REMM™ Expeditionary Power
Operational Energy System Solution

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Patents Pending
REMM™ Expeditionary Power
Mobile & Renewable Operational Energy

Presentation Outline
• DoD “Capability Gap” Challenge
• REMM™ System Inspiration
  – HEMTT A3 Heavy Tactical Vehicle
    • 100 kW Export Power
    • C130 / C17 Aircraft Compatible
    • Enhanced Load Handling System (ELHS)
  – Folding Blade Wind Turbine Innovation
• REMM™ Expeditionary Power Module
  – Design Configuration
    • Specifications / System Performance
    • Product Attributes / Discriminators
• Operational Demonstration Opportunities
CAPABILITY GAP CHALLENGE

• Power and Energy Innovation Workshop – July 2009
  – Army Requirement & Development Commands
    • TRADOC / ARCIC / RDECOM / TARDEC
  – All DoD Services represented
  – National Labs & Academia
  – Industry Experts

• Expeditionary Energy Surety “Help Needed”
  – Support and sustain operations in forward, austere locations
  – Operate with only what you carry in for an extended time period
  – Readily transported within existing military logistics infrastructure
  – Eliminate need for fossil fuel or greatly extend time for fuel resupply
Diesel Electric HEMTT A3
Exports 100 kW of Mil-Spec A/C Power

- Exportable A/C Power
  - 100kW @ 480V or 240V 60Hz
  - 86kW @ 416V or 208V 50Hz
  - 86kW @ 120V 50Hz or 60Hz

Katrina Support: Charity Hospital
New Orleans – Sept 2005

Oshkosh Co. Purchasing Office
Power Outage – June 2008

Wittman Field: Simulated Disaster
Oshkosh, WI – Sept 2001

REMM™ EXPEDITIONARY POWER
HEMTT A3 + ELHS = Logistics Enabler
Enhanced Load Handling System (ELHS)

- Transports 13-Ton Payload
  - 20’ Standard or CROP style Flatrack
- Loads/Unloads 13-Ton Cargo
  - Ground ↔ Truck
  - Truck ↔ Trailer
  - C130 ↔ Truck
- HEMTT A3 is C130 / C17 Transportable
REMM™ - Folding Turbine & Mobile System Concepts

- Natural Power Concepts
  - Technology Incubator Co.
  - John Pitre: Inventor & Founder
  - Multiple Patents Pending

- Technology Licensed to Oshkosh Defense

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Proof of Concept Folding Blade Turbine

- NPC / John Pitre Invention
  - Quarter scale working turbine
  - Initial testing in Hawaii
  - Energy production
  - Power conversion efficiency

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*Patents Pending*
REMM™ Expeditionary Energy - Concept Video
GVSETS / AUSA 2009
HEMTT A3 & PLS Trailer Transporting REMM™ Modules

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Oshkosh REMM™ Expeditionary Power Module Configuration – May 2011

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REMM™ in Transport Configuration

- Fold-out Solar Panels (RH side not shown)
- 10kW Diesel Generator
- 20kW Folding Blade Wind Turbine
- Power Distribution Box
- Energy Storage Battery Packs (under grating)
- Power Electronics Cabinet
- Outriggers / Solar Panel Support
- Electrical Fuse Box
- Transport Platform
- 3-section Telescoping Tower
- Operator Display
- Hydraulic Controls

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REMM™ Deployed

~40 ft

~32 ft

~20 ft

Note: 95 percentile soldier shown

REMM™ EXPEDITIONARY POWER
REMM™ Deployment Process
REMM™ Technical Demonstrator Specifications

• ISO container with REMM weighs ≤ 13 Tons

• REMM system output rating
  – Continuous output = 10kW
  – Peak output = 20 kW

• Wind turbine energy production
  ≥ 2.0 kW @ 10 mph wind
  ≥ 5.0 kW @ 14 mph wind
  = 20.0 kW ~ 25 mph wind

• Solar energy production
  ≥ 4.5 kW
REMM™ Technical Demonstrator Specifications (cont’d)

• Energy storage system features:
  – Two light weight Li-Ion battery packs
  – 4 hours of 10kW continuous output

• 10kW on-board backup generator
  – Needed to guarantee a 24 / 7 output system rating
  – DF2 / JP8 fueled with 24 hour fuel capacity
  – Automatically activated on demand

• Export power off-grid electrical distribution box
  – 120 V, Single-Phase A/C @ 60 Hz
  – 208 V, Three-Phase A/C @ 60 Hz
REMM™ System Attributes

- Renewable energy / transportable micro-grid solution
- For remote, austere locations / expeditionary or humanitarian missions
- 34’ or 38’ diameter blade sweep options
- Wind turbine designed to maximize energy conversion in low winds
- Folds for transport on 20 ft LHS transportable platform
- Slides inside a standard 8’ x 8.5’ x 20 ISO container
- Transports on a C-130 cargo aircraft
- Drive on/off C-17 aircraft capability on HEMTT A3 or PLS Trailer
- Operates as a stand-alone “off-grid” system
- Options for “grid-tied” REMM
- Automated, self-contained, self-managed control system
- Wireless remote system monitoring capability
REMM™ Product Discriminators

- Folding blade invention enables largest transportable wind turbine
  - **Size matters:** Blade swept area impacts wind energy production
  - Larger wind column = Greater wind energy conversion
- Designed around existing military transport logistics
  - 13-Ton LHS equipped Tactical Wheeled Vehicles (TWV)
  - C-130 and C-17 cargo air planes
  - Standard ISO container compatible
- Rolling micro-grid solution
  - Convenient set up, takedown, and redeployment
  - Options for off-grid / grid-tied solutions
  - Standalone micro-grid or micro-grid power source
  - Fully automated control with remote monitoring capability
Operational Demonstrations
Oshkosh Defense Planning in Process

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