DoD Mobile Electric Power Systems
Command Brief to EGSA

Mr. Paul Richard
Deputy Project Manager

March 2009
Outline

- Team MEP Overview/Strategic Framework
- PM MEP DoD Executive Agent Mission
- Equipping the Force
- Transforming the Force
- Battlefield Electric Power Integration
- Wrap-up
Team MEP Overview/Strategic Framework

Powering the Force
Matrix Support
- CECOM LCMC
  - CERDEC
- CECOM LCMC Logistics Readiness Center North
- CECOM LCMC Logistics Readiness Center South
- CECOM LCMC Readiness
- RDECOM
- CECOM LCMC Safety
- Support Contractors

Strategic Partners
- CECOM LCMC Acquisition Center Legal Office
- Aberdeen Test Center
- Prime Contractors
- Tank Automotive Command
- Depots
- Defense Logistics Agency
- Combined Arms Support Command

Project Manager
- Deputy Project Manager
  - Product Manager Small Systems (USMC)
  - Product Manager Medium Systems (USA)
  - Product Manager Large Systems (USAF)

Technical Management Division
- Director System of Systems Integration

Business Management Division
- Logistics Division

Strength
Core...............................24
Military............................4
Matrix Support ...............59
Contractor Support........22
109

RDECOM - Research Development and Engineering Command
CECOM - Communications Electronics Command
LCMC - Life Cycle Management Center
CERDEC - Communication - Electronics Research Development & Engineering Center
“All our (PEO C3T) accomplishments are the result of change.”

BG Nick Justice
PEO C3T All Hands Meeting
18 July 2008

Powering the Force
2008 Accomplishments

- Produced **9,923** generators
- Issued **11,577** generators
  - Fielded **130** Units with **1,798** generators
  - Completed **562** supply transactions with **5,674** generators
  - Filled **274** customer orders with **4,105** generators
- Customer Order Details
  - Other Services - **189** orders with **2,818** generators
  - Foreign Military Support – **16** orders with **163** generators
  - Other Army – **69** orders with **1,124** generators
- Trained **298** maintainers and **321** operators
2008 Accomplishments (continued)

- Successful 60 IECU Milestone C Decision
- Awarded first commercial contract for Power Distribution Illumination Systems, Electric
- Tactical Quiet Generator production surge execution
- Advanced Medium Mobile Power Sources Phase II execution
- Deployable Power Generation and Distribution System engine retrofit
- 9/18/36 IECU source selection
2008 Accomplishments (continued)

- Designated System of Systems Integrator (SOSI) for Battlefield Electric Power
- Received approval to establish a Product Director for Batteries position
- Designated as Umbrella Transition Manager for the Net Zero Plus Joint Concept Technology Demonstrator (NZ+ JCTD)
- Established cooperative Research, Development, Test, and Engineering (RDTE) programs
  - Co-generation, hybrid electric, and renewable
- PM MEP facilities expansion
Values
- Integrity – Quality - Innovation

Mission
- Provide standardized tactical electric power and environmental control capabilities to the Department of Defense in support of National Security

Vision
- Recognized as the Department of Defense leader for innovative power and environmental control solutions; known for the quality of our products and the excellence of our people
FY09 Strategic Priorities

- Equipping and Sustaining the Force
  - To equip and sustain power and environmental control capabilities to enable the preeminent military force on earth (Current Force)

- Transforming the Force
  - To develop integrated future power generation and environmental control systems that will significantly enhance performance and efficiency over current systems while simultaneously reducing the footprint on the battlefield (Future Force)

- Battlefield Power Management
  - Establish PM MEP as the DoD authority for Battlefield Power Management and Environmental Control

- Human Resources
  - Develop a human resources strategy to build and sustain a team of professionals dedicated to innovative power and energy solutions
PM MEP DoD Executive Agent Mission

Powering the Force
PM MEP Executive Agent Mission

**DOD Total Requirements**
125,125 Generator Sets
2,104,952 kilowatts (kW)

**Army**
- 102,493 Gen Sets (82%)
- 1,264,105 kW (60%)

**Marine Corps**
- 7,698 Gen Sets (6%)
- 179,802 kW (9%)

**Navy**
- 1,594 Gen Sets (1%)
- 84,588 kW (4%)

**Air Force**
- 13,340 Gen Sets (11%)
- 576,547 kW (27%)

**Assistant Secretary of the Army (Acquisition, Logistics and Technology)**

**Deputy Under Secretary of Defense (Logistics and Material Readiness)**

**Program Execution**
1965
Southeast Asia

Exorbitant Demand for Electrical Power

1967
DOD Ad Hoc Working Group Established

Vietnam

Excessive Proliferation: 2,000 different makes, models, and sizes

Ineffective Logistical Support

- Identified need for a Department of Defense Standard Family of Mobile Electric Power Generating Sources
- US Army designated as lead standardization activity
- Established Project Manager Mobile Electric Power to execute mission
- Codified in Department of Defense Directive and Joint Operating Procedures
Establish, maintain, and provide a DOD Standard Family of Mobile Electric Power Generating Source (MEPGS); includes follow-on fuel cells and thermoelectric devices

Provide advice and consultation on how to improve and/or expand the standardization of MEPGS across DOD

Approve/Disapprove all requests for non-standard MEPGS
### Army Battlefield Operating Systems

## Tactical Electrical Power Requirements

### Army Acquisition Objective

- **102,493 Generator Sets**
- **1,264,105 kW**

### Command and Control

- **8,728 Gen Sets (8%)**
- **103,634 kW (8%)**

### Maneuver

- **16,255 Gen Sets (16%)**
- **132,878 kW (10%)**

### Fire Support

- **2,769 Gen Sets (3%)**
- **16,276 kW (1%)**

### Air Defense

- **1,735 Gen Sets (2%)**
- **21,067 kW (2%)**

### Combat Support / Combat Service Support

- **68,439 Gen Sets (67%)**
- **967,084 kW (77%)**

### Mobility / Countermobility / Survivability

- **4,567 Gen Sets (4%)**
- **23,166 kW (2%)**
Equipping the Force

Powering the Force
Meeting Operational Needs

- **Operation in harsh environments**
  - High and low ambient temperatures
  - Dust
  - Reduced acoustic and thermal signatures
  - Low noise

- **High performance, rugged systems**
  - EMI/EMC/EMP
  - Shock resistance
  - Noise and vibration
  - Resistant to nuclear, biological, and chemical (NBC)

- **Deployability and flexibility**
  - Interoperability with NATO equipment
  - Fully transportable and mobile
  - Reliability and maintainability

- **Advanced control systems and human-machine interfaces**
  - Prognostics and diagnostics
  - Automatic sequencing and paralleling

**EMI/EMC/EMP** – electromagnetic interference/electromagnetic compatibility/electromagnetic pulse
Electric Power Generation & Distribution Programs

Small Sets
- 2kW Military Tactical Generator, manportable/skid mounted, AC (60Hz) and DC (28VDC)
- 3kW Tactical Quiet Generator, skid mounted, (60Hz & 400Hz)

Medium Sets
- 5kW, 10kW, 15kW, 30kW, 60kW, skid mounted, Tactical Quiet Generator, (60Hz & 400Hz)

Large Sets
- 100kW & 200kW Tactical Quiet Generator (TQG), skid mounted, (60Hz)
- 840kW Deployable Power Generation and Distribution System (DPGDS)

Power Units/Power Plants
- Trailer Mounted Tactical Quiet Generators in the 3kw, 5kW, 10kW, 15kW, 30kW, 60kW, 100kW, & 200kW power ratings
- 20 different models that use 4 different but standardized trailer models

Power Distribution Illumination System Electric
- Man-portable, reliable, modular, Quick Assembly Standardized electrical Management and Distribution System Components
- 40 AMP/Phase Distribution System
- 60 AMP Distribution System
- 100 AMP/Phase Feeder System
- 200 AMP/Phase Feeder System
- Utility Receptacle and Lighting Kit
Benefits and Savings

- Soldier Safety
- 24/7 operation of mission-critical equipment
- Reduction in spare parts, maintenance, fuel consumption
- Organically supported
- Reduce Division fuel consumption by 275k gallons per year
- Reduce Division maintenance by 71k hours per year
- Reduce carbon dioxide emissions by 2400 tons per year

Total Net Present Value Savings

- $5 million: 15 year peacetime scenario
- $150 million: 10 year peacetime/5 year low intensity conflict
- $200-250 million: 10 year peacetime/5 year high intensity conflict
Advanced Medium Mobile Power Sources (AMMPS)

- Third generation of Mobile Electric Power Generating Sources
- Replaces Tactical Quiet Generators (TQG)
- Employs advanced technologies to enhance power generation capability, improve engine control to achieve improved fuel efficiency, increase system reliability, reduce system size and weight, increase survivability for military applications, and reduce total ownership

- 5kW-60kW sizes
- Multi-fuel (JP-8, JP-4, DF-1, DF-2, DF-A)
- Reduced noise and IR signature
- More reliable
- Less weight
- High Altitude Electromagnetic Pulse (HAEMP) protected
- Total package fielding (logistically supportable)
- Power Units/Power Plants
- Less cost (procurement, support cost)
- Transportable (External Airlift Transport [EAT], 5 & 10kW air drop)
- Production 2010
Improved Environmental Control Units (IECU)

- 9, 18, 36 and 60k BTUH sizes
- Form, fit and function replacement of Military Standard Environmental Control Units (MIL-STD ECUs)
- Use R-410A refrigerant, the commercial industry’s standard
- Fully operable up to 125 °F
- Ruggedized for military environments
- Reduced power consumption up to 25%
- Reduced weight up to 30%
- Increased reliability 200% over current MIL-STD ECUs
- Soft start, limited inrush current
- NBC compatible and EMI protected
- Embedded diagnostics
- 9, 18, and 36k BTUH in source selection
- 60k BTUH in low rate initial production

BTUH - British Thermal Units per Hour
NBC – Nuclear, Biological, Chemical
EMI – electromagnetic interference
3-100kW TQG Modularity TPF Distribution Schedule (FY09)

**3-100kW TQG Fielding**

<table>
<thead>
<tr>
<th>OIF/OEF Reconstitution/ONS</th>
<th>1st Qtr</th>
<th>2nd Qtr</th>
<th>3rd Qtr</th>
<th>4th Qtr</th>
</tr>
</thead>
<tbody>
<tr>
<td>155 HBCT, CP McCain, MS (ARNG)</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>32 IBCT, CP Douglas, WI (ARNG)</td>
<td></td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>10 CSH, Ft Carson, CO (100kW)</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>115 FiB, Camp Guernsey, WY (ARNG)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 MEB, Ft Leonard Wood, MO</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I Corps TAC, Ft Lewis, WA (CPS)</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>41 IBCT, CP Wthycombe, OR (ARNG)</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>HQ 1ID/4-1ID, Ft Riley, KS (CPS)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-1AD Ft Bliss, TX (CPS)</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>36ID, 36 SUS, 72/36ID, Austin, TX (ARNG)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>86 IBCT, CP Johnson, VT (ARNG)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90/96 SUS/103 ESC, CP Robinson, AR (USAR)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-10 MTN, Ft Drum, NY (CPS)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>218 MEB, Eastover, SC (ARNG)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-28ID, FIG, PA (ARNG)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>141 MEB, TBD, ND (ARNG)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GTA45, TBD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiple, Region 2, TBD (USAR)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>121 CSH (100kW)/8A/2ID(-) (CPS), Korea</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35 CAB, Sedalia, MO (ARNG)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-1ID, Ft Riley, KS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-10 MTN, Ft Polk, LA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Legend:**
- ✓ COMPLETED
- **BLACK** – 3-60kW TQGs
- **GREEN** – Central Power Only
- **RED** – 100kW TQG only

As of 14 Jan 09
Fielding Facts

- CY06 4,396 Systems
- CY07 5,637 Systems
- CY08 7,472 Systems
- Normally, 50% of fielded systems each year supports emerging requirements.
- CY08 - 76% of our fielded systems supported unforcasted emerging requirements.
  - Example - 434 systems (27 truck loads from TYAD airlifted to Area of Responsibility (AOR) in 10 days)
- Two training teams and five fielders onboard (allows at least 24 hands-offs per year)
- Expanding effort to include Central Power and preparing to insert Improved Environmental Control Units (IECUs)
FY09 Funding

OPA Base Program  $224.8M
OPA Bridge  $20.0M
Total OPA  $244.8M

OPA TEP, 209.8
OPA IECU, 7.6
OPA Bridge, 20.0
RDTE IECU, 5.8
RDTE TEP, 9.4
OPA Withhold-IECU, 1.1
OPA Withhold-TEP, 6.3
OMA, 1.6

SMALL SETS, 29.5
MEDIUM SETS, 90.3
LARGE SETS, 9.9

PDISE, 29.2
PUPP, 77.2
IECU, 8.7

OPA – Other Procurement Army
TEP – Tactical Electric Power
RDTE – Research, Development, Test, and Engineering
OMA – Operations and Maintenance, Army
PDISE – Power Distribution Illumination System Electric
PUPP – Power Units/Power Plants
IECU – Improved Environmental Control Units
FY11-15 Resourcing Priorities

1. **Equipping the Force:**

   - Obtain full funding for Tactical Electric Power to procure hardware to meet Data Interchange (DI) requirements, Operation Iraqi Freedom/Operation Enduring Freedom (OIF/OEF) life support and Theatre Provided Equipment (TPE) retrograde requirements.

2. **Transforming the Force:**

   - Obtain funding to award System Development and Demonstration (SDD) contracts for STEP (Small Tactical Electric Power) and LAMPS (Large Advanced Mobile Power Sources) development.

3. **Setting the Force:**

   - Obtain funding for several HQDA/DoD directed programs: PdD Batteries, TPE Retrograde, Intelligent Power Management (IPM), DI, Cascade, Army Prepositioned Stocks (APS) Growth
# Power and Environmental Control Migration

## Past

### Environmental Control Units
- Military Standard Environmental Control Units

### Electric Power Generation
- Military Standard Generators

### Electric Power Distribution
- Distribution Illumination Systems Electrical (DISE)

## Present

### Improved Environmental Control Units

### Tactical Quiet Generators

### Power Distribution Illumination Systems Electric (PDISE)

## Future

### Central Cooling Solution

### Next Generation Power Sources
- AMMPS
- LAMPS
- STEP

### Alternative/Hybrid Energy

### Intelligent Power Distribution

---

**Technology Driven Warfighter Focused**
# Tactical Electric Power and IECU Contracts

## Overview

- **AMMPS**: Cummins Onan Advanced Medium Mobile Power Sources
- **IECU**: Improved Environmental Control Unit
- **LAMPS**: Large Advanced Mobile Power Sources
- **STEP**: Small Tactical Electric Power
- **TQG**: Tactical Quiet Generator

### Power Distribution
- **Illumination System Electrical**

### Power Systems

<table>
<thead>
<tr>
<th>FY07</th>
<th>FY08</th>
<th>FY09</th>
<th>FY10</th>
<th>FY11</th>
<th>FY12</th>
<th>FY13</th>
<th>FY14</th>
<th>FY15</th>
<th>FY16</th>
</tr>
</thead>
<tbody>
<tr>
<td>RDTE</td>
<td>PROD</td>
<td>PROD</td>
<td>RDTE</td>
<td>PROD</td>
<td>PROD</td>
<td>PROD</td>
<td>PROD</td>
<td>PROD</td>
<td>PROD</td>
</tr>
</tbody>
</table>

- **60k BTUH**: DRS
- **9, 18, 36k BTUH**: TBD
- **120k BTUH**: TBD

### Small Tactical Electric Power
- **2kW MTG**: Dewey Elec Military Tactical Generator

### Large Advanced Mobile Power Sources
- **5, 10, 15kW TQG**: DRS Tactical Quiet Generator
- **30 & 60kW TQG**: L-3 Tactical Quiet Generator
- **100 & 200kW TQG**: DRS Tactical Quiet Generator

### Other Systems
- **PDISE**: Tobyhanna Army Depot/Fidelity

### Production Phases
- **Re-buy**
- **Begin AMMPS**
- **Begin LAMPS**

---

*Power Employees: Toby FY07–08/Fidelity FY09–13 PRODUCTION*
Planned Upcoming Business Opportunities

- 120k BTUH Co-generation: market survey 2QFY 2009/prototype procurement 3QFY2009
- HI-Power Phase II BAA: industry day/contract awards 2QFY2009
- Tactical Quiet Generator Cascade Program: RFP 3QFY 2010/contract award 1QFY2009
- Small Power Sources Production Rebuy (2 & 3kW generators) FY2011
- Advanced Medium Mobile Power Sources competitive re-buy: FY2011 or 2012
- Large Advanced Mobile Power Sources development: contract award 3QFY2010
- Small Tactical Power Systems development: contract award 1QFY2012

BTUH – British Thermal Units per Hour
RFI – Request for Information
BAA – Broad Area Announcement
RFP – Request for Proposal
Transforming the Force
# Hybrid Intelligent Power (HI-Power)

## Project Objective
- To develop a general Hybrid Intelligent Power Management architecture that demonstrates:
  - Feasibility of Autonomous source and load side management
  - Compatible interface and operation with legacy equipment
  - Reduction in fuel consumption by >25%
  - Fault tolerance and ability to handle transient events
  - Ability to automatically parallel multiple sources
  - Scalability/Flexibility from 2kW – 200kW
  - Plug and Play Capability

## Execution
- OSD funded
- PM MEP Program Lead
- CERDEC Technology Lead
- Support contracts
  - Electricore, Inc.
  - I-Power Energy Systems, LCC

## Sources
- HI-Power provides...
  - Plug & Play connectivity
  - Intelligent control
    - Source management
    - Load management
      - Load shedding
      - Peak shaving
      - Load prioritization
      - Phase balancing
  - Legacy interoperability
    - TQGs
    - PDISE

## Loads
- Data
- Power

---

OSD – Office of the Secretary of Defense  
CERDEC – Communications and Electronics Research Development and Engineering Center  
TQG – Tactical Quiet Generator  
PDISE – Power Distribution Illumination System Electric
Phase II SBIRs Supporting HI-Power

- **Williams-Pyro; Microgrid Development**
  - Design and fabricate a modular and portable Intelligent Energy Control System (IECS) which is scalable, robust and compatible with a plug-n-play architecture.
  - Integrate advanced sensor technologies into all the source and load platforms for accurate feedback to the power management and command and control.
  - Demonstrate the IECS proof of concept at the end of Phase II at Fort Belvoir, Virginia
  - Mainstream Engineering; Oxygen-Enriched Combustion
  - PM MEP funded/CERDEC execution

- **Intelligent Power and Energy Research Corporation; Microgrid Architecture and Algorithms**
  - Coordinate the dispatch of sources with prioritized demand shedding
  - Develop predictive algorithms for system control
  - Office of the Secretary of Defense (OSD) funded/CERDEC execution
Intelligent Power Management

I-100 is an intelligent power distribution box that offers:

- Power management for Command Posts (CP)
- Reduced training needed to establish and maintain an effective power grid
- Improved utilization of power assets
- Reduced fuel consumption
- Compatibility with current line of PDISE power distribution equipment
- Automatic Phase Load Balance
- Input Qualification & Power Management
- Rugged Design for Environmental Survivability

Execution

- Defense Challenge Program co-funded by PM-MEP
- PM MEP will transition I-100 to production and fielding in 2011.

PDISE – Power Distribution Illumination System Electric
Net Zero Plus (NZ+)
Joint Capabilities Technology Demonstration

Objective: Demonstrate a Forward Operating Base operating on reduced energy consumption

DEMAND
Enduring energy efficient structures and technologies reduce energy consumption through minimized air infiltration, low power devices, and efficient environmental control.

INFRASTRUCTURE
A system of distribution that precisely measures, analyzes, and connects the flow of power between energy consuming and producing devices

SUPPLY
Reduces fuel consumption by generating power through a combination of renewable, traditional and alternative power generation

ENDURING ENERGY EFFICIENT STRUCTURES
Monolithic Domes
External Insulation for Temporary Structures

INFRASTRUCTURE
Utility Survey
Remote Metering/Assessment

SUPPLY
Renewable/Hybrid Power

Enduring Energy Efficient Technology
LED Lights
Geothermal Heating, Ventilation, and Air Conditioning (HVAC)

Distribute, Manage, Monitor, Store, Meter
Intelligent Power Management
Mobile Electric Power System

- Project Manager, Mobile Electric Power Initiative with Department of Energy National Renewable Energy Lab
- “Power Block” based on advanced power electronic interfaces
- Follow-on to initial Tactical Hybrid Electric Power System (THEPS) effort by the Rapid Equipping Force and leveraging micro-grid efforts underway at Tank and Automotive Research Development and Engineering Center (TARDEC), Corps of Engineers, and Defense Logistics Agency

- Single Point-Source System, but can interface with other sources
- Hybrid Capability
- Plug & Play connectivity
  - Sources
  - Loads
- Intelligent control
  - Source management
  - Load management
    - Load shedding
    - Peak shaving
    - Load prioritization
    - Phase balancing
- Phase balancing
- Legacy interoperability
  - Tactical Quiet Generators (TQGs)
  - Power Distribution Illumination System Electric (PDISE)
Tactical Intelligent Power System (TIPS)

- Cooperative Research and Development Agreement with DRS Technologies Inc.
- Based on hybrid electric HMMWV technology
- 75kW rating with additional 18kW peak capability
- Lithium-ion battery backup

- Enables full-load/high efficiency operation; engine off power at low loads
- Intelligent control system for load prioritization and source control
- Contractor system to be tested Spring 2009 to quantify benefits

Similar Systems Approach And Capabilities across the Power Spectrum for Mobile and Fixed Applications

Hybrid Energy HMMWV (XM1124)
University Research

- Active Control of Noise Radiated from Portable Army Diesel Generator Sets

- Automated Optimal Design Codes for Man-portable Power Systems

- Multi-Objective Optimization of Small Tactical Electric Power Units for Reduced Noise and Increased Power Density

- Improved Small Engine Electric Generators by Computational Fluid Dynamics (CFD) Modeling and Experiments
Tactical Electric Power Technology Gaps

- **Power and energy density improvements**
  - Dramatic improvements in power and energy densities required
  - Applicable to engines, batteries, fuel cells, and generators
  - Offers dramatic improvements in operational performance and logistics reduction

- **Fuel efficiency improvements**
  - Reduces logistical burden and costs
  - Applicable to internal combustion, turbine, fuel cells and Stirling engine

- **Renewable energies and fuels**
  - Alternative fuels to reduce energy dependency
  - Includes solar and alternative (bio-diesel and trash-to-waste)

- **Thermal management and co-generation**
  - Improved, lightweight, efficient thermal management techniques to reduce parasitic energy losses
  - Development of co-generation power sources to improve efficiency

- **Power demand/fuel consumption reductions**
  - Materials, techniques, and products designed to reduce power consumption in militarily relevant products

- **Improved power management and distribution**
  - Materials, techniques, software, and products that provide improved grid diagnostics, load-balancing, efficiency, and redundancy
Powering the Force

Battlefield Electric Power Integration
Energy Security Challenge Paradigm

Supply
- Conventional fossil fuels
- Synthetic fossil fuel (e.g. coal, shale oil and tar sands derived fuels)
- Alternative fuels (e.g. biodiesel, alcohols, hydrogen, etc.)
- Renewables (e.g. solar, geothermal, wind)
- Novel supply (e.g. fuel cells)
- Exotics (e.g. isomers)

Demand
- Conservation initiatives
- Fixed base
- Tactical base
- Platforms
- Efficiency
- Life cycle cost

Direct oil/fossil fuel costs
Policy, processes and risk assessment
Refining Capacity
Doctrine

Assured Distribution
Convergence for Energy Security
OSD Energy Strategic Objectives

- Maintain or enhance operational effectiveness while reducing total force energy demands
- Increase energy strategic resilience by developing alternative/assured fuels and energy
- Enhance operational and business effectiveness by institutionalizing energy considerations and solutions in DoD planning and business processes
- Establish and monitor Department-wide energy metrics

2007 – ESTF analysis results in $300M+ plus-up in Power & Energy
2008 – Congress directs OSD establish an “energy czar” position
2008 – Army establishes Energy Security Task Force to develop way-forward
2008 – Army establishes Senior Energy Council & establishes an Executive level position responsible for energy activities

SECDEF – Secretary of Defense
DDRE – Director of Defense Research and Engineering
OSD – Office of the Secretary of Defense
Generators are the Army’s single largest user of fuel on the battlefield during wartime.*

<table>
<thead>
<tr>
<th>Category</th>
<th>Peacetime OPTEMPO</th>
<th>Wartime OPTEMPO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combat Vehicles</td>
<td>30</td>
<td>162</td>
</tr>
<tr>
<td>Combat Aircraft</td>
<td>140</td>
<td>307</td>
</tr>
<tr>
<td>Tactical Vehicles</td>
<td>44</td>
<td>173</td>
</tr>
<tr>
<td>Generators</td>
<td>26</td>
<td>357</td>
</tr>
<tr>
<td>Non-Tactical</td>
<td>51</td>
<td>51</td>
</tr>
<tr>
<td>Total</td>
<td>291</td>
<td>1040</td>
</tr>
</tbody>
</table>

Army Fuel consumption in peacetime and wartime (million gallons per year)

Establishes PM MEP as System of Systems Integrator (SOSI) for Battlefield Electric Power Integration

Expands PM MEP charter across entire electric power spectrum for the Army

Captures and defines
- Electric power generation
- Electric power consumption
- Battlefield electric power architecture
Battlefield Power Architecture Vision

- **Approach**
  - Holistic Power Architecture
  - Scalable, Integrated Micro-grids
  - Intelligent Power Management
  - Distributed Power Sources
  - Plug-and-Play Capability

- **Benefits**
  - Increased Capability
  - Improved Efficiency
  - Reduced Fuel Consumption
  - Smaller Logistics Footprint
  - Power Surety
Battlefield Electric Power Challenges

- Integrated and Intelligent Battlefield Power Management
- On-board Vehicle Power (APUs, hybrids, energy storage)
- Large Power Sources
  - Forward Operating Bases/Combat Outposts
  - Prime Power/Directed Energy Weapons Systems
- Low Power Systems
  - Soldier power (battery replacements or hybrids)
  - Battery standardization
  - Unattended ground sensors power
- Fuel reduction and use of alternative renewable energies
PM MEP Battlefield Electric Power Initiatives

- Designated as the Army’s System of Systems Integrator for Battlefield Electric Power
  - Identify current and planned electric power generation/consumption requirements
  - Identify/characterize Forward Operating Base/Combat Outpost power requirements
  - Develop integrated battlefield electric power architecture

- Establishing Army-directed Product Director for Batteries
  - Central authority for development and acquisition
  - Develop standard family of batteries for military application

- Developing improved Intelligent Power Management and Hybrid-Intelligent Power (HI-Power) systems architectures

- Developing Prototype Hybrid Energy Systems
Wrap-up
Dynamic times are ahead.

Remain flexible and adaptive.

Focus on unity of effort to achieve a greater good.

Remember, we are a Nation at war.

We are a TEAM!

**Government & Industry Working Together**

**To support our Nation’s soldiers**
Points of Contact

- **Mr. Michael Padden**
  - Project Manager, Mobile Electric Power
  - michael.padden@us.army.mil
  - 703-704-3162

- **Lt Col Thomas Bowers (USMC)**
  - Product Manager, Small Power Systems (0.5-3kW)/Improved Environmental Control Units (IECU)
  - thomas.s.bowers@us.army.mil
  - 703-704-3160

- **LTC Gordon (Tim) Wallace (USA)**
  - Product Manager, Medium Power Systems (5-60kW)
  - gordon.wallace@us.army.mil
  - 703-704-3155

- **Lt Col Bob Thoens (USAF)**
  - Product Manager, Large Power Systems (100-920kW)/Power Distribution Illumination System Electrical (PDISE)
  - bob.thoens@us.army.mil
  - 703-704-0132