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U.S. Army/CERDEC's Portable Fuel Cell Evaluation and Field Testing

2011 Fuel Cell Seminar & Expo – Orlando, FL – 31 Oct 2011

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US ARMY/AMC/RDECOM/CERDEC/C2D/Army Power Division/Power Sources Branch

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MISSION

Conduct RDT&E, leading to the highest density, safest, most cost-effective energy technologies to meet the war fighter's portable & mobile application needs

Technologies

Wind, PV, batteries, fuel cells, generators, power electronics, environmental control units.

Partners

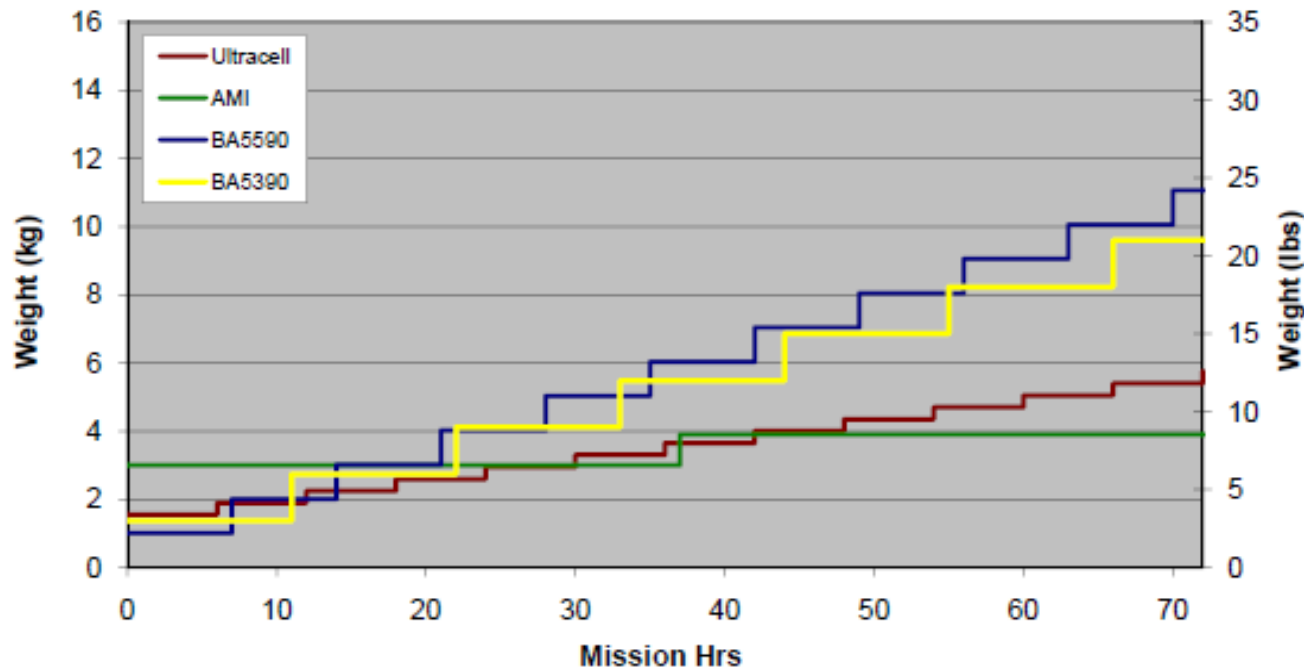
Include other DOD agencies, industry, academia



The Reusing Existing Natural Energy Wind and Solar (RENEWS) is a kit that enables the harvesting and utilization of wind and solar power.



- Present battery solution significantly adds to soldier load burden
- In extended missions, fuel cells can potentially reduce soldier burden
- Developing and evaluating FC systems < 500W



Comparison of FCs systems vs. primary Li batteries (LiSO_2 , LiMnO_2)

Limited User Test

- Power Excursion sponsored by PM Soldier Warrior
- Conducted at Fort Riley, KS.
- Systems demonstrated in Restrictive, Unrestrictive and Urban Terrain



System Deployment

- 7x-300W Propane Fuel Cells
- 7x-300W Methanol Fuel Cells
- 6x-55W Methanol Fuel Cells



Requirement	Specifications
Weight	30 lbs w/ Internal Batteries
Volume	15.7" x 14" x 8"
Internal Battery	1x BB-2590
Voltage: APU	28 VDC
Fuel	Propane
Runtime	1lb Propane= 4 hrs
MTBF	1080 hrs
Batteries Charged per Cartridge	None: APU only
Start-up/Shutdown Time	25min / 25min





300W Protonex Methanol System



Requirement	Specifications
Weight	36lbs w/ Internal Batteries
Volume	15" x 12" x 10"
Internal Battery	2x BB-2590
Voltage: APU	28 VDC
Fuel	Methanol / Water
Runtime	Cartridge (1.2 L) = 4hrs
MTBF	1080 hrs
Batteries Charged per Cartridge	3x BB2590, 6x MBITR, 6x Li-145
Start-up/Shutdown Time	20min / Instant



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Requirement	Specifications
Weight	44lbs w/ Internal Batteries
Volume	11.5" x 20.2" x 11.5"
Internal Battery	Li 80
Voltage: APU	28 VDC
Fuel	Methanol
Runtime	Cartridge (2L) = 8hrs
MTBF	1080 hrs
Batteries Charged per Cartridge	3x BB2590, 6x MBITR, 6x Li-145
Start-up/Shutdown Time	2 min





55W UltraCell Methanol System



Requirement	Specifications
Weight	6.5lbs w/ Internal Battery
Volume	12.3" x 8.6" x 3.2"
Internal Battery	1x Li-80
Voltage: APU	16.8 VDC, 2x - 5V USB ports
Fuel	Methanol / Water
Runtime	Cartridge (550cc) = 8 hrs
MTBF	1080 hrs
Batteries Charged per Cartridge	None: APU only
Start-up/Shutdown Time	13 min / Instant



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PROTONEX, AMI and Ultracell systems placed in a limited user test excursion for soldier feedback

- ✓ All FC systems performed to specifications
- ✓ Users liked quiet operation of devices
- × System size limits all FCs to missions with vehicle access
- Indicated preference for propane vs. methanol due to logistics
- Disliked systems with minimum required time for start up & shut down

- **Size, Weight & Power still concerns with FC systems**

Requires further miniaturization

- **Cost vs. capability gap with existing FC systems**

Fuel cell life cycle cost high vs. incumbent solutions

- **Focus Area -Wearable power systems**

- ✓ *Including fuel cartridge, system must be wearable (eg. Li-ion battery)*
- ✓ *>20W Objective Target*
- ✓ *Submit white papers to W15P7T11RA609-0003 (www.fbo.gov)*