FuelCell Energy
Ultra-Clean, Efficient, Reliable Power

**Technology Focus Area**

# FUEL CELL POWER GENERATION UTILIZING PROPANE

The ability to operate highly efficient, pollution-free, distributed-generation power plants interchangeably on either natural gas or HD-5 grade propane is of interest to the U.S. Army and the U.S. Department of Homeland Security as a way to maintain secure power for critical power operations. Continuous long-term operation on HD-5 propane also provides a value proposition to islands, remote sites, national parks, data centers, military bases, hotels, and hospitals where natural gas is not available. Although natural gas distribution through utility pipelines is economical, it is vulnerable to natural disaster, threats of terrorism, and repair outages. Propane is routinely transported and stored as a liquid at ambient temperatures and offers a secure option for fuel cell operations. Sufficient propane can be stored on-site under wide temperature conditions to sustain operations of sub-megawatt fuel cell power plants for several days.

A field evaluation of the ability to operate FuelCell Energy's DFC® power plants with propane was conducted at Concurrent Technologies Corporation (CTC) in Johnstown, PA. This test demonstrated that a DFC300A commercial fuel cell power plant, normally operated on natural gas, can be operated on HD-5 propane at high load for long-term, high efficiency power production, and make instantaneous fuel swaps between natural gas and propane while operating on-load in both grid-connected and grid independent operation.

Operation of the DFC300A fuel cell power plant on HD-5 propane commenced on January 22, 2006 and ended on August 31, 2006. During this period, the power plant accumulated over 3,900 hours with propane, generating 603 MWh of electricity, and accumulated an additional 1,107 operating hours and 139 MWh while operating with natural gas.

Power plant efficiency during propane operation at part load and full load was independently measured by CTC, with third party gas analysis. The data showed efficiency on HD-5 propane was 45 - 47 % (LHV) over a wide range of power output. This efficiency is comparable to typical plant efficiency on natural gas.

A self-contained commercial DFC® power plant operated for six months at providing high-quality, base-load electric power using propane. Ability to switch seamlessly from natural gas to propane and back with no loss of power was demonstrated.

FCE's DFC-300A Power Plant Operating at the CTC Test Facility in Johnstown, PA

The first commercial installation of a DFC® power plant fueled by propane began operating in early 2010 at a remote US Navy base in Hawaii.

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