



## SFC's Direct Methanol Fuel Cells: Lightweight, Portable Power for Soldiers in the Field

**SFC**  
SMART FUEL CELL

Christian Boehm  
Director Defense Division

Joint Service Power Expo 2009



**I.**  
**SFC – The Company**

**II.**  
Fuel Cell Technology

**III.**  
Man Portable Power Solution

**IV.**  
Other Application

## Company facts

- 🕒 Founded in 2000
- 🕒 Sole company with commercial DMFC products
- 🕒 Location: Munich, Germany  
Atlanta, GA, USA
- 🕒 105 employees
- 🕒 ISO 9001:2000 certified
- 🕒 Listed company since 2007

## Products

- 🕒 DMFC fuel cell systems
- 🕒 Power Manager
- 🕒 Methanol cartridges



## Core Markets

### Leisure - Comfortonomy



### Remote Industrial - Dependability



### Defense - Weight Saving



## Products



EFOY



Fuel cartridges



EFOY Pro



Fuel cartridges



FC-250

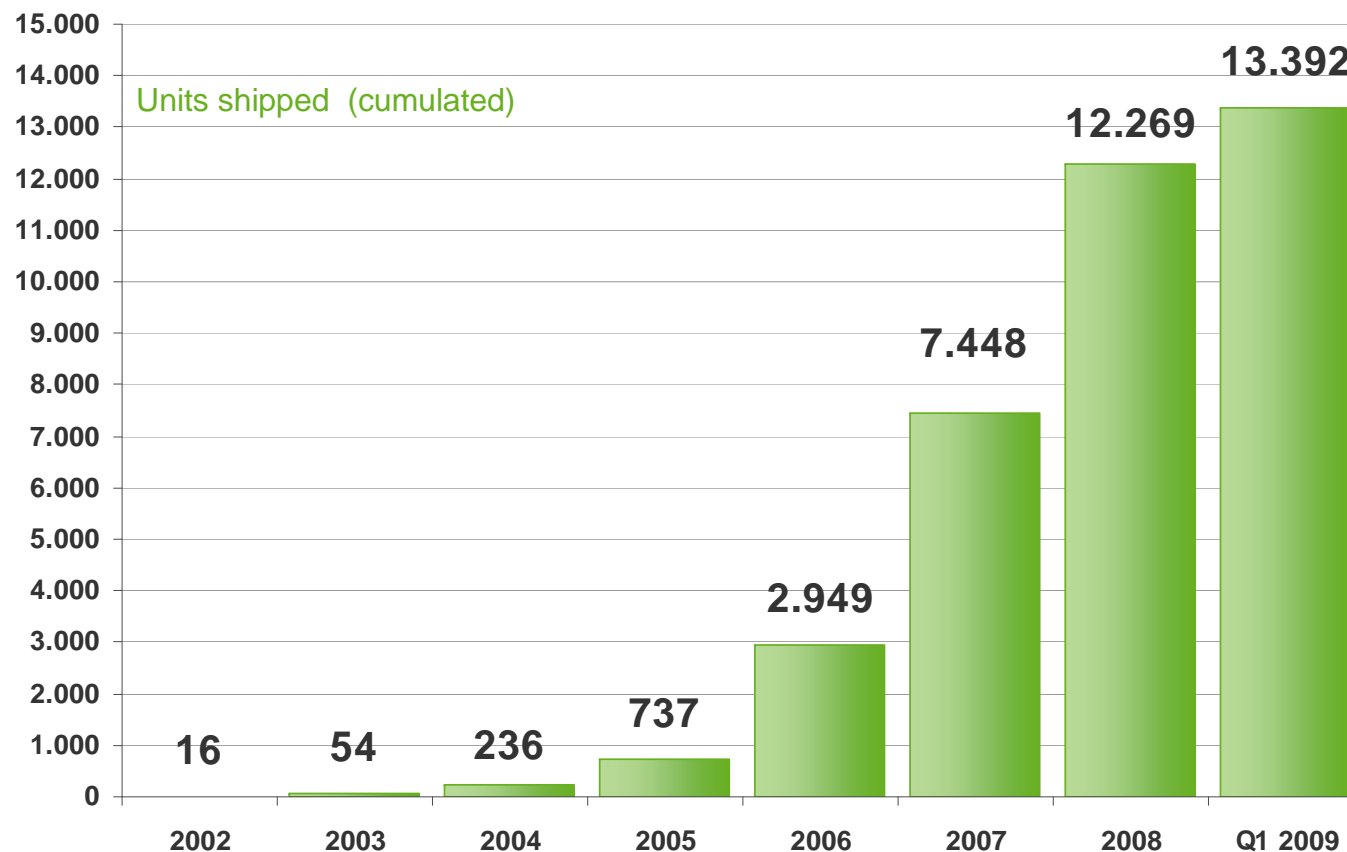
Emily

Jenny

Power Manager

## Substantial Market Traction

- over 13,000 shipped fuel cells
- over 100,000 shipped fuel cartridges
- 5 million operating hours in user hands





**BMVg / BWB**  
Portable DMFC-Solution  
Vehicle backup power



**PEO Soldier**  
US-Army Defense Acquisition and Challenge Program  
**FFW**  
Future Force Warrior  
**ATEC**  
US-Army Test and Evaluation Command



**AFRL**  
Battery renewable integrated tactical energy system (BRITES)  
**AFSOC**  
Power Managers & Jenny for Air Force Special Operations Command



**NATO-members:**  
Finland, Netherlands, Norway, South Africa, Sweden, Switzerland, UK  
NIAG Study for vehicle APU

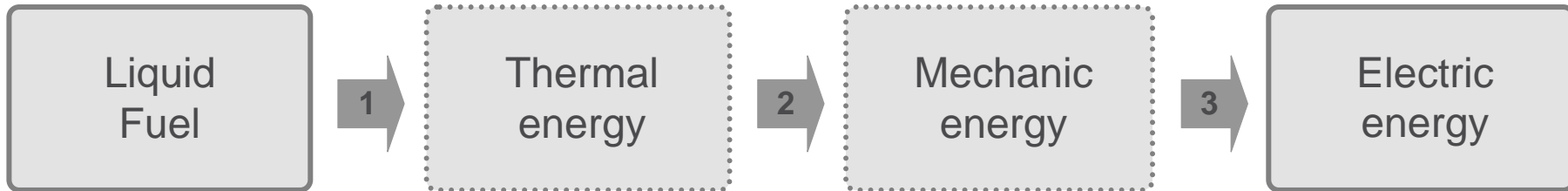
**I.** SFC – The Company

**II.** **Fuel Cell Technology**

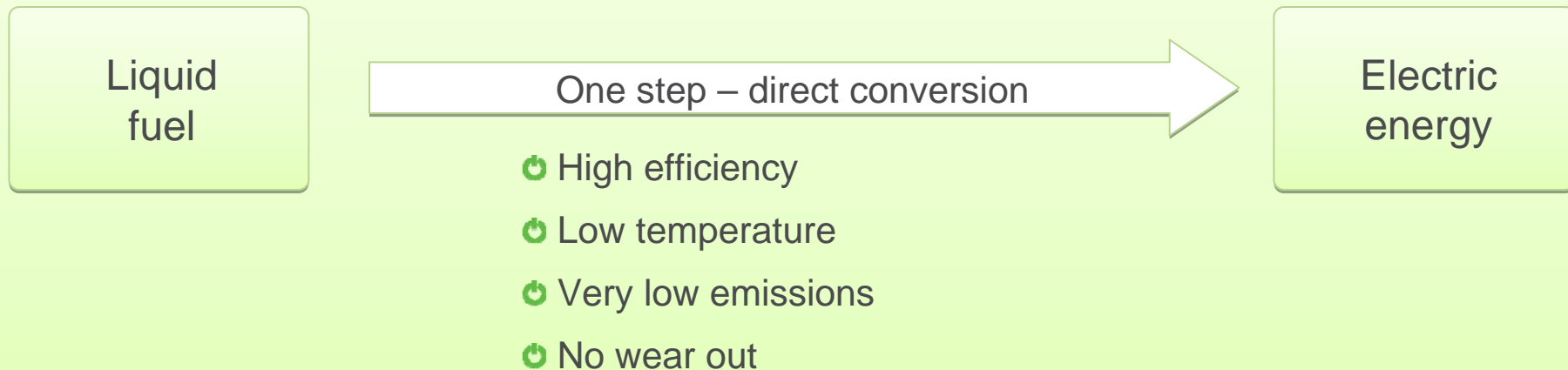
**III.** Man Portable Solution

**IV.** Other Applications

## Conventional generator



## Direct-methanol fuel cell (DMFC)





# Storage of 10 kWh of Energy

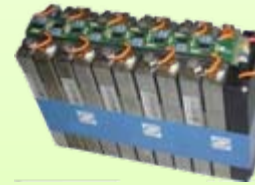
**Methanol**



**Hydrogen**



**Lithium Batteries**



**Lead acid batteries**



**weight:** 8 kg

85 kg

110 kg

270 kg

**volume:** 10 l

60 l

120 l

Methanol combines superior energy density with easy handling, shipping and low cost.

**I.** SFC – The Company

**II.** Fuel Cell Technology

**III.** **Man Portable Solution**

**IV.** Other Applications



## Challenges:

- 🔋 The longer the mission the heavier the soldier's weight
- 🔋 Limited mission capability due to increased weight
- 🔋 Far away from any logistic institution
- 🔋 No resupply during the mission duration



Power Manager

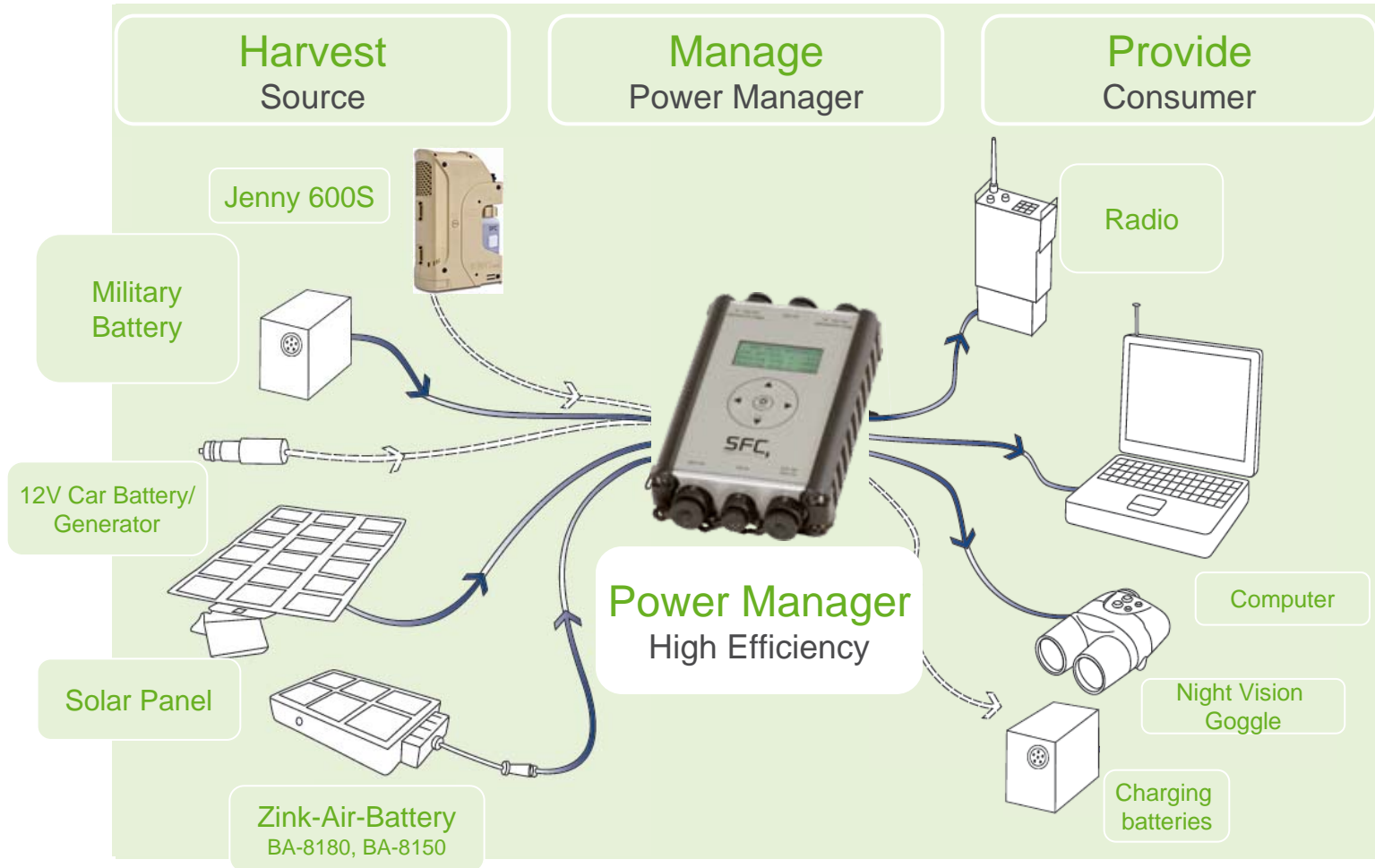
Jennv 600S



over 1,000 fielded

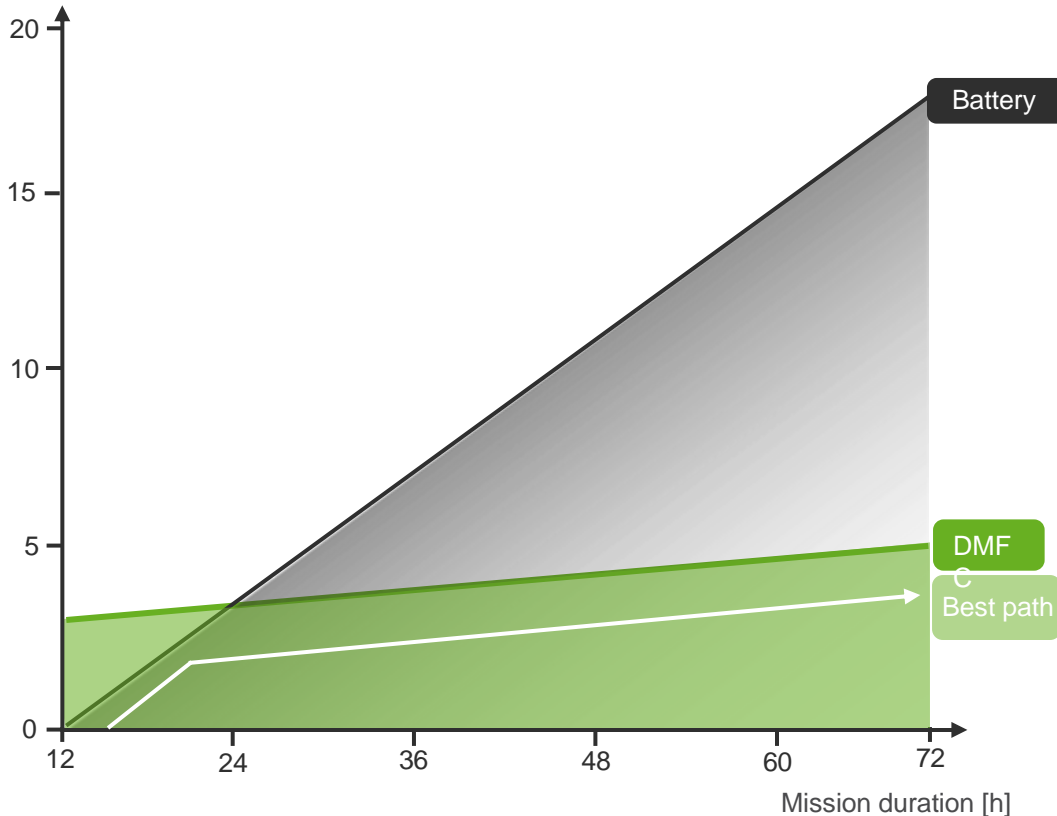


# Portable Power Architecture



# SFC Man Portable Power

Weight of technical equipment [kg]



SFC Fuel Cell System  
and hybrid battery  
**up to 80%\***  
weight reduction  
on a 72+ hrs Mission

\*compared with conventional rechargeable battery packs

## Advantages:

- more power, less weight
- elimination of spare batteries

# Winner of the wearable Power Prize Competition

**1st Place!!**



M-25



## Prize Purse (US Dollars):

1<sup>st</sup> - \$1,000,000.00

2<sup>nd</sup> - \$500,000.00

3<sup>rd</sup> - \$250,000.00

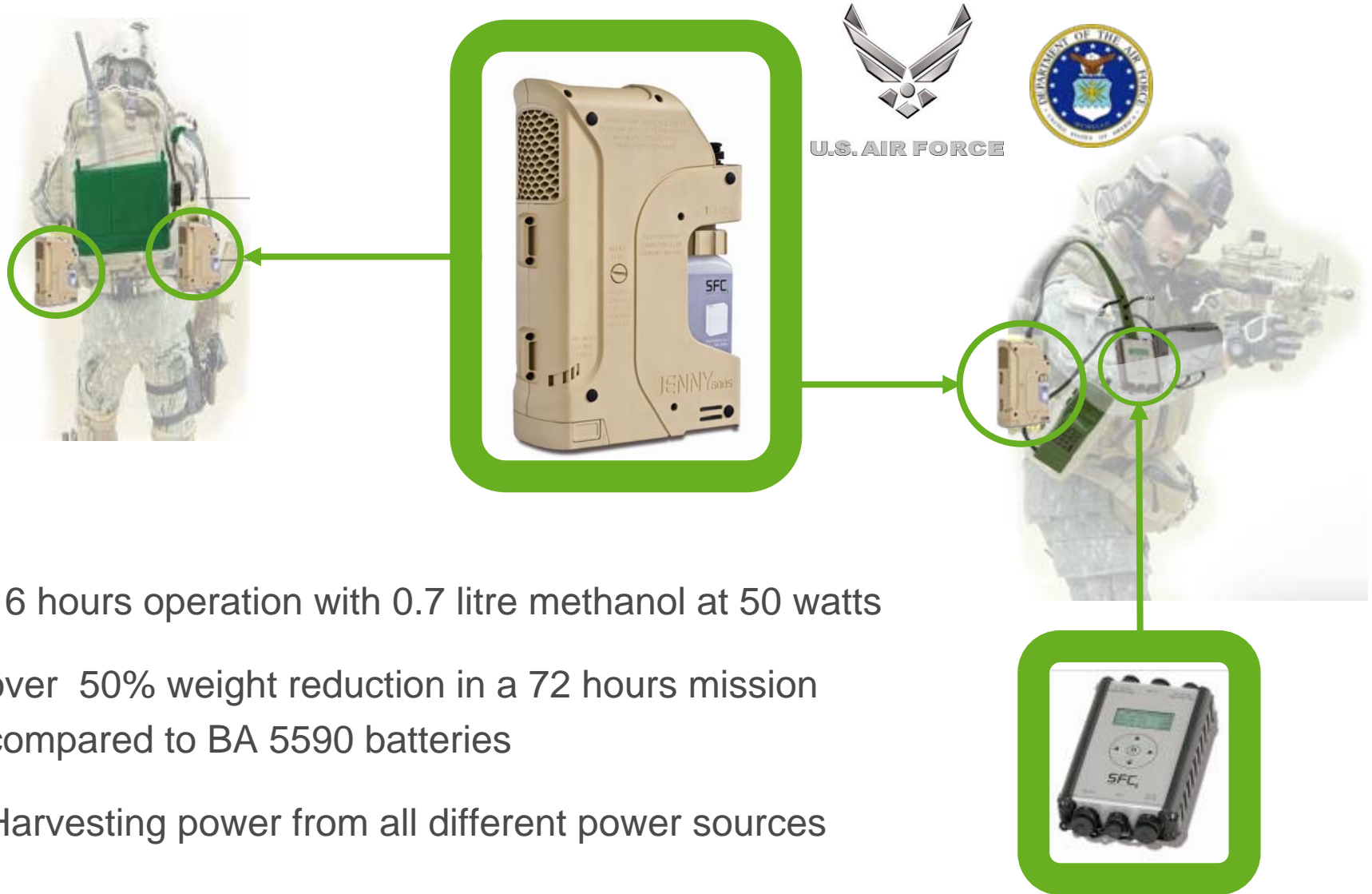


**3rd Place!!**



Jenny 600 S

# AFSOC: JENNY 600S and Power Manager Solution



- 16 hours operation with 0.7 litre methanol at 50 watts
- over 50% weight reduction in a 72 hours mission compared to BA 5590 batteries
- Harvesting power from all different power sources



# US Air Force Ground Airman Example

## Baseline



weight

energy

volume

35.5 lbs

2500 W·hr

11 L

## Spiral 1



26.9 lbs

2620 W·hr

9.5 L

24% Reduction

14% Reduction

## Spiral 2



~17-18 lbs

≥2500 W·hr

6.4 L

50% Reduction

33% Reduction

SFC solution



Automatic battery charging



Fuel cell attached to the IdZ system

- 🔋 16 hours operation with 0.35 liter methanol at 25 watts
- 🔋 Automated, stand alone battery charging

## Mission advantages

- ⦿ Power Source for portable, mobile and stationary reconnaissance systems
- ⦿ Endless power for night vision devices
- ⦿ Reliable power for targeting systems
- ⦿ Power radio communication
- ⦿ Higher Mobility due to reduced weight
- ⦿ No battery resupply/ recharging in the field



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## ATEC uses SFC Fuel Cells for Test Instrumentation



**100 hours operation  
@ 250 Watts  
with 28 liters fuel**

- ➊ Reduced costs: replace one cartridge in every 4 days, no disposal fees
- ➋ Reduced weight: (24 kg) 53 lb fuel replaces (581) 1280 lb battery
- ➌ Invisible testing: Stand alone, automatic and quiet operation

- ⦿ Efficient power on board vehicles
- ⦿ Fuel saving
- ⦿ Independent of fossil fuels
- ⦿ Undetectable / silent watch
- ⦿ No connection to the engine power necessary
- ⦿ Easy to install



# Special Purpose Vehicles



- Reliable energy for all devices on board / mobile office
- Fully automatic recharge, maintenance free, easy integration
- No data loss due to empty batteries, no extra depot tours for recharges
- Unlimited mission times
- Inconspicuous, no emissions, no noise





Ft Bliss  
MOUT  
Military Operations in Urban Terrain  
site

Lat: 32deg, 19min, 7sec, North  
Long: 106deg, 26min, 22.6sec, West



Unattended operation for weeks

Hybridized with solar power and rechargeable battery

Remote control available



Visit our Booth 210!



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