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# **Lightening the Load:** ***Defining the Path Forward***

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# Agenda

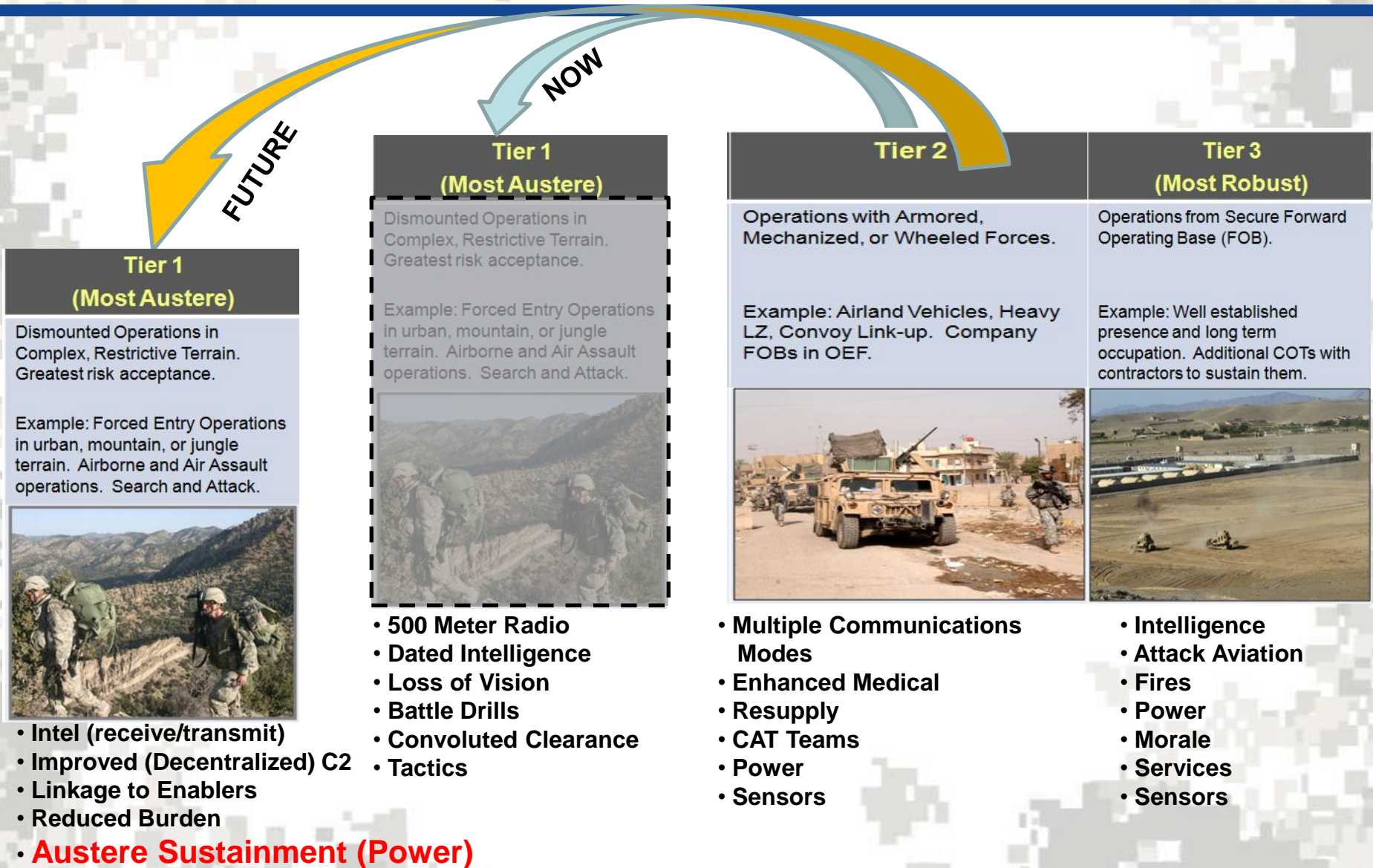


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- Scope the Problem
- Operational Requirements
- Priorities of Effort
- Gaps
- Gap / Solution Crosswalk



# Enhancing the Now





# Problem



***The sharp rise in Soldier worn capability has resulted in a dramatic increase in the numbers, and variety of batteries carried by the Warfighter. This trend is unsustainable from a Soldier load and logistical perspective.***

## **Symptoms:**

- Trade-offs for power in way of mobility, lethality, and agility
- Decreased Unit/Soldier range and endurance - limits mission duration & engagement time
- Increased fatigue (increased energy expenditure results in carrying more water and food)
- Overly frequent halts in operations to swap batteries
- Excessive sustainment footprint
- Cost:
  - Lives
  - Medical
  - Procurement (Military specific applications & cost for new battery R&D)
  - O&M (sole-source batteries)
  - Transportation (compounds with distance)

## **Causes:**

- ***Soldier Load (volume, weight and configuration which limit mobility)***
- Dramatic increase in power and energy for Soldier support equipment
- Battery proliferation (too many types, voltages, power)
- No effective means to generate power in an austere environment
- Lack of Soldier confidence in battery state of charge



# Problem to Impact



Problem	Contributing Factors	Corrective Action
Soldier Load	Water	No direct fixes
	Food	No direct fixes
	Power / Batteries	Next generation family of batteries
		Small unit power generation / recharging
		Reduced system power demand
		Power monitoring and management
	Ammo	Lightweight Small Caliber Ammunition (20% reduction)
	Body Armor	Soldier Protection System (10-15% reduction)
	Medical	No significant direct fixes



# Walking the Dog: Problem to Impact



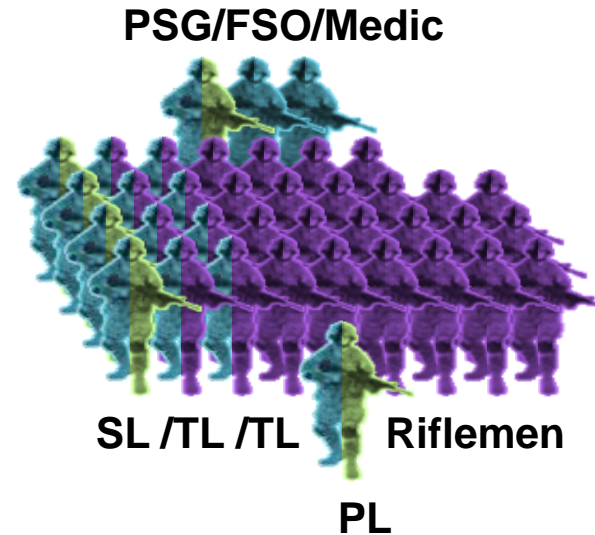
Contributing Factors	Corrective Action	Benefit 1 <sup>st</sup> order	Benefit 2d order
Water	No direct fixes	Trade Space for Additional food/water	Small Unit agile and flexible to remain in contact with enemy/people.
Food	No direct fixes		
Power / Batteries	Next generation family of batteries	Reduced Weight	
	Small unit power generation / recharging	Same or Increased Power	
	Reduced system power demand	Inherent Base Power	
	Power monitoring and management	Power Generation	
Ammo	Lightweight Small Caliber Ammunition (20% reduction)	Trade Space for Additional CL V/FP/MED or PLT EQUIP	
Body Armor	Soldier Protection System (10-15% reduction)		
Medical	No significant direct fixes		



# 2010 Infantry Rifle Platoon 72 Mission Hour Requirement

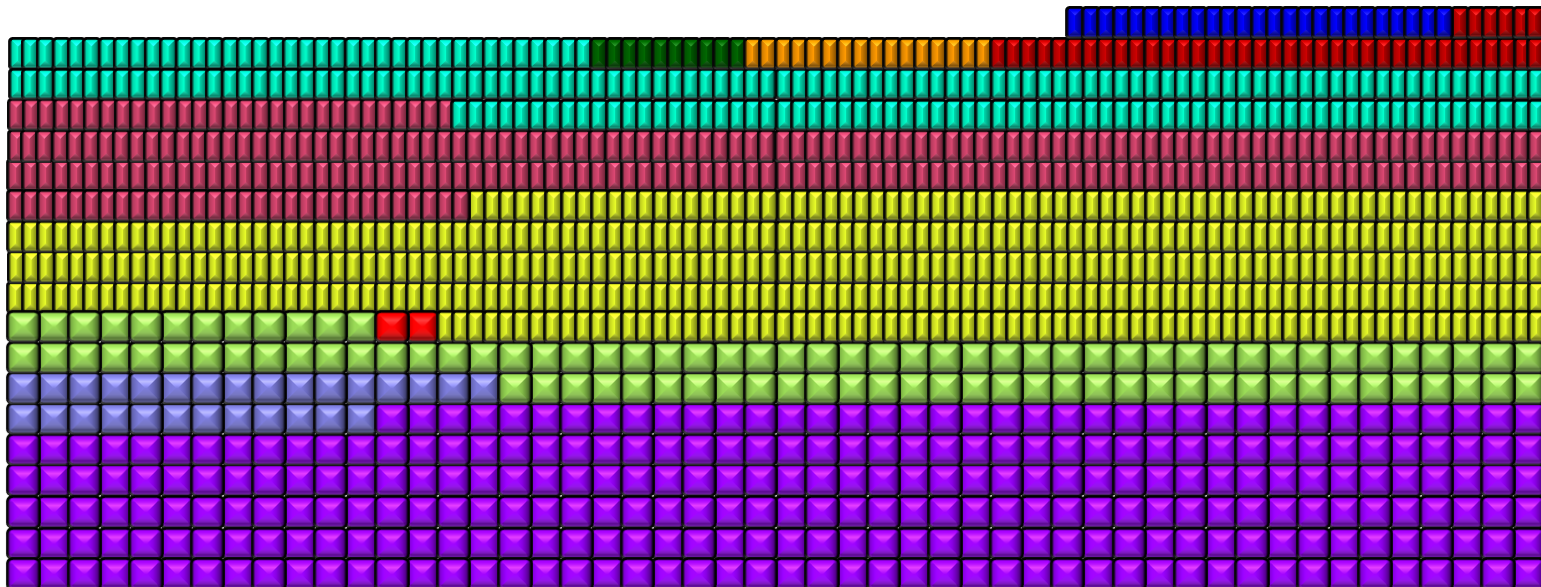


11 Battery Types,  
1418 Batteries,  
Per Platoon,  
412-436 LBS for a 72 Hour  
Mission



## Basis of issue (BOI)

- DL1/3N
- 9V
- 9V Lithium
- ½ AA
- DL123A
- AA Alkaline
- AA Lithium
- MARK VII
- MBITR Radio
- BA5590/BB2590
- LMR



*Based on 2010 CERDEC/MCOE analysis; assumes BOI systems are carried/worn*





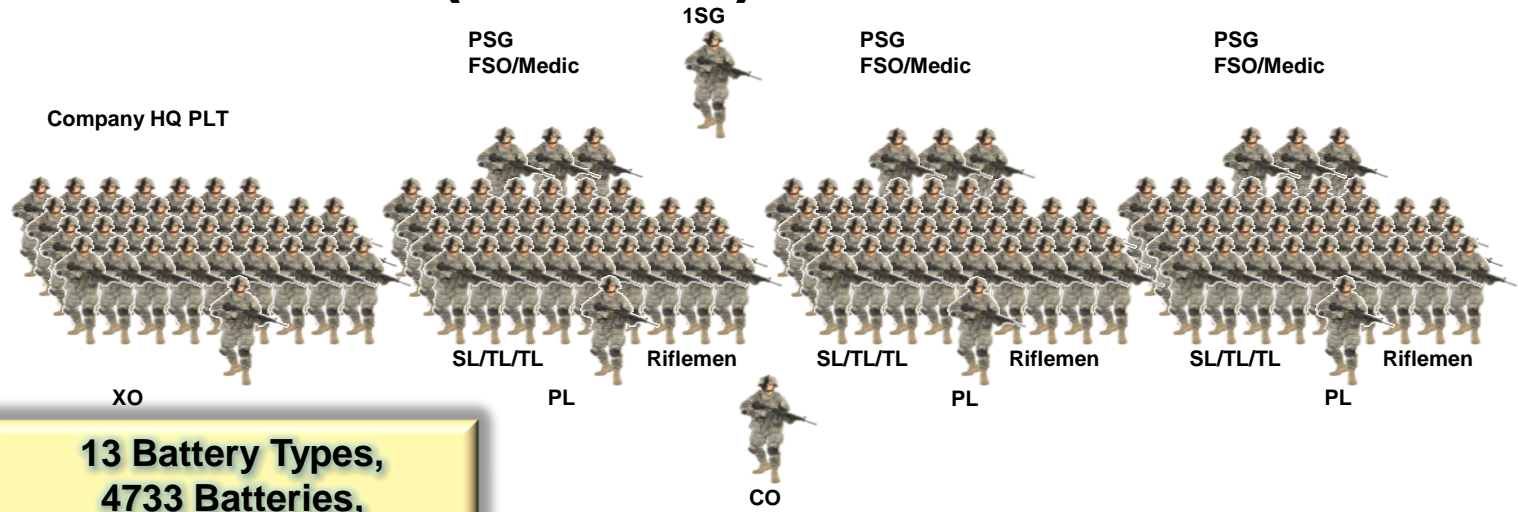


# 2010 Infantry Rifle Company 72 Mission Hour Requirement (Cont'd)

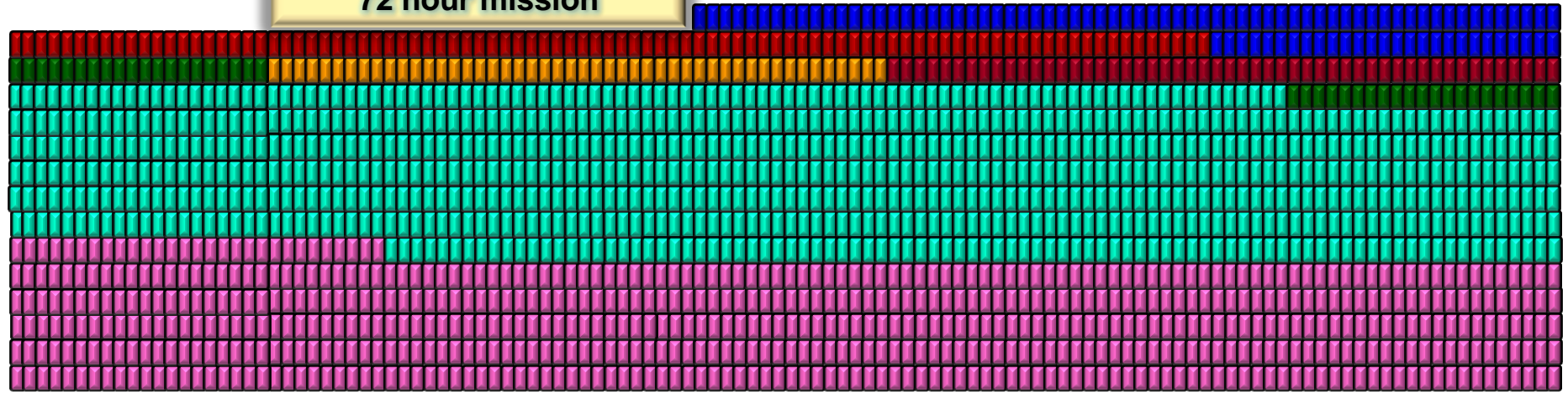


**Basis of issue (BOI)**

- DL1/3N
- 9V
- 9V Lithium
- ½ AA
- DL123A
- AA Alkaline
- AA Lithium
- MARK VII
- MBITR Radio
- BA5590/BB2590
- LMR
- BA5557
- BA5699



**13 Battery Types,  
4733 Batteries,  
Per Company,  
1413-1557 LBS for a  
72 hour mission**



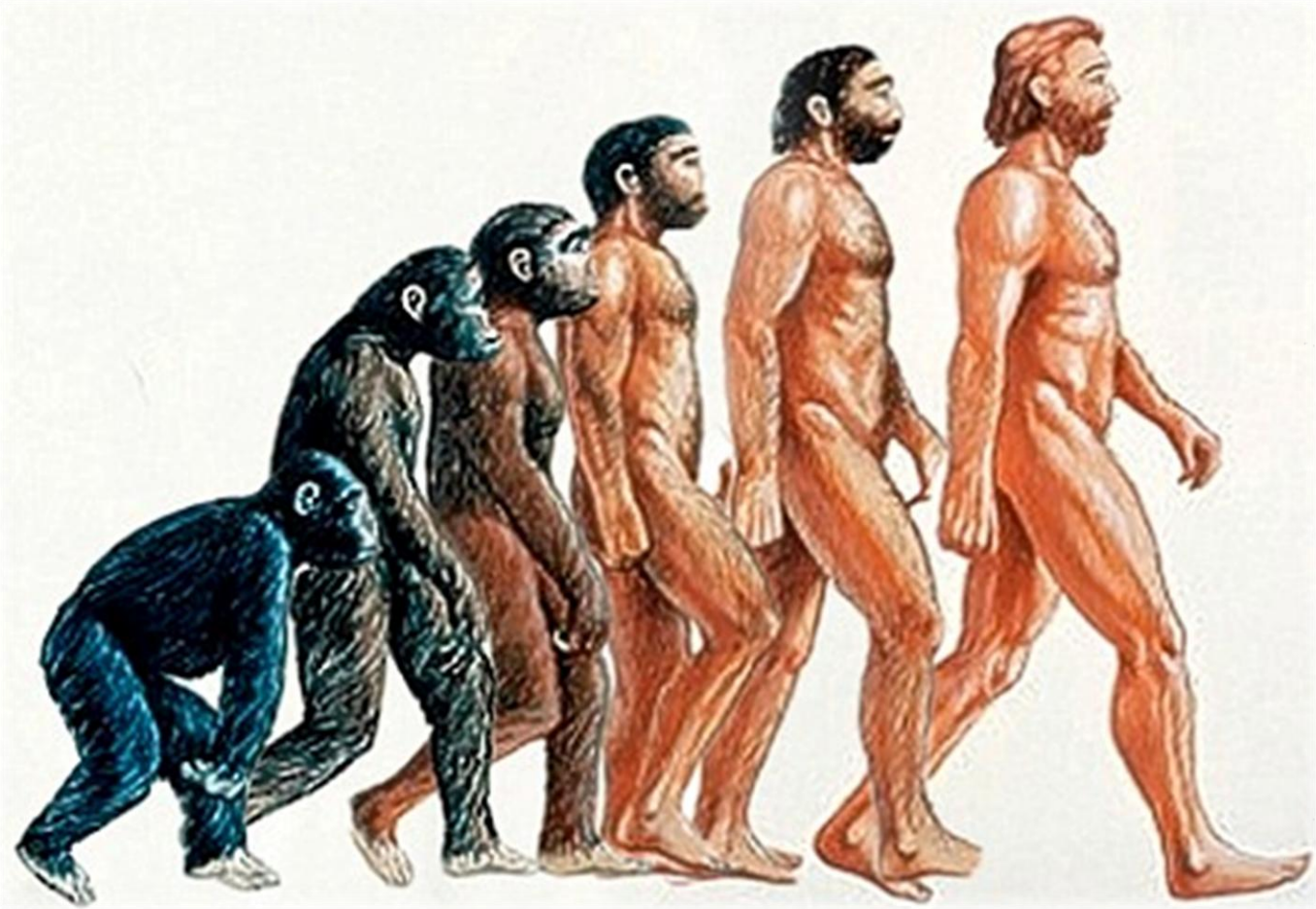
*Based on 2010 CERDEC/MCOE analysis; assumes BOI systems are carried/worn*



# How did we go back in time?



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WEIGHT





# MCoE Soldier Priorities of Effort



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- Develop Strategy, Plan, Metrics, Objectives
- Define Efforts
- Determine and Document Requirements
- Establish MCoE Soldier Power management construct
- Determine Funding Requirements
- Guide Policy and Regulatory Guidance
- Implement Solutions



# Operational Energy ICD Gaps



<b>1</b>	<b>Power source duration</b>
<b>2</b>	<b>Energy management processes</b>
<b>3</b>	<b>High efficiency energy conversion &amp; distribution systems</b>
<b>4</b>	<b>Common power source for Soldier Systems</b>
<b>5</b>	<b>Energy demand</b>
<b>6</b>	<b>Energy interoperable interfaces</b>
<b>7</b>	<b>Widely dispersed power generation</b>
<b>8</b>	<b>Engagement systems</b>
<b>9</b>	<b>Petroleum energy systems</b>
<b>10</b>	<b>Tactical energy conversion and distribution</b>
<b>11</b>	<b>Institutional Energy Awareness</b>
<b>12</b>	<b>Single fuel standard</b>
<b>13</b>	<b>Refueling and rearming operations</b>
<b>14</b>	<b>Bulk fuel, liquid storage and distribution systems</b>
<b>15</b>	<b>Alternative energy sources</b>
<b>16</b>	<b>Interoperability with non-US military systems</b>

Note: Operational Energy ICD signed by LTG Vane, 31 JAN 2011; currently in Army staffing

**\*\*Grayed areas apply more to platform, base camp, or aviation\*\***

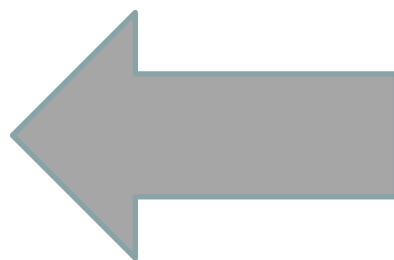
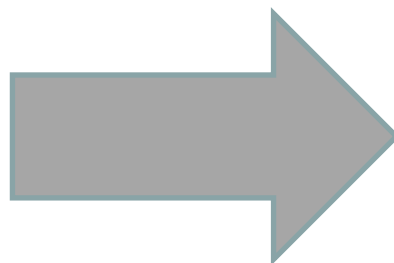


# Army ↔ USMC Comparison



## Army Gaps

1	Power source duration (Soldier, aerial platforms, ground systems)
2	Energy management processes
3	High efficiency energy conversion & distribution systems
4	Common power source for Soldier Systems
5	Energy demand
6	Energy interoperable interfaces
7	Widely dispersed power generation
8	Engagement systems
9	Petroleum energy systems
10	Tactical energy conversion and distribution
11	Institutional Energy Awareness
12	Single fuel standard
13	Refueling and rearming operations
14	Bulk fuel, liquid storage and distribution systems
15	Alternative energy sources
16	Interoperability with non-US military systems



## USMC Tasks

1	Plan to supply Energy (conventional, renewable, alternative) to the MAGTF; integrated throughout the supply chain and with Joint/Coalition and HNS
2	Provide the capability to Manage Energy, Water, and Waste Resources in an Expeditionary Environment
3	Conduct Combat Operations across the MAGTF with minimal energy and energy related logistics requirements
4	Plan for reductions in energy demands of current and future capability sets without reducing combat/mission effectiveness
6	Plan and Design Efficient, Scalable Expeditionary Forward Operating Base Utilities
7	Provide the capability to Measure Energy, Water, and Waste Resources in an Expeditionary Environment
8	Conduct "smart" expeditionary Electrical Distribution
9	Plan to produce all C4I energy and power requirements organically in place
12	Conduct Expeditionary Bulk Fuel Distribution
13	Provide a Power Source appropriate to the individual user's required capability
14	Provide the capability to Analyze data on Energy, Water, and Waste Resources in an expeditionary environment
15	Produce Energy Efficient Climate Control environments to maintain Personnel and Equipment operating efficiency
19	Develop migration plan for FOB to transition from expeditionary to enduring base
23	Management of additional tasks to comply with higher guidance (i.e. DoDI regarding burn pits, etc.) in an expeditionary environment
24	Provide Storage for Collection of Energy Sources Other than Liquid Fuels

Note: Operational Energy ICD signed by LTG Vane, 31 JAN 2011; currently in Army staffing

Note: Info from draft Expeditionary Energy, Water and Waste (E2W2) ICD

**\*\*Grayed areas apply more to platform, base camp, or aviation\*\***





# Potential DOTMLPF Solutions



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## Doctrine (and Policy):

- Resupply operations / methods
- Policy/Regulation: Energy Efficiency must be mandatory
- CECOM "Preferred Battery List" must be updated and enforced

## Organization:

- MCoE named Proponent for Soldier Power
- Establish MCoE Soldier Power Branch
- Establish PD Battery (PM MEP, PEO C3T)
- Assess MTOE basis of issue
- Modify MTOEs to retire / reallocate systems not being utilized

## Training:

- Power conservation must be instilled in Soldiers from day one
- Power monitoring and management

## Leadership and Education:

- Educate leaders on importance of conservation and extending life of all systems
- Provide feedback to leaders on power consumption after deployments

Personnel: TBD

Facilities: TBD

## Material:

- Personal, Squad, and Platoon recharging and distribution capability
- New standard family of batteries (cyclical upgrades)
  - increased power, energy density, and configurations
- Standardized power interface/connectors
- Soldier/unit level power monitoring and management
- Future systems must be "smart"
  - Automatic power monitoring and management with manual override
  - Reduced system energy demand
- Standard family of alternative energy sources (fuel cells)
- Vehicles must have SWaP allocated for rechargers
- Wireless power distro → one power source becomes reality





# Soldier Load

Cause	Corrective Action (Proposed)
<i>Soldier Load</i> (volume, weight and configuration which limit mobility)	<ul style="list-style-type: none"><li>•Establish MCoE Soldier Power management construct</li><li>•Establish PD Battery</li><li>•Education and training</li></ul> Modify MTOEs to retire / reallocate systems not being utilized
Dramatic increase in power and energy for Soldier equipment	<ul style="list-style-type: none"><li>•Energy efficiency KPPs</li><li>•Standardize system power draw</li><li>•Require and enforce policy adherence</li></ul>
Battery proliferation (too many types, voltages, power)	<ul style="list-style-type: none"><li>•Update CECOM “preferred” battery list<ul style="list-style-type: none"><li>•Time phased reduction in types</li><li>•Establish enforcement committee/proponent</li></ul></li><li>•New family of batteries w/ cyclical upgrades</li><li>•Develop standard interfaces / connectors</li></ul>
No effective means to recharge in an austere environment	<ul style="list-style-type: none"><li>•Small unit power generation / recharging</li><li>•Standard family of alternative energy sources</li><li>•Platforms must have SWaP allocated for rechargers</li></ul>
Lack of Soldier confidence in battery state of charge	<ul style="list-style-type: none"><li>•Power monitoring and management</li></ul>



# Proposed Incremental Approach



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## Inc 1 (2011-2015)

- New Family of Batteries
  - Adds Conformal and Clam Shell
- Battery Type Reduction
- Squad Recharging (RFI or SEP)
- Platoon Generators (RFI or SEP)
- Energy Efficient Systems
- Acquisition & Policy Reform
- Conservation & Efficiency Training & Education

## Inc 2 (2016-2020)

- New Family of Batteries (Next Gen)
- Further Battery Type Reduction
- Energy Efficient Systems
- Individual Soldier Recharging
- Soldier Power Monitor / Management

## Inc 3 (2021-2030)

- Wireless Recharging and Power
- Integrated Power



Soldier Power WG est. DEC 2010



# Message...



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- To Government partners
  - Requirements development
  - Collaboration
  - Common vision
- To industry
  - Industry Standards (battery types and interface)
  - Industry day
  - Demonstrations, competitions, “shoot offs”
- To academia
  - Partner with CERDEC and NSRDEC



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***Questions???***