DIRECT FUEL CELL POWER PLANTS FOR DISTRIBUTED GENERATION

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Direct FuelCell® (DFC®) power plants electrochemically produce electricity directly from readily available fuels, such as natural gas and wastewater treatment gas, by internally generating hydrogen within the fuel cell. As a result, DFC power plants offer fuel efficiency, environmental and other advantages compared to conventional combustion-based power generation technology.

FuelCell Energy, a world leader in the development of high temperature fuel cell power plants, offers three standard commercial products for distributed generation: DFC300A (250 kilowatt nominal rating), DFC1500 (one megawatt nominal rating) and DFC3000 (two megawatt nominal rating) (Figure 1). Increasing demand for reliable power worldwide supplemented by air pollution concerns caused by older, traditional power generation and weak electrical grid delivery systems present significant opportunities for DFC power plants.

Direct FuelCell®
DFC®300A
250 kW480V$_{AC}$
375 kVA50 or 60 Hz

Direct FuelCell®
DFC®1500
1000 kW480V$_{AC}$
1700 kVA50 or 60 Hz

Direct FuelCell®
DFC®3000
2000 kW480V$_{AC}$
3400 kVA50 or 60 Hz

Figure 1. FuelCell Energy Core Products:
Submegawatt and megawatt products offered

Applications for fuel cell power plants include hotels, hospitals, universities, municipal and industrial wastewater treatment plants, data centers, utilities, manufacturing and industrial facilities, and commercial/office buildings. A common characteristic of these applications is demand for quality power around-the-clock, and potential for utilizing high quality waste heat for cogeneration. A DOE/Onsite Sycom Energy Corporation assessment indicates 60,000 MW U.S. market potential for combined heat and power applications such as hotel/motels, hospitals/nursing homes, universities/schools and office buildings. The assessment examined power ratings of four size ratings: 100 to 500 kW, 500 to 1000 kW, 1 to 5 MW and greater than 5 MW. It was concluded that significant markets exist in all the sizes.

Significant operational experience has already been accumulated with submegawatt DFC300A power plants. Over 62 million kWh of electricity have been generated by our DFC power plants, with 45 million kWh at 35 customer sites in Europe, Japan and the United States. Certifications for product safety, interconnection, performance and installations have been obtained. Field units have achieved electrical efficiencies of 45-47%, with total energy efficiency much greater than this for units operating in combined heat and power modes. A field trial of the DFC1500 has commenced operation at King County (Washington state) wastewater treatment facility. A DFC3000 unit has been installed at a Wabash River (Indiana) coal gasifier site.

Focus has now moved from product standardization to further cost reduction, and developing sustainable markets for continuous, base load power applications.

A DFC stack has significant hydrogen generation capacity by virtue of the internal reforming catalyst present in the cell. This ability can generate enough hydrogen to fill up to 100 cars per day (Figure 2). This can help to enable early fleet refueling stations for early adopters of hydrogen power vehicles. FCE is presently evaluating this option.

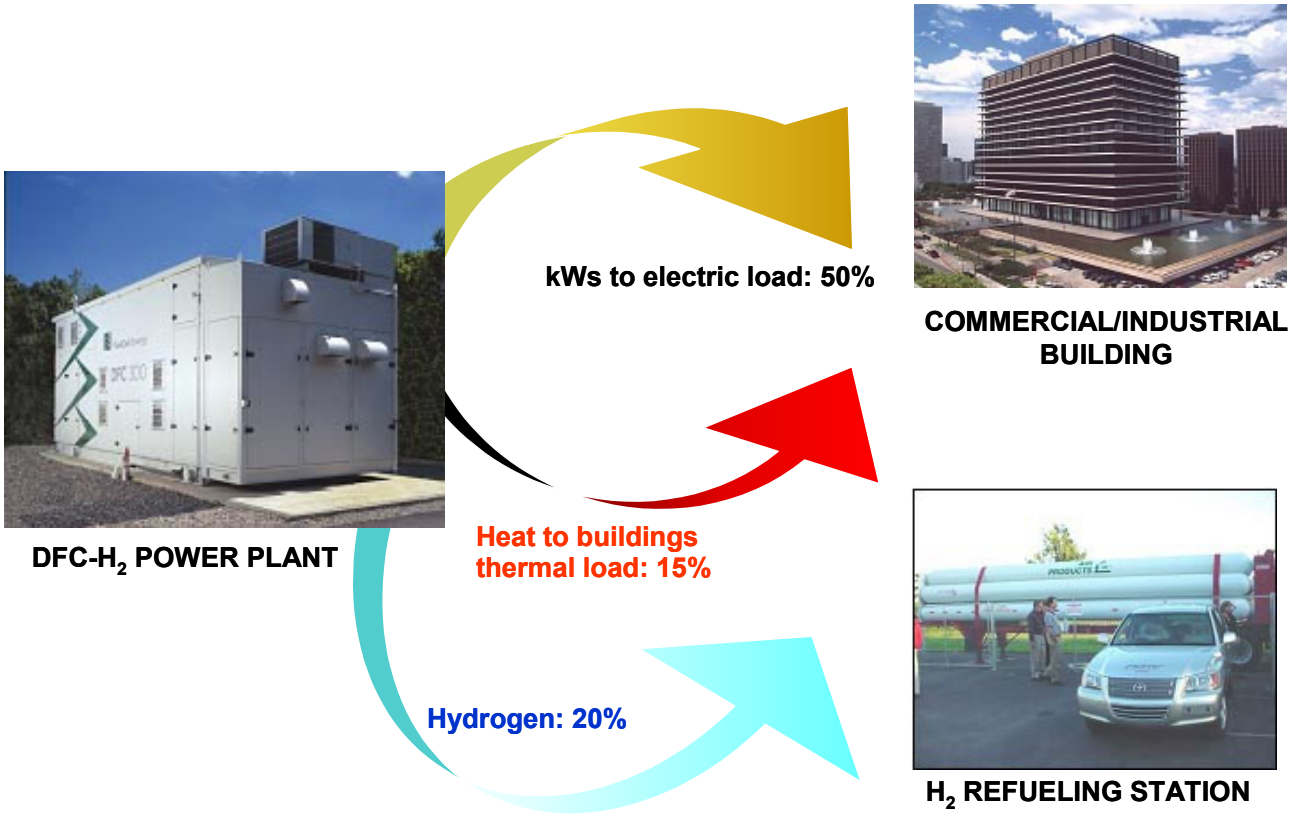

Figure 2. Co-Generation of Hydrogen Can Facilitate Earlier Adoption:
A DFC 1500 can make enough hydrogen to refuel about 100 cars per day as a by-product