuel blends containing at least 20% biodiesel. As of July 2011, the program adds natural gas, liquefied petroleum gas or propane, hydrogen, electricity, and any fuel that the U.S. Department of Energy determines, by final rule, to be substantially not petroleum. The Program also funds up to 80% of the incremental cost of purchasing and using alternative fuel for businesses, public school systems and local governments.

OREGON

Alternative Fuel Vehicle (AFV) and Fueling Infrastructure Tax Credit – Under Oregon's Residential Energy Tax Credit Program, qualified residents can receive tax credits for purchasing new alternative fuel vehicles, converting vehicles to operate on an alternative fuel, and the purchase of alternative fuel infrastructure. Tax credits can be claimed for both a vehicle and fueling infrastructure. Although the AFV credit expired at the end of 2011, the fueling infrastructure credit is available through 2017. Qualified alternative fuels include hydrogen.

RHODE ISLAND

Distributed Generation Standard Contracts Act – The Act establishes a feed-in tariff for new distributed renewable energy generators up to 5 MW, requiring electric distribution companies to enter into standard contracts for an aggregate capacity of 40 MW or more by the end of 2014. Standard contracts include a fixed payment rate and a 15-year term. Eligible renewables include fuel cells using renewable resources.

TEXAS

Alternative Fueling Facilities Program – The Program will help to provide fueling facilities for alternative fuel in nonattainment areas by providing a grant for each eligible facility to offset the cost of those facilities. An entity that constructs, reconstructs, or acquires an alternative fueling facility is eligible to participate in the program. The definition of alternative fuel under the program includes hydrogen.

VERMONT

Comprehensive Energy Plan 2011 – In Volume 2, "Facts, Analysis, and Recommendations," the report makes the following fuel cell-related recommendations:

Vehicles: To meet Vermont's climate change goals and lower transport-related petroleum consumption, clean vehicles - such as hybrid-electric, electric, cleaner internal combustion engines and fuel cell vehicles - must be introduced more rapidly in the state. The report urges development of policies to address infrastructure needs and provision of incentives for early purchasers.

Stationary Power: The Department of Public Service (DPS) is required to prepare a 20-year electrical energy plan for the state, which must include an assessment of all energy resources available to the state for electrical generation or to supply electrical power, including fuel cells. Vermont also supports the development of Distributed Utility Planning and encourages utilities to consider all available technologies to meet customer demand in the most efficient and cost-effective way, including the use of fuel cells.

VIRGINIA

State Vehicles to be fueled with alternative fuels – A 2011 Executive Order requires the state to develop a plan to fuel government vehicles with alternative fuels. The fleet – 10,000 strong – could be fueled by hydrogen, propane, biofuels, electricity or natural gas. A determination of the "best available path" for the state fleet is due by May 2012.

WEST VIRGINIA

Alternative Fuel Vehicle (AFV) and AFV Infrastructure Tax Credits – Eligible taxpayers that convert a vehicle to operate exclusively on an alternative fuel, or purchase a new original equipment manufacturer dedicated or bi-fuel AFV, are eligible for tax credits. Qualifying alternative fuel vehicles may use hydrogen fuel. A tax credit may be taken for 35% of the vehicle purchase price, or 50% of the vehicle conversion cost, up to $7,500 for vehicles with a gross vehicle weight rating (GVWR) up to 26,000 lbs. and up to $25,000 for vehicles with a GVWR greater than or equal to 26,000 lbs.

A tax credit is also available for the construction, or purchase and installation, of qualified alternative fueling infrastructure. A credit may be taken for 50% of the total allowable costs associated with construction or purchase and installation of the equipment, with a maximum of $250,000. Qualified home fueling infrastructure is eligible for the 50% credit, up to $10,000. If the infrastructure is accessible for public use, the credit will be multiplied by 1.25, with a maximum amount $312,500. The maximum tax credit allowed will decrease to $200,000 in 2014 and to $150,000 in 2016. Qualified alternative fuels include hydrogen. The tax credits will expire at the end of 2021.

Appendix 4 – U.S. Department of Defense/Department of Energy Backup Power PEM Fuel Cell Project Recipients

Facility	State	Total Power	Individual Units	Providing Backup Power to:
NASA Ames Research Center	CA	12 kW	ReliOn T-2000 12 kW	Wind Tunnel Facility Control Room
U.S. Marine Corps Air Ground Combat Center 29 Palms	CA	4 kW	ReliOn T-2000 4 kW	Internet Switch
Cheyenne Mountain Air Force Base	CO	24 kW	3 ReliOn T-2000s (4 kW, 8 kW, and 12 kW)	911 Call Center
U.S. Army Aberdeen Proving Ground	MD	43 kW	3 IdaTech ElectraGen 5s (a) 4 IdaTech ElectraGen 5s (b) 1 ReliOn T-2000 8 kW (c)	a. Energy Management Building b. Range Control and Coordination building c. DPW Conservation Branch
U.S. Army Picatinny Arsenal	NJ	20 kW	2 IdaTech ElectraGen 5s	Two Separate Sewage Lift Pumps
The U.S. Military Academy at West Point	NY	40 kW	2 Altergy Systems' FPS -20s	Internet Switch and Internet Service and Telecom Closet
U.S. Army Fort Bragg	NC	15 kW	3 IdaTech ElectraGen 5s	Training Range Control Building
U.S. Army National Guard	OH	40 kW	4 IdaTech ElectraGen 5s 1 Hydrogenics HyPM Rack 20	Command Headquarters Civil Support Administration
U.S. Army Fort Hood	TX	19 kW	1 ReliOn T-2000 8 kW 1 ReliOn T-1000 1.2 kW 1 Altergy Systems' FPS-10	Wastewater Pretreatment Plant

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Appendix 5 – Fuel Cell-Powered Forklifts in North America

Blue Shaded Entries = Entire Materials Handling Fleet is Fuel Cell-Powered at This Location

Company	Location	Site	Year Deployed	Fuel cell manufacturer*	# of forklifts
Ace Hardware	Sacramento, CA	Warehouse	2008	Plug Power	6
Baldor Specialty Foods	Bronx, NY	Facility	2012	Oorja Protonics	50
BMW Manufacturing Co.	Spartanburg, SC	Manufacturing plant	2010, additional units purchased 2012	Plug Power	230+
Bridgestone-Firestone	Aiken County, SC	Manufacturing plant	2008, more added in 2009	Plug Power	43
	Warren County, TN	Manufacturing plant	N/a	Plug Power	N/a
Central Grocers	Joliet, IL	New distribution center	2009, more added in 2011	Plug Power	234
Coca-Cola	San Leandro, CA	Bottling and distribution center	2011 – 27 forklifts, 19 pallet jacks	Plug Power	56
	Charlotte, NC	Bottling facility	2011, ARRA funding awarded to GENCO	Plug Power	40
CVS Caremark	Chemung, NY	Distribution facility	Planned (under construction)	N/a	N/a
	North Smithfield, RI	Distribution facility	N/a	N/a	N/a
Defense Logistics Agency, U.S. Department of Defense	San Joaquin, CA	Distribution depot	Planned	Plug Power	20
	Fort Lewis, WA	Distribution depot	Planned	Plug Power	19
	Warner Robins, GA	Distribution depot	2010	Hydrogenics	20
	Susquehanna, PA	Distribution depot	2009, additional units in 2010	Nuvera, Plug Power	40, 15 additional
EARP Distribution	Kansas City, KS	Distribution center	2011	Oorja Protonics	24
East Penn Manufacturing	Topton, PA	Manufacturing facility	N/a	Nuvera	10
FedEx	Springfield, MO	Service center	2010, ARRA funding awarded to FedEx Freight East	Plug Power	40
	Toronto, ON, Canada	Logistics hub	N/a	Hydrogenics	N/a
GM	Oshawa, ON, Canada	Car assembly plant	N/a	Hydrogenics	19
	Oshawa, ON, Canada	Car assembly plant	2005	Hydrogenics	2
Golden State Foods	Lemont, IL	Distribution facility	2011	Oorja Protonics	20
H-E-B	San Antonio, TX	Perishables distribution center	2009, ARRA funding awarded to Nuvera	Nuvera	14
ISOLA Laminates	Ridgeway, SC	Warehouse	2007, 2-week demonstration	Hydrogenics	2*
Kimberly-Clark/GENCO	Graniteville, SC	Distribution center	2010, ARRA funding awarded to GENCO	Plug Power	25
	Graniteville, SC	Distribution center	GENCO operating a fuel cell forklift pilot program	N/a	2*
Kroger Co.	Compton, CA	Distribution Center	Purchased 2011	Plug Power	161
Leigh Fibers	Spartanburg, SC	Warehouse	2007, 2-week demonstration	Hydrogenics	2*
Lowe's	Rome, GA	Distribution center	Planned for 2013	Plug Power	N/a
LPC	Lodi, CA	Warehouse	2009	Oorja Protonics	N/a ("entire fleet")
Martin-Brower	Stockton, CA	Food distribution Center	2010, 2011 add-on order converted entire Stockton pallet jack fleet	Oorja Protonics	15, 2nd order -N/a
Mercedes-Benz	Tuscaloosa, AL	Automotive plant	2012	Plug Power	72
Michelin	Columbia, SC	Manufacturing plant	2007, 2-week demonstration	Hydrogenics	2*
Nestlé Waters	Dallas, TX	Bottling facility	2009	Plug Power	32

Company	Location	Site	Year Deployed	Fuel cell manufacturer*	# of forklifts
New United Motor Manufacturing, Inc. (NUMMI)	Fremont, CA	Manufacturing plant	2007	Oorja Protonics	N/a
Nissan North America	Smyrna, TN	Assembly plant	Purchase in 2009, 18-month field trial beforehand	Oorja Protonics	60
	Smyrna, TN	Assembly plant	2007, 5-month demonstration	Plug Power	N/a
Ozburn-Hessey Logistics	Smyrna, TN	Warehouse	2004	Ballard Power Systems	4
PBR	West Columbia, SC	Warehouse	2007, 2-week demonstration	Hydrogenics	2*
Proctor & Gamble	CA, NC, LA	Facility	Purchased 2011	Plug Power	200+
The Raymond Corp.	Greene, NY	Manufacturing facility	2007	Plug Power	N/a
Stihl Inc.	Norfolk, VA	Facility	Order announced in 2012	Plug Power	N/a
Super Store Industries	Lathrop, CA	Warehouse freezer	2009	Oorja Protonics	N/a
Sysco	Riverside, CA	Distribution Center	Purchased 2011	Plug Power	80
	Boston, MA	Distribution Center	Purchased 2011	Plug Power	160
	Long Island, NY	Distribution Center	Purchased 2011	Plug Power	42
	San Antonio, TX	Distribution Center	Purchased 2011	Plug Power	113
	Front Royal, VA	Redistribution facility	2011	Plug Power	100
	Philadelphia, PA	Distribution center	2010, ARRA funding awarded to GENCO	Plug Power	95
	Houston, TX	Distribution center	2010, ARRA funding awarded to Sysco Houston	Plug Power	98
	Vancouver, BC, Canada	Distribution center	N/a	Plug Power	N/a
	Canton, MI	Distribution center	2010, trial completed	Plug Power	45
	Grand Rapids, MI	Distribution center	2009, trial completed	Plug Power	30
Testa Produce	Chicago, IL	Distribution Center	Order placed Nov. 2010	Oorja Protonics	20
Unified Grocers	N/a	Refrigerated Food Distribution Facility	2011	Oorja Protonics	200
United Natural Foods, Inc. (UNFI)	Sarasota, FL	Distribution center	2010	Plug Power	65
U.S. Foodservice	Livermore, CA	Distribution facility	2010	Oorja Protonics	40
Walmart	Cornwall, ON, Canada	Distribution center	Planned	Plug Power	155
Wakefern Food Corp./Newark Farmer's Market	Newark, NJ	Distribution center	2011	Plug Power	193
Walmart	Balzac, AL, Canada	New refrigerated distribution center	2010	Plug Power	70
	Washington Court House, OH	Food distribution center	2007	Plug Power	60
	OH	Two distribution centers	2006	Plug Power	14
	MO	Distribution center	2005	Plug Power	4
Wegmans	Pottsville, PA	Warehouse	2010, ARRA funding awarded to GENCO	Plug Power	136
Whole Foods Market	Landover, MD	Distribution center	2010, ARRA funding awarded to GENCO	Plug Power	61
WinCo Foods, LLC	Modesto, CA	Distribution center	Purchased in 2011 – 82 operational, a total of 184 to be deployed in 2013.	Plug Power	184

* 2 forklifts were deployed in 2-week trials at several companies in the Charlotte, SC area
In 2008, Plug Power entered into an agreement with Ballard Power Systems to purchase fuel cell stacks for its electric lift truck applications
ARRA = American Recovery and Reinvestment Act.
N/a = information unavailable

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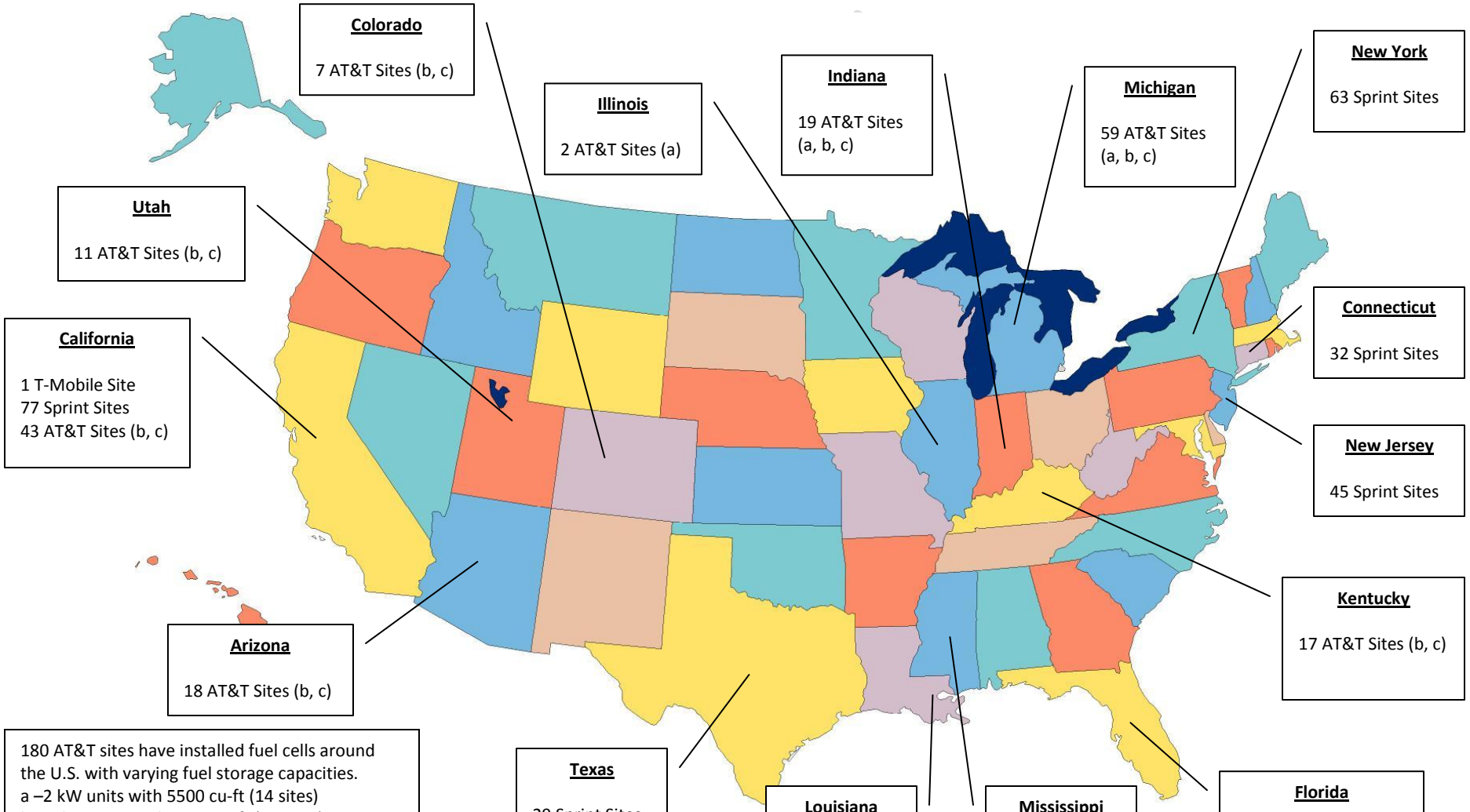
Appendix 6 – Fuel Cells Installed for Telecommunications Backup Power in the U.S.



Colorado

7 AT&T Sites (b, c)

Illinois

2 AT&T Sites (a)

Indiana

19 AT&T Sites
(a, b, c)

Michigan

59 AT&T Sites
(a, b, c)

New York

63 Sprint Sites

Utah

11 AT&T Sites (b, c)

California

1 T-Mobile Site
77 Sprint Sites
43 AT&T Sites (b, c)

Connecticut

32 Sprint Sites

New Jersey

45 Sprint Sites

Kentucky

17 AT&T Sites (b, c)

Arizona

18 AT&T Sites (b, c)

Texas

29 Sprint Sites

Louisiana

12 Sprint Sites

Mississippi

2 Sprint Sites

Florida

356 fuel cells at 140
MetroPCS Sites
1 AT&T Site (c)
T-Mobile Sites

180 AT&T sites have installed fuel cells around the U.S. with varying fuel storage capacities.
a –2 kW units with 5500 cu-ft (14 sites)
b – 4 kW units with 9500 cu-ft (93 sites)
c – 6 kW units with 13500 cu-ft (73 sites)

Fuel Cell Manufacturers

AT&T = ReliOn
Sprint = ReliOn and Altergy Systems
MetroPCS = Altergy Systems
T-Mobile = IdaTech