

Commercialization Status for Micro/Portable Fuel Cells

AVAILABLE

Electric Fuel Corp. INSTANT POWER™ products



available

INSTANT POWER chargers using the 4-cell zinc-air cartridge are available for most cell phones and PDAs and are sold in thousands of locations in the USA, Canada, Europe and Asia. Cell phone batteries based on Electric Fuel Corp.'s advanced zinc-air fuel cell are sold in 5,000 7-Eleven participating stores.

Ballard Power Systems AirGen™ fuel cell generator



entered market in 2001

\$6,495.00

The AirGen™ unit acts like a portable generator and is a standby uninterruptible power supply (UPS) and automatically starts during a power outage.

FH2 ECOmy CuteFC™ series



Commercially available

One, two or three PEM fuel cells in stacks utilizing Proton Exchange Membrane (Polymer Electrolyte). Provides 1 to 3 W.

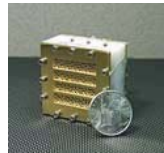
Electro-Chem-Technic Mini Fuel Cell



Commercially available

When using methanol or ethanol as the fuel it produces enough current to show the principle of fuel cell operation. If sodium tetrahydridoborate is used, much greater power is obtained and the performance exceeds similar size PEM fuel cells. It will easily drive small electric motors.

MTI Micro Fuel Cells Portable hybrid fuel cell



In development - market entry date in 2004 for mobile phone convergence devices

Hybrid micro fuel cell system, which included a micro fuel cell, a fuel cartridge, a small hybridizing battery and voltage regulation electronics.

Casio Computer Co., Ltd. High-Performance Fuel Cells for Portable Devices (Digital Camera)



In development with market date in 2004

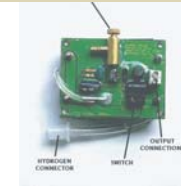
FH2 ECOmy CoolFC™ series



Commercially available

One to ten PEM fuel cells in stacks utilizing Proton Exchange Membrane (Polymer Electrolyte). Provides 12 to 100 W.

Electro-Chem-Technic FCO3 PEM Fuel Cell System 2 cell stack



This is a complete power supply system that only requires the connection of an H2 supply.

Available – temporarily withdrawn due to MEA supply problems

99 British pounds

Fraunhofer Institute for Solar Energy Applications PEM Fuel Cells (for portable devices)



Provides a continuous power supply of more than 50 W.

Electric Fuel Corp. Primary zinc-air packs



Commercially available
Military Contract only

Military and homeland security applications based on zinc-air battery technology. 12/24 V Extended-use non-rechargeable batteries.

FH2 ECOmy CozyFC™ series



Commercially available

One to seven PEM fuel cells in stacks utilizing Proton Exchange Membrane (Polymer Electrolyte). Provides 3.5 to 21 W.

MTI Micro Fuel Cells

DMFC for handheld electronic devices

Market entry date in late 2004, manufacturing agreement with Flextronics

Intended for integration into industrial handheld electronic OEM (original equipment manufacturer) devices.

Smart Fuel Cell GmbH

Smart Fuel Cell C25
for consumer electronics



Available for industrial users in the second half of 2003

The capacity of 140 Wh for one fuel cartridge Smart Fuel Cell M125 with the size of a cigarette box guarantees at least 7 hours (@ 20 W average power output) of mobility.

NEC Corporation

Notebook PC with a built-in fuel cell



NEC plans to market by the end of 2004.

NEC intends to make a notebook PC equipped with an internal fuel cell that offers 40 hours of continuous operation.

PowerZinc Electric Inc.

PowerChip

Available later this year through retail outlets such as mass-merchandise stores, electronic stores, drugs stores, and grocery stores.

Convenient, disposable low-cost source of portable energy that can be applied to most consumer electronic products.

Voller Energy

VE100 Portapack PEM fuel cell



Commercially available

The VE100 provides up to 100 watts of power for about one hour with one hydrogen cartridge. Ideal for recharging batteries in portable electronic devices such as remote monitoring equipment, mobile sensors, communications and computer equipment.

Voller Energy

VE1000 Portapack



Commercially available second quarter of 2004

The VE1000 provides 1kW or 1,000 watts of portable power. The robust unit can be pulled along on its own wheels like a golf trolley.

Voller Energy

VE10



Commercially available

The VE10 is a state of the art integrated fuel cell battery charger designed for portable electronic equipment such as mobile phones, cordless power tools, cameras and laptop computers.

miniHYDROGEN

3 W 2.5 V fuel cell



Reactants: hydrogen/air, reformat/air

Protonex Technology Corp.

20 W betas available today

Uses new manufacturing methods to produce encapsulated cassettes, self-adjusting seals. This makes for a very simple, robust and cheap fuel cell.

Protonex Technology Corp.

NGen™ Hydrogen-Air Fuel Cell Stacks

available

NGen™ stacks offer the highest specific power density (watts / kg) and volumetric power density (watts / liter) in their class. They are durable and rugged for harsh environments.

Protonex Technology Corp.

NGen™ Direct Methanol-Air Fuel Cell Stacks

available

Protonex incorporates direct methanol MEA's and proprietary components in NGen™ fuel cell stacks for direct methanol systems, including both Nafion™ and non-Nafion™ based MEA's.

Protonex Technology Corp.

NGen™ Portable Power SolutionStacks

available

Can incorporate complementary battery and electronics technology to achieve optimum performance.

Produced by

