FUEL FLEXIBLE GENERATORS FOR MAN-PORTABLE AND REMOTE POWER APPLICATIONS

SAFCell Inc. | www.safcell.com
U.S. Army Research Laboratory (ARL)

Power on the battlefield is of uppermost importance. For the dismounted Soldier, there is an increasing need for a high-energy density and lightweight power source that can run on logistic fuels. SAFCell's fuel-flexible power systems run on patented, solid acid fuel cell stacks that convert fuels into electrical power silently and efficiently, and can handle the highest impurities found in military logistic fuels (i.e. JP8). In Phase II and ongoing Phase II Enhancement efforts, SAFCell and system partner UltraCell LLC., are developing a 50W man-portable power generator with system energy density (> 1000 W*hr/kg) that will reduce pack weight by 3 times compared to use of typical high capacity batteries (i.e., BB2590/U).

The power unit will run on military or commercial fuels with efficiencies approaching 30 percent in comparison to 3 to 15 percent for other small power generation technologies. The SAFCell power unit is at least two times, up to ten times, more efficient than current fielded technologies. This greatly reduces fuel costs, fuel logistics and rucksack weight burden for mobile power. Based on a military specified design, SAFCell's PP-50-Flex: Portable Flex-fuel Power System, can be quickly transported and deployed where necessary even under demanding field conditions. The unit is designed to enable universal use of high power communication devices, targeting systems and anti-IED or anti-mine units.

For commercial applications in Oil & Gas sectors, SAFCell modified the 50W propane fueled power system to run on industrial methanol (a fuel found on-site at almost all modern wellheads) and power equipment used at the surface of the drilled hole. In laboratory testing, the system has demonstrated operation down to -40°C and up to +50°C and with 50W (net) continuous operation for over 1000 hours. The system has demonstrated operation in pulse power mode, required to power wellhead pumps and controllers, with peak powers up to 300W (duty cycle ~ 15 percent) for hundreds of hours.

TECHNOLOGY TRANSITION:

Phase II Enhancement efforts are focused on system packaging of Phase II prototype to hit the Army's stringent weight and volume requirements. UltraCell provided matching funds of $250K for the Phase II Enhancement. Packaged and stress tested demonstration units will be delivered to the Army for initial field trials in early 2017. Phase III efforts will involve integration of a compact JP8 reformer from InnovaTek Inc. into field trial units for extensive evaluation by the Army Research Office. SAFCell has received $6.5M in venture capital funds from Lake Bridge Capital, and $3.7M from a DOE grant in Phase III funding to aid in development efforts of both military and commercial SAFCell power generators. Key in securing this Phase III funding were stack and system level demonstrations produced under Army SBIR contracts. Commercial product development has focused on remote power applications in the O&G sector. Specifically, small power units for wellhead communication, monitoring and control that can deliver reliable, year round power even under the extreme weather conditions (-40°C to +50°C) found in the O&G industry.

Field trials with O&G partner started in the fall of 2015, and integration into commercial wellheads is scheduled for the summer of 2017. Initial lab and roof testing were conducted with Calscan Energy Solutions, a commercial company specializing remote power and electrification of wellheads. To test the reliability in all weather conditions, replicating usage in military applications, visits to Calscan were conducted from December 2015 to July 2016. Final configuration testing will start in December 2016 on Calscan's roof in Edmonton, Alberta to ensure the technology is able to withstand winter weather. Future field trials are scheduled for 2017 with ConocoPhillips on the condition that Calscan gets awarded additional funding from the Canadian government.