DOE-DOD Emergency Backup Power Fuel Cell Installations

On July 19, 2011, the U.S. Department of Energy (DOE) announced that, as part of an interagency partnership with the U.S. Department of Defense (DOD) to strengthen American energy security and develop new clean energy technologies, DOE and DOD will collaborate on a project to install and operate 18 fuel cell backup power systems at eight defense installations across the country. The Departments will test how the fuel cells perform in real world operations, identify any improvements manufacturers could make to enhance the value proposition, and highlight the benefits of fuel cells for emergency backup power applications.

As of May 2012, six fuel cell units have been installed at Aberdeen Providing Ground and Fort Hood. In a first-of-a-kind heavy duty use application, a 10 kW fuel cell at Fort Hood provides backup power to a 20np air compressor. Additionally, a deployment coordination team made up of these fuel cell end users meets quarterly to provide first hand experiences and important suggestions to industry.

These projects, managed by the U.S. Army Corps of Engineers' Construction Engineering Research Laboratory, are accelerating the deployment of this important clean energy technology at DOD facilities and providing valuable data that helps identify future research areas for fuel cells. Continued R&D efforts enable further reductions in fuel cell costs, and as they continue to come down, fuel cells are becoming increasingly competitive in the commercial marketplace.

"The shared vision of the Department of Energy and the Department of Defense for a safe, secure energy future provides us with a strong foundation to work together on specific technologies," said Energy Secretary Steven Chu. "Projects like these fuel cell systems will help reduce fossil fuel use and improve energy reliability at defense installations across the country."[1]

Compared with diesel generators, which are often used for backup power, fuel cells use no petroleum, are quieter, and produce far fewer air emissions. Fuel cells used in emergency backup power applications with natural gas reduce the emission of carbon dioxide by 10% and nitrogen oxide by over 90% when compared to diesel generators.[2] Fuel cells also require less maintenance than either generators or batteries, and can easily be monitored remotely to reduce maintenance time.

The primary challenge facing currently available fuel cells is the higher first cost for the units, compared to the conventional technologies they are replacing. Targeted fuel cell demonstrations, like the backup power systems that are being installed under the DOE-DOD partnership, will increase the scale of deployment and help improve the economics of the technology, which could lead to more widespread adoption and use.

The eight DOD installations were chosen based on responses from a joint DOD-DOE project proposal request. LOGAN Energy of Roswell, Georgia, is the prime contractor for the project and is installing fuel cells from four manufacturers: ReliOn, Inc. of Spokane, Washington; Altergy Energy Systems of Folsom, California; Idatech, LLC of Bend, Oregon; and Hydrogenics Corporation of Ontario, Canada.

Cheyenne Mountain Air Station

U.S. Air Force Cheyenne Mountain Air Station is an underground command center for monitoring the skies and space for hostile incoming weapons. The installation is managed by the USA/Canadian North American Aerospace Defense Command (NORAD) and the U.S. Space Command. The fuel cell backup power at the 911 Call Center is used to ensure the availability of electric power for computers, lighting, and telecom equipment during utility grid outages.

U.S. Army Aberdeen Proving Ground

U.S. Army Aberdeen Proving Ground is one of the Army's oldest ordinance design and testing installations. The three fuel cell systems are providing emergency backup power for computers, lighting, and telephone systems at the Building Operations Command Center, Snow Emergency Center, and the Test Center Buildings.

U.S. Army Fort Bragg

U.S. Army Fort Bragg is home to the XVIII Airborne Corps Headquarters, the 82nd Airborne Division, the U.S. Army Special Operations Command, and the Joint Special Operations Command. A 15 kW fuel cell ensures availability of electric power at the Range Control building to support computers and lighting systems.

Rickenbacker Air National Guard Base

The Rickenbacker Air National Guard is home to the Air Force 121st Air Refueling Wing and is part of a joint military facility with the Ohio Army National Guard, Navy Reserve, and Marine Corps Reserve. Two 20 kW fuel cell systems will be installed at the Troop Command and the Civil Support Readiness Center, for a total deployment of 40 kW. The backup power supplied by the fuel cells will ensure the availability

of electric power for the emergency needs of these buildings.

U.S. Army Picatinny Arsenal

U.S. Army Picatinny Arsenal, New Jersey is a Joint Center of Excellence for Armaments and Munitions, providing products and services to all branches of the U.S. military by specializing in research, development, acquisition and lifecycle management of advanced conventional weapon systems and advanced ammunition. Two 10 kW fuel cells are installed at sanitary sewage lift stations to ensure the availability of electric power to these sewage pumps that serve critical areas of the installation during power grid outages. The failure of any one of these pumping stations from power outages places the Picatinny Arsenal at substantial health and environmental risk from sewage backup into buildings and operations, as well as from environmental contamination.

U.S. Army Fort Hood

U.S. Army Fort Hood in Texas is the largest active duty armored post in the U.S. Armed Services. Fort Hood trains, maintains, and sustains a corps-level headquarters, two army division-level headquarters, a corps sustainment command, six brigade combat teams, five additional brigade-sized formations, and a number of other major organizations. The three fuel cell backup power systems will ensure the availability of electric power for a waste pretreatment controller and multiple air compressors, including one that is 20 hp. This is a first-of-its-kind heavy duty use application for fuel cells.

U.S. Military Academy at West Point

Renowned as one of the world's preeminent military leader development institutions, West Point's mission is to educate, train, and inspire the Corps of Cadets so that each graduate is a commissioned leader of character committed to the values of duty, honor, and country. The student body, or Corps of Cadets, numbers 4,400 and each year approximately 1,000 cadets graduate and are commissioned as second lieutenants in the U.S. Army. The backup power supplied by the two 10 kW fuel cells will ensure the availability of the Internet, computer equipment, and telecommunication systems.

U.S. Marine Corps AGCC-29 Palms

The U.S. Marine Corps Air Ground Combat Center at 29 Palms promotes operational forces readiness by conducting combined arms training, urban operations, and the Joint/Coalition level integration training. The backup power supplied by the 4 kW fuel cell will ensure the availability of electric power for the Internet and computer equipment.

NASA's Ames Research Center

NASA's Ames Research Center is located in Ames, California, and was selected to be the second aeronautical research laboratory in 1939. One of ten NASA field centers, Ames has over $3.0 billion in capital equipment; 2,500 researches, scientists, and technology developers; and a $750-850 million annual operating budget. The 12 kW fuel cell installed at the Wind Tunnel Facility will provide emergency backup power to the control room's computers and lighting.

Over the last decade, the DOE has invested in research and development projects to advance key fuel cell components such as catalysts and membranes at several companies including 3M, Dupont, Gore, Johnson Matthey, and BASF. This research has helped decrease the amount of platinum used in catalysts by a factor of five and reduced the costs of transportation fuel cells by more than 80% since 2002. Many of these innovations are now being used in the fuel cell units being deployed through these DOD-DOE projects. DOE's Fuel Cell Technologies Program has funded research and development of catalysts, membranes, and other fuel cell components, resulting in more than 300 patents and 33 commercially available technologies.

References and Notes

1. U.S. Department of Energy, "Departments of Energy, Defense Partner to Install Fuel Cell Backup Power Units at Eight Military Installations" (July 20, 2011) http://www1.eere.energy.gov/hydrogenandfuelcells/news_detail.html?news_id=17564

2. Argonne National Laboratory, "Fuel Cycle Comparison of Distributed Power Generation Technologies" (November 2008). http://www.transportation.anl.gov/pdfs/TA/554.pdf