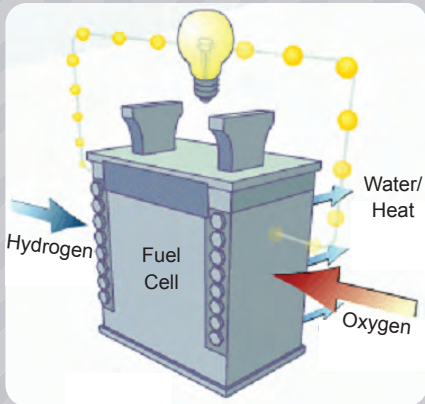


## Tactical Fuel Cell Power Plant:

- The Fuel Cell Power Plant (FPP) features global outputs (120/220 VAC, 50, 60 or 400 Hz: 12, 24, 48, 72 or 125 VDC) allowing it to be deployed anywhere in the world and used with any electronic equipment.
- Additional hydrogen fuel canisters can provide several hours to days of continuous operation.
- Individual Load Control: local and/or remote manually or via TTY, HTTP or SNMP software
- Very quiet operation in all modes.
- Trays slide for easy access.
- Optional Hydrogen Fuel Reformer System (HFRS)

## What Are Fuel Cells?

- *Efficient electrical power generation from hydrogen fuel and oxygen from air*
- *Clean operation with only water and heat by-products*
- *Separate power and energy components; can add fuel canisters for hours or days of additional runtime*



## Metal Hydride Fuel Cell: Single Cell

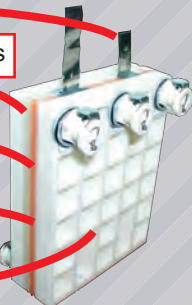
Nickel tab

Air electrode with non-platinum catalysts

Alkaline electrolyte without expensive membrane

Hydrogen electrode with non-platinum catalysts

Plastic endplate with fittings for air, hydrogen, and electrolyte



[www.TacticalFuelCells.com](http://www.TacticalFuelCells.com)  
[sales@TacticalFuelCells.com](mailto:sales@TacticalFuelCells.com)

219 Park Avenue East  
Mansfield, OH 44902-1845

**Energy Technologies Inc.**  
Rugged Power ♦ Global Solutions

# Tactical Fuel Cells®

Rugged • Reliable • Intelligent



[www.TacticalFuelCells.com](http://www.TacticalFuelCells.com)



**Energy Technologies Inc.**

Rugged Power ♦ Global Solutions

Place  
Stamp  
Here

## Fuel Cell Technologies Compared

There are many fuel cell technologies being developed, but ETI's Metal Hydride Fuel Cells (MHFC) offer many advantages versus to other technologies:

### Polymer Electrolyte Membrane (PEM)

#### Advantages:

- High Power
- Low Temperature
- Quick Start-Up

#### Disadvantages:

- Expensive Catalysts
- Sensitive to fuel impurities
- Solid Electrolyte corrosion & electrolyte mgt. problems

### Solid Oxide (SOFC):

#### Advantages

- High efficiency
- Can use a variety of catalysts
- Suitable for CHP & CHHP
- Fuel flexibility
- Solid Electrolyte
- Hybrid/GT cycle

#### Disadvantages:

- High Temperature corrosion & breakdown of cell components
- High Temperature operation requires long start up time & limits

### ETI's Alkaline Nickel Metal Hydride Fuel Cells Advantages:

- Cathode reaction faster in Alkaline electrolyte: Instant starts lead to higher performance
- Low cost components: Plastic meshes, Non-platinum catalysts, Carbon powders, Nickel screens and tabs
- Low Temp Performance:
- Stores & Releases energy like a battery: capable for power bridging & transients

#### Disadvantages:

- Sensitive to CO<sub>2</sub> and Sulphur in fuel and air
- Electrolyte Management

## Metal Hydride Fuel Cells (MHFC)

MHFC technology has been scaled up and demonstrated in stacks and systems ranging up to 5.0 kW. This enables fuel cell stack building blocks in the range of 1-10 kW for military, industrial and other backup power generation requirements.

Simultaneously, a specific power capability of 200 W/kg has now been achieved - more than double the specific power previously reported for ambient temperature fuel cells without platinum catalysts. This 200 W/kg specific power rivals that of PEM (proton exchange membrane) stacks now being demonstrated in backup power applications. Furthermore, ETI's technology has key advantages in performance and cost.

The fundamental materials durability of the MHFC technology has been demonstrated by the operation of several multicell stacks for 8,000 hours. Unique charge storage characteristics of the metal hydride active material provide for special features including instant start, fuel hot-swap capabilities, good low temperature performance, and inherent bridging and transient handling capabilities. The MHFC is comprised of low cost components, including low cost, non-platinum catalysts, carbon powders, nickel meshes, plastic binders and plastic stack components.

Fabrication and manufacturing of the MHFC involves conventional processing equipment similar to that used commercially in the battery industry. MHFC technology offers an excellent opportunity for fuel cell stacks that overcome the serious cost issues facing the fuel cell industry.

## Low Cost Manufacturing Approach

### Metal Hydride Fuel Cell

- Plastic meshes
- Carbon powders
- Non-platinum catalysts
- Nickel screens and tabs

### Vs. Conventional Ambient Temperature Fuel Cells

- Expensive platinum catalysts
- Expensive membranes
- Expensive bipolar plates

## Instant Start Capability

- Instant start performance
- Capabilities to operate without hydrogen fuel providing: Fuel hot-swap capabilities and continued operation even with fuel supply interruptions for short time frames.



## Energy Technologies: Fuel Cell Development

Energy Technologies' products are in use around the world where high-reliability and high-quality power conditioning, power generation and computer peripherals are needed. ETI's units are designed and built rugged to prevent damage due to mechanical shock and vibration. These products also incorporate numerous intelligent monitoring and control features while conforming to all pertinent commercial, industrial and mil spec standards.

Energy Technologies, Inc. is working to develop reliable, cost-effective back up power equipment combining UPS functionality with fuel cell efficiency.

To this end, ETI has develop rugged, kW-scale metal hydride fuel cells (MHFC) targeted at backup and mission-critical power for military, telecommunication, industrial and commercial applications.

## Fuel Cell Power Plant (FPP)

- Total Packaged Power Solution: Integrated UPS, Fuel Cells & Power System Control
- 3 in 1 Application:
  - Power Generation
  - Power Conditioning
  - Emergency Backup
- Currently runs on Hydrogen Fuel Canisters (with fuel reformer in development)
- Global Output Voltages and Frequencies:
  - 115/120/220/240 VAC
  - 50, 60 or 400 Hz
  - 3.3, 5, 12, 24, 48, 72, 125 VDC
- Runs while installed in mobile tactical case.
- Nearly silent operation in all modes.



## Fuel Cells for Backup Power

- Increasing demand for extended runtime backup power
- ETI metal hydride fuel cells have been demonstrated up to 5,000 W
- Higher power 10,000 W versions are in the works
- Metal hydride fuel cells can provide cost and performance advantages for extended runtime backup power
- Reduced CO<sub>2</sub> footprint

## Metal Hydride FPP: Benefits

Features	Benefits
Low Cost Components	Lower initial and life cycle costs
Instant Start Capability	Rapid start is key for all applications
Good Low Temperature Performance	Suitable for operations to -20°C
Long Life Potential	Robustness and durability
Stores & Releases Energy Like a Battery	Capabilities for power bridging & transients

ETI's Standard or Custom Fuel Cell Systems will Simplify Your Power Applications Needs.