Expeditionary Energy:
Sharpening the “Tactical Edge”

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Unclassified
"Increased Lethality"
Enhanced Company Operations

- 250% Increase in Radios
- 300% Increase in IT/Computers
- 200% Increase in # of Vehicles
- 75% Increase in Vehicle WGT
- 30% Decrease in MPG
  - MTVR – 4.3 MPG
  - HMMWV – 8.0 MPG
  - MRAP – 4.0 MPG

150 Marines conducting operations that 1,000 Marines plus conducted 10 years ago!
“Effect”
Need for Power

- 58 critical programs require direct generator
- 54 major end items are powered by fossil fuel
- 600+ end items require battery power

Centrally Managed Inventory
within the USMC

64 MW
14 MW (OIF deployed)

1,564 MW in 2008
(OIF tactical & commercial)

472 MW
(OIF tactical & commercial)

303 MW

120 MW

40 MW

8 MW

OEF

100 MW

200 MW

300 MW

400 MW

500 MW

600 MW


100 MW

200 MW

300 MW

400 MW

500 MW

600 MW


100 MW

200 MW

300 MW

400 MW

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200 MW

300 MW

400 MW

500 MW

600 MW


100 MW

200 MW

300 MW

400 MW

500 MW

600 MW


100 MW

200 MW

300 MW

400 MW

500 MW

600 MW

OEF Lessons Heard
From the “Tactical Edge”

- Maneuver Constrained by Battery & Water:
  - Demand
  - Combat Load
  - Re-supply
- Weapon System Power Limits Mobility & Wastes Fuel
- Lack of Generator Maintenance Reduces Reliability & Wastes Fuel

Technology & Life Support on the Distributed Battlefield
USMC Energy Facts

OEF 2010 Strategy Baseline
~1.7M Bbls

USMC Annual Fuel
~5M Bbls

USMC Annual (Non-Rechargeable) Battery Consumption
~290,000
281 Tons
$22.5M
USMC Consumes ~ 5M Bbls per year
Energy cost have risen over 300% since 2000
$10 increase per Bbl = $1.2B cost to DoD
Oil has increased $20+ since Oct 2010
Projected to increase to $125/Bbl by 2025 (EIA 2010)

We can’t afford to continue business as usual.
The Marine Corps Expeditionary Energy Office will analyze, develop, and direct the Marine Corps’ energy strategy in order to optimize expeditionary capabilities across all Warfighting functions.

E²O is the functional advocate for USMC expeditionary energy and serves as the Senior Official for USMC operational energy IAW NDAA 2009.
"The future security environment requires a mindset geared toward increased energy efficiency and reduced consumption, thus allowing us to operate lighter and faster. We will aggressively continue our pioneering efforts in energy through our Expeditionary Energy Office, with goals of reduced energy demand in our platforms and systems, self sufficiency in our battlefield sustainment, and a reduced expeditionary footprint on the battlefield."

"E2O – Develop a plan to decrease the Marine Corps’ dependence on fossil fuel in a deployed environment.”
By 2025 we will deploy Marine Expeditionary Forces that can maneuver from the sea and sustain its C4I and life support systems in place; the only liquid fuel needed will be for mobility systems which will be more energy efficient than systems are today.

Current Status: E2W2 ICD / CBA in Staffing
Developing POM-14 S&T GAPS
Experimental Forward Operating Base (ExFOB) 2010
ExFOB Phase II / III

Technologies and Results

- **SPACES** (Battery Charger)
- **GREENS** (300 Watts Continuous Power)
- **Zero Base** (300 Watts Continuous Power)
- **Shelter Liners**
- **LED Lights** (100 Watts Continuous Power)
- **Solar Shade** (100 Watts Continuous Power)
- **Solar Light Poles**
- **Power Meters**

**Systems Approach**

- Couple Efficiency with Renewable Energy
- Train Marines & Provide Behavior Change Tools

= 3 Week Combat Patrol No Battery Resupply
= 2 Patrol Bases Operating on Renewable Energy
= 25%-90% Fuel Savings at Company FOB
Way Ahead
Changing Ethos

2010-2011 (Build Confidence)
Training and Employment of ExFOB
• African Lion
• Enhanced Mojave Viper
• Cobra Gold
• Operation Enduring Freedom

2012 and Beyond (Institutionalize)
• Create Overarching Doctrine
• Organizational Changes
• Build Master Lesson Files / Training
• Improve Legacy Systems during Reset
• Leadership Training and Education
• Personnel Assignment Policy
Way Ahead

Key Technology Focus Areas

FY-12
- Solar Portable Alternative Communications Energy System (SPACES)
- Ground Renewable Expeditionary Energy Systems (GREENS)
- Advanced Medium Mobile Power Sources (AMMPS)
- Enhanced Efficiency Environmental Control Units (E3CU)
- Integrated Trailer – ECU – Generator (Generation II)
- Exportable Vehicle Power
- GBOSS CDD - Prototype

FYDP
- MTVR Hybridization-RDT&E
- Man-Portable Electric Power/Energy Storage & Distribution - RDT&E
- Man-Portable Water Purification - RDT&E
- Advanced integrated solutions for electrical power generation and distribution - RDT&E
- Certification of equipment on alternative fuels.

Beyond
- DARPA – Photovoltaic Optimization Program (POP)
- ONR – Concentrated Solar Program
- ONR – Fuel Cells
- ONR – Storage Technology Improvements

2012

2025
Way Ahead
ExFOB Phase 4 Follow On - “Battalion Level COC”

**Systems Approach**
- Coupling LED lights with Liners
- Adding
  - Hybrid Solar Systems
  - More Efficient A/C
  - Solar Power Refrigerators

- Expected 70% Savings
- ~$1M per year
Experimental Forward Operating Base
Informs Requirements / Mitigates Investment Risks / Builds Confidence

**Individual Marine and Company FOB**

**Phase I**
- Mar 2010
- Quantico, VA
- Baseline USMC Equipment

**Phase II**
- Mar 2010
- Quantico, VA
- COTS Evaluation

**Phase III**
- Jul 2010
- 29 Palms, CA
- Mojave Viper User Evaluation
  - Technologies
    - Renewable Power:
      - GREENS (300W continuous)
      - Solar regenerator (300W cont.)
      - Man Portable Power: SPACES
        — 62W Solar battery charger
  - Efficient Shelters:
    - LED Lighting (30-60% eff ↑)
    - Energy Efficient Tent Liners

**Phase IV**
- Aug 2010
- 29 Palms, CA
- Follow On Evaluation
  - May 2011
- 29 Palms, CA
- MCTOG COC
  - Technologies
    - Hybrid PV Power
    - Energy Efficient C4I
    - Solar Power DC ECU
    - Solar Power Cooling

**ExFOB 2011**
- 11-19 Aug 2011
- 29 Palms, CA
- COTS Evaluation
  - Technology Focus Areas
    - Concentrated Solar Harvesting & Passive Water Heating
    - Vehicle Efficiency
    - Efficient Exportable Vehicle Power

**Multi-Functional Team**

**India 3BN 5th Marines Deployment**
- 2 Patrol Bases 100% Renewable Powered
- 3 Week Foot Patrol w/o Battery Resupply
- 3rd Patrol Base 90% reduction in fuel

**Battalion Deployment TBD**
- Afghanistan for Evaluation
Questions?

USMC Expeditionary Energy Strategy & Implementation Plan
~21 Mar 2011 Release

ExFOB 2011 RFI
~ Currently on FedBizOpps.gov