Department of Defense
Project Manager Mobile Electric Power (PM MEP)

EGSA Government Relations
Session: Army R&D Efforts

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Current Programs

Military Tactical Generator
- 2kW
- 3kW
- 5kW
- 10kW
- 15kW
- 30kW
- 60kW
- 100kW
- 200kW

Tactical Quiet Generators

Power Units/Power Plants (PU/PP)

Power Distribution Illumination System Electrical (PDISE)

Deployable Power Generation & Distribution System (DPGDS)
- 840kW

Advanced Medium Mobile Power Sources (AMMPS)
- 5kW
- 10kW
- 15kW
- 30kW
- 60kW

Improved Environmental Control Unit (IECU)

9/18/36/60k BTUH
Research and Development Programs

Small Power Sources/Advanced Power Sources
- 25-300W
- 1kW Diesel
- 100-200kW LAMPS (Large Advanced Mobile Power Systems)

Alternative/Renewable Power
- Green CP (Command Post)
- FAST Demo (Field Assistance in Science and Technology)
- Energy Storage
- NZ+ JCTD (Net Zero Plus Joint Capabilities Technology Demonstration)
- Co-Generation
- Integrated Systems

Intelligent Power Management and Distribution
- Automatic Phase Balancing (Three-Phase to Single-Phase)
- HI-POWER (Hybrid Intelligent)
Hierarchy of Tactical Electric Power Requirements

WARFIGHTER OUTCOMES

Future Years Defense Plan FY 12-17

DOTLMPF Solutions (Programs of Record)

Capability Needs Analysis

Development Programs
- AMMPS
- LAMPS
- STEP

Future Concepts FY 17+

Joint/Army Concepts

Future Operational Capabilities

Technology Gaps/S&T Programs
- Concept Demonstrations
- University Research
- ATO/SBIR

DOTLMPF: Doctrine, Organizations, Training, Leader Development, Materiel, Personnel and Facilities
AMMPS: Advanced Medium Mobile Power Sources
LAMPS: Large Advanced Mobile Power Sources
STEP: Small Tactical Electric Power

S&T: Science and Technology
ATO: Army Technology Objective
SBIR: Small Business Innovation Research
Power and Energy (#3 Army S&T Priority)
Provide enhanced agility to operate worldwide by:
- Reducing by half the weight and volume of fuel associated with powering the force
- Providing combat platforms up to 30 MJ of pulsed power for lethality and 20% increase in continuous power
- Providing excess capacity for on/off board electrical power use while increasing fuel economy by 40%
- Providing dismounted Soldiers a fourfold increase of available power, above current 12.3 Watt/HR at half the tactical weight
Improved power density
Improved fuel efficiency
Lighter, more efficient power conversion
Holistic, intelligent power management and control
Intelligent power distribution systems
Diesel-fueled systems <2kW
Improved energy storage (e.g. battery power/energy densities)
Lighter, more efficient ECUs
Increased reliability and reduced maintenance
Prognostics/diagnostics/central monitoring
Ability to incorporate alternative energy into tactical systems
Technology Gaps rolled up into potential Thrust Areas:

- Crosses product lines
- Leverages common technology efforts
- Simplifies reporting
Technology Gaps
PM-MEP

- Improved power density
- Improved fuel efficiency
- Lighter, more efficient power conversion
- Holistic, intelligent power management and control
- Intelligent power distribution systems
- Diesel-fueled systems <2kW
- Improved energy storage (e.g. battery power/energy densities)
- Lighter, more efficient ECUs
- Increased reliability and reduced maintenance
- Prognostics/diagnostics/central monitoring
- Ability to incorporate alternative energy into tactical systems

PM MEP RDTE STRATEGY THRUST AREAS

- Conventional generator improvements
- Smaller power sources (<2kW)
- Alternate/Renewable power
- Power distribution and control
- Environmental control
Large Advanced Mobile Power Sources (LAMPS)

- LAMPS will replace 100kW and 200kW Tactical Quiet Generators (TQG)
- RDT&E phase to implement advanced technologies to:
  - Enhance power generation capability
  - Improve fuel efficiency
  - Increase system reliability
  - Reduce system size and weight
  - Increase survivability for military applications
  - Reduce total ownership costs
- Signal suppressed & EMI protected
- Capable of starting & operating in extreme climatic and tactical military environments
- EPA current tier certified engines
- Fielding recommendations incorporated into CPD
- TQG and LAMPS units will parallel together (100 and 200kW sets only)
Small Fuel Cells

- 25-250W
- Many different technologies
- Packaged fuels (methanol, propane)
- Soldier power, remote sensors, unmanned platforms
- Initial theater demonstrations planned for this year
JP-8/Diesel Conversion of Honda 1kW Set

- **Benefits**
  - One Fuel Forward
  - First single-soldier portable diesel system
  - 2x power density compared to the 2kW

- **Equipment Uses**
  - Battery charging, remote sensors, C4ISR suites, CS/CSS
  - Backup for small PV/battery systems
  - PEO Soldier (Battery charging)
  - PM-Robotics
  - PEO-STRI
  - SOCOM

- **Contractor**
  - Foster-Miller, Waltham, MA
  - Systems to support Army field experiment

- **Follow-on Development**
  - Defense Acquisition Challenge Program for 10’s of units; further evaluation and test
  - Open competition
  - Transition to production

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Right Sizing Generators for Fuel & Weight Savings

2kW MTG
- 2,000 W
- 156 lbs
- 4-soldier carry

Modified Commercial Generator
- 900 W
- 33 lbs
- 1-soldier carry

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Emerging needs from Afghanistan for remote site fuel reduction.


PM-MEP effort initiated at National Renewable Energy Laboratory to evaluate Off-The-Shelf solutions; develop spec for standardization and performance.

Niche applications

Mission-specific

Weight Estimates for Solar Array only Array is at optimal tilt.
Hybrid - Mobile Electric Power Generating System

Project Execution:
- 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 Source (THEPS) effort by the Rapid Equipping Force, and leveraging microgrid efforts underway at TARDEC, Corps of Engineers, and Defense Logistics Agency

Project Objective:
- Single Point-Source System, but can interface with other sources
- Embedded Alternative Energy
- 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 Intelligent Power System (TIPS)

Project Execution:

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

Project Objective:

- Enable full-load/high efficiency operation; engine-off power at low loads
- Intelligent control system for load prioritization and source control
- System to be tested Spring 2010 to quantify benefits

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

Hybrid Energy HMMWV (XM1124)
**Demand**

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

**Infrastructur**

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.

### Project Objective:

Demonstrate a Forward Operating Base operating on reduced energy consumption.

### Project Execution:

- Operational Manager: CENTCOM
- Technical Manager: OSD PSTF
- Transition Manager: PM MEP
Improved Legacy Power Distribution

Project Objective:

- More efficient lighting
- Increased safety features (GFCI, open ground detection)
- Automated planning/layout tool (AutoDISE) w/ better user interface
- Improved training and designated “power grid planners”
- Improved environmental capabilities
- Lower cost
Intelligent Power Distribution

- Simplified power distribution for Command Posts
- 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

Vehicles: Connect as Mission Requires

Compatible with existing line of PDISE
Automatically balances loads in CP
Tactical Quiet Generator (TQG) Set

Project Objective:

Project Execution:
- OSD Defense Acquisition Challenge Program co-funded by PM-MEP
- PM MEP will transition to production and fielding in 2011.
- Contracts awarded to CME and LEX Products.
- Down-select after testing and award production options.
# 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

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

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

## Loads
- Data
- Power

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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
>50% of tactical electric power is used for cooling

Potential to save fuel through more efficient generation of cooling; save weight through more efficient packaging

Three stages of Integration
- Common Packaging
- Integrated System (shaft-driven compressor)
- Heat-driven Cooling System

$6M in RDECOM Energy Stimulus funds

CHAMMPS Characteristics
- 15kW output power @ 0.8 power factor
- 21kW heating capacity
- 60k BTU/hr cooling capacity
- Renewable Energy Interface
- Digital Control Panel
- Condition Based Maintenance
- Trailer-mounted capacity
- Designed to MIL-STD-1332B, 461 and 810