



## Army And Marines Go Fossil Fuel-Free



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In 2006, a Joint Urgent Operational Needs Statement written by the top ground commander in western Iraq wound its way through the bureaucracy of Multinational Force-Iraq to Central Command and finally to the Pentagon's Rapid Equipping Force (REF) at Fort Belvoir, Va. There it was handed off to then-Col. Dan Nolan, who says that when it reached his desk, the attitude of those who reviewed the request was "this is kind of weird," since no one had "ever seen anything like it."

The request wasn't for anything that would allow troops to engage the enemy, but for gear that would help Americans stay away from roadside bombs. Marine Corps Maj. Gen. Richard Zilmer, commander of Multinational Force-West, had had enough of his troops being blown up while driving fuel-laden supply convoys to small outposts. He requested a "renewable and self-sustainable energy solution . . . to augment our use of fossil fuels with renewable energy, such as photovoltaic solar panels and wind turbines." He wanted troops to produce their own energy and be freed from dangers of constant resupply.

While Zilmer's request for 183 commercial renewable-energy systems would be denied, his request woke the Pentagon up to the energy needs that small, dispersed units have and the huge material and human costs of keeping them supplied.

That initial request was modest, but the Army and Marine Corps are now doubling down on their commitment to renewable energy on the battlefield. Both services are shipping everything from hybrid generators for base camps to small collapsible solar panels that recharge handheld electronics to Afghanistan this year. There has been little hoopla over the deployment of some of

these renewable technologies, but if they prove out, 2011 may be a major turning point in how the U.S. military meets battlefield energy needs in the future.

After taking the lead on Zilmer's request, Nolan—who now runs a consulting business—helped form the Power Surety Task Force, a group within REF that would briefly take the lead in renewable-energy research for the Army. Among other projects, the task force developed the Transportable Hybrid Electric Power Station, which never proved out but spurred the Defense Advanced Research Projects Agency to allocate \$30 million to the Army to develop the Hybrid Intelligent Power (HI-Power) generator, a microgrid system under development by Lockheed Martin.

A microgrid consists of a series of generators ganged to operate as one “smart” unit, producing as much energy as needed at any given time. This reduces fuel consumption—instead of small buildings running their own generators 24 hr. a day whether needed or not, they all work together, turning on and off as necessary to meet demand.

The Army has been testing large-scale microgrid technology at Fort Irwin, Calif., for some time, and will ship a smaller system to Afghanistan this summer. Col. Paul Roege of the U.S. Army Capabilities Integration Center tells DTI that a megawatt's worth of generators are going to a large forward operating base (FOB)—a source says it's Bagram Air Base—to see how it fares in an expeditionary environment. The Army expects to save “10-20% of fuel” currently burned by inefficient generators. When dealing with the numbers the U.S. military deals with in Afghanistan—consuming 50 million gal. of fuel per month—a 10-20% reduction in fuel is significant.

There are 22 minigrids in Afghanistan, which differ from the larger microgrids in that instead of tying together multiple 60-kw generators over a large area, each consists of one 500-kw generator, which supplies power to several structures. According to Richard Kidd, deputy assistant secretary of the Army, energy and sustainability, in places where minigrids are deployed, fuel consumption has gone down 50%, “saving thousands of gallons a week.”

But it's not just energy grids for large FOBs that the Army is deploying to Afghanistan—it's also providing tactical solutions. Four Brigade Combat Teams (BCT)—starting with the 173rd Airborne BCT in July 2010—have been supplied with the Rucksack Enhanced Portable Power System, a small, flexible, 62-watt solar panel that has adaptors to charge military standard batteries. While there are only 100 in theater, Kidd says 600 are “in the pipeline” for deployment. With some Army batteries weighing more than 2 lb. each, or soldiers having to carry hundreds of commercial batteries on long missions, being able to recharge a single battery with a small solar panel would take a huge load off infantrymen who already hump packs weighing in excess of 100 lb. on long missions. It also allows a small unit to reduce the time it runs gas-guzzling generators to recharge a growing array of electrically powered gear.

The 1st Btn., 16th Infantry Regt., 1st Infantry Div. deployed to Afghanistan this year with alternate and renewable power sources focused principally on their battery load. Kristopher Gardner, deputy director of technology in the Office of the Assistant Secretary of the Army for Acquisitions, Logistics and Technology, tells DTI that in training, the 1/16 evaluated everything

from 300-watt fuel cells to rechargeable batteries, power managers and individual fuel cells, and their deployment marks the first time soldier-portable fuel cells are in theater.

When looking at how much oil the Defense Department uses, any saving, even at the end of a long, expensive supply chain, is important. The Defense Department spent \$15 billion for oil in 2010, with 75% going to operations. The largest consumers of fuel on the battlefield are electrical generators, and due to the recent surge in American forces, Kidd says that from 2009-10, fuel costs in Afghanistan increased 60%—largely due to the use of more inefficient generator power. Given numbers like that, and with a serious budget crunch coming, it's easy to see why the services are scrambling to find savings in renewable energy.

Sharon Burke, assistant defense secretary for operational energy plans and programs, a new office at the Pentagon, recently said on Capitol Hill that despite those numbers, “we don't have good data on power use at the source.” In other words, the military isn't good at keeping tabs on where and how it uses energy.

The problem in deployed environments is that the military doesn't have a process to collect fuel data in theater. It is trying to rectify that by sending a bar code technology called Tactical Fuel Manager Defense to Afghanistan to collect such data. Kidd says that the system is about 50% fielded, with full deployment to be completed by year's end. He says the system provides an “automated, tactical, operational-level picture of what the fuel is being used for” across the battlefield.

The fuel manager system is an example of how the military is only now—after a decade of conflict—paying close attention to how much fuel it burns in theater, and to the fact that it doesn't have a handle on how that fuel is being used. Roeger adds that the Army is starting to study how its contractors keep fuel logs so “we can tap into that kind of capability, collect the data and figure out how you report it, who needs to see it, what analysis needs to be done, how you tie that into your decision processes.”

Of 50 million gal. of fuel per month that U.S. forces consume in Afghanistan, 200,000 gal. a day are used by the Marines. For a force that wants to be more expeditionary and act like less of a second land army, this tether is unacceptable.

Enter India Co. of the 3/5 Marines. Having returned this spring from a seven-month tour in Helmand Province, the unit managed to demonstrate the feasibility of a suite of renewable-energy systems that in some cases reduced the fuel use of generators to 2 gal. a day from 20.

Called exFOB, the system uses a variety of devices to convert solar energy to power to charge everything from battery packs to cooling, heating and electrical systems in living quarters and operation centers. The system proved so successful that two small patrol bases in Afghanistan are operating entirely on renewable energy, with a 90% reduction in fuel at a third base. One platoon was even able to conduct a three-week foot patrol without battery resupply, reducing the load on those Marines by 700 lb.

But this was only the beginning. Spurred on by high fuel costs and a desire to become reacquainted with its expeditionary roots, the Marines' Expeditionary Energy Office, led by Col. Bob Charette, is taking the success of exFOB and running with it.

Charette tells DTI that India Co. was a small but significant part of the Marines' plans. Due to their success, "we wrote requirements" and have "LED lights, shelter liners and Spaces (Solar Portable Alternative Communication Energy System—a portable solar panel that recharges batteries) on their way to Afghanistan. We're also looking at accelerating the Ground Renewable Expeditionary Energy Network (a larger solar display that can power a platoon's command center) as a result of what we learned with India Co."

The Marines have more than 400 Spaces systems in Afghanistan, and are acquiring more as quickly as possible. The service is also sending hybrid 10-30-kw generators to Afghanistan this summer to act as a microgrid for battalion-level operations. The hybrid generators grew out of testing the Corps did last summer at Twentynine Palms, Calif., to make a battalion's "command and control system as renewable and energy-efficient as possible," Charette says.

During the tests, "a few of the vendors were able to save 70-90% of fuel against program-of-record generators," Charette adds, although he doesn't know if they're going to get the same results in the field. Still, he is confident that "we'll have a battalion-level capability in less than a year," while stressing that for the Corps, this isn't a one-time thing. This is how Marines are going to deploy, Charette says.

"As we learn, we're writing requirement documents, making acquisition decisions and rearranging our funding decisions based on all of this," Charette says. Systems like Spaces "give us a lot of flexibility at the tactical edge," and while "we're building the airplane in flight a little bit," he notes that "we moved around a lot of money to get all these battalions the same gear that 3/5 has." The cost, moreover, is relatively small given the potential for fuel savings. The cost of testing and supplying this gear to theater has been about \$3.5 million, while the hardware sent to Afghanistan with India Co. costs less than \$500,000.

At small outposts, Marines often use idling vehicles as power-generation sources, using up as much fuel as a generator. To reduce that, the Corps recently issued a request for information for "any other automotive technologies such as cold and hot weather idle-free solutions for vehicle climate control, reduction of parasitic loads, or any other automotive solutions designed to improve vehicle fuel efficiency." Charette says that in August the Corps is conducting exFOB 2011 tests to look at concentrated solar energy and other solutions for exportable power of vehicles at idle.

Budgetary pressure, lessons learned from the field and simple logistical common sense have led the ground services to embrace renewable energy where and when they can. But "the big gaping hole is that the Defense Department has no energy strategy," warns Christine Parthemore, a fellow at the Center for a New American Security. "There's no overarching, long-term strategy" for energy efficiency at the Pentagon. Contributing to the problem with fuel use in Iraq and Afghanistan, she points out, are the expensive, all-inclusive, long-term fuel and supply contracts in the theaters that often impose "distinct disincentives for conserving fuel or using it

efficiently.” The Army particularly “felt like their hands were tied” when it came to trying new things when so much was invested in logistics contracts.

The budget environment, however, “is adding a whole new interest in solving the energy question in a more serious way and much more broadly within the department than 3-5 years ago,” she adds. Kidd says that if the microgrid experiment is successful, “we envision a day when microgrids are standard practice in what we do.” These technologies, along with the Marine Corps’ plan to rely on liquid fuel for vehicles only by 2025, point the way to further innovation.

But to tie these programs together, as well as those in the Navy and Air Force, as Burke and her office are tasked to do, the Defense Department still needs an overall strategy for energy use—one that is overdue.