

# Army Power and Energy

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# Army Energy in Perspective

- The Army has both Installation & Operational Energy requirements
- The Army is largest facility energy consumer in the Federal Government – 80.2 trillion Btu/\$1.2B (FY10)
- The Army spent more than \$2.5 billion on fuel purchases in FY10, a 64% increase in Afghanistan from FY09
- DoD expects a \$400 million increase in fuel costs in Afghanistan for FY11



Fort Carson Photovoltaic Array

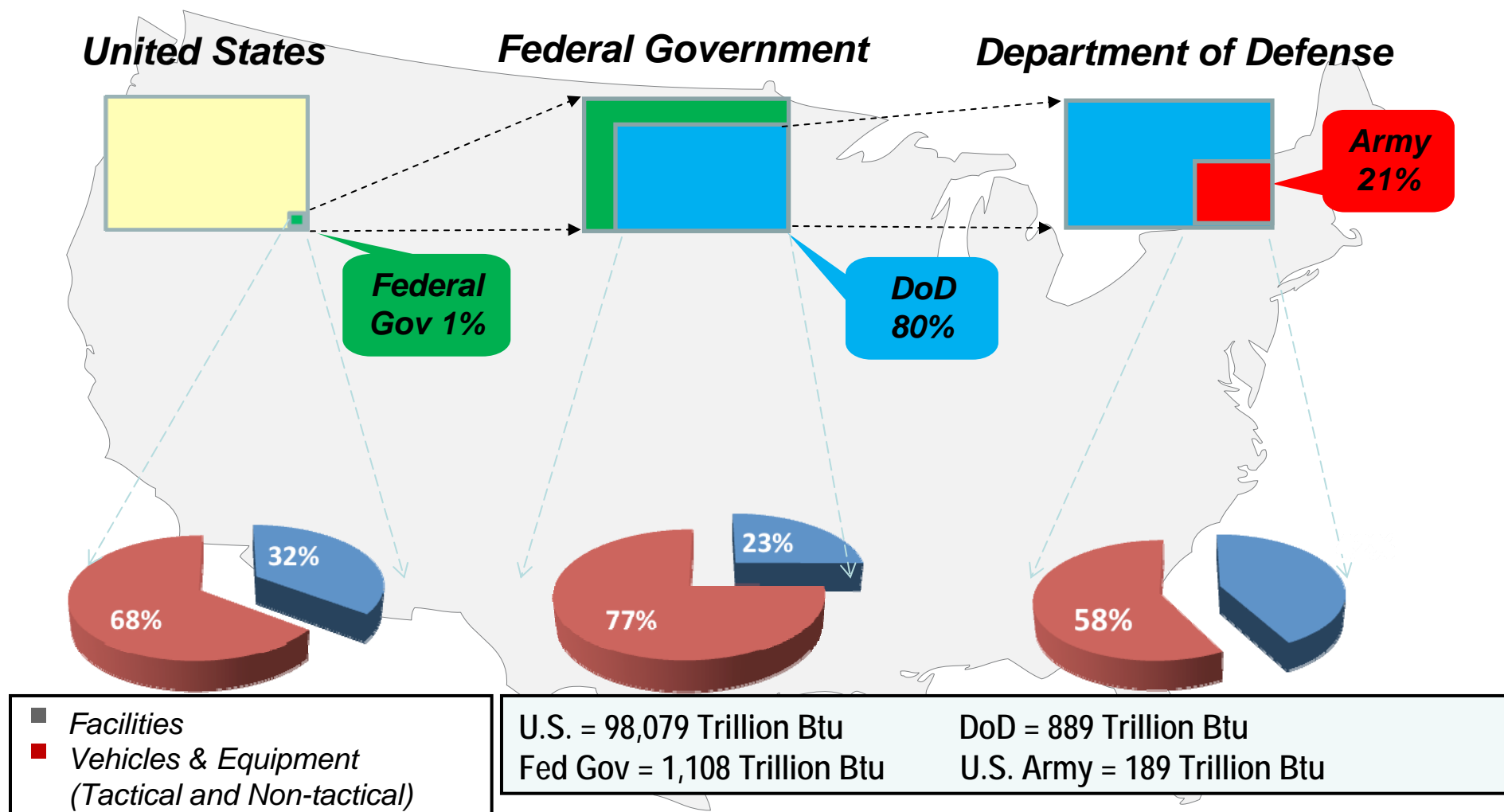
*EXTERNAL VIEW: "Pay attention: When the U.S. Army desegregated, the country really desegregated; when the Army goes green, the country could really go green." – Thomas Friedman, 2009*

*WHITE HOUSE VIEW: "Now, there are costs associated with this transition. And there are some who believe that we can't afford to pay those costs right now. I say we can't afford not to change how we produce and use energy – because in the long-term costs to our economy, our national security and our environment are far greater. " – President Obama, June 2010*

*ARMY VIEW: "To remain operationally relevant and viable, the Army must reduce its dependency on energy, increase energy efficiency, and implement renewable and alternate sources of energy." – SA/CSA Testimony, House Armed Services Committee, March 2011*

*OPERATIONAL VIEW: "High fuel use imposes risks to the mission and to each of us. In fact, nearly 80% of ground supply movements are composed of fuel and we have lost many lives delivering fuel to bases around Afghanistan. Moreover, moving and protecting this energy diverts forces away from combat operations. A force that makes better use of fuel will have increased agility, improved resilience against disruption" – General David Petraeus, June 2011*

# Army Energy Consumption, 2010



Sources: Energy Information Agency, 2010 Monthly Energy Review; Agency Annual Energy Management Data Reports submitted to DOE's Federal Energy Management Program (Preliminary FY 2010)

# Army Power and Energy



## OPERATIONAL ENERGY

## NET ZERO STRATEGY

### "Grand Challenges"

- Give soldiers and leaders capability to manage energy status, resources, performance
- Significantly reduce energy footprint
- Provide flexibility and resiliency by developing alternatives and adaptable capabilities

Power and Energy Strategy White Paper, Army Capabilities Integration Center/Research, Development and Engineering Command /Deputy Chief of Staff, G-4, US Army, 1 April 2010

# Army Energy Program

- **Change the Culture: Every Soldier a Power Manager**
  - Senior Energy and Sustainability Council (SESC)/Senior Energy Executive (SEE)
  - Energy and Sustainability must be a consideration in all Army activities
  - System wide approach for designing base camps to capture efficiencies
- **Drive Efficiency Across the Enterprise**
  - Technology/policies will reduce energy footprint
  - Leverage public private financing to accelerate efficiency projects
  - Implement technologies to significantly reduce energy footprint in the field.
- **Build Resilience through Renewable/Alternative Energy**
  - Diversify sources of energy to allow for continued operations during energy disruptions
  - Attract private investment to develop large scale renewable energy projects
  - Provide flexibility and resiliency by developing alternatives and adaptable capabilities
- **Science and Technology**
  - Army's future efforts depend on Science and Technology investments



# Basing – Net Zero Installations



Energy	Water	Waste
Fort Bliss, TX		
Fort Carson, CO		
Fort Detrick, MD	Aberdeen PG, MD	Fort Detrick, MD
Fort Hunter Liggett, CA	Camp Rilea, OR	Fort Hood, TX
Kwajalein Atoll, RMI	Fort Buchanan, PR	Fort Hunter Liggett, CA
Parks Reserve Forces TA, CA	Fort Riley, KS	Fort Polk, LA
Sierra AD, CA	JB Lewis-McChord, WA	JB Lewis-McChord, WA
West Point, NY	Tobyhanna AD, PA	USAG Grafenwoehr
Oregon ARNG (statewide)		

- **A Net Zero ENERGY Installation** produces as much energy on site as it uses, over the course of a year
- **A Net Zero WATER Installation** limits the consumption of freshwater resources & returns water back to the same watershed so not to deplete the groundwater & surface water resources of that region in quantity or quality
- **A Net Zero WASTE Installation** reduces, reuses, & recovers waste streams, converting them to resource values with zero solid waste to landfill
- **A Net ZERO INSTALLATION** applies an integrated approach to management of energy, water, & waste to capture & commercialize the resource value and/or enhance the ecological productivity of land, water, & air



# Energy Initiatives Task Force

*EITF announced by SecArmy on 10 August 2011, opened 15 September.*



## MISSION:

Identify, prioritize & support the development & implementation of large-scale, renewable & alternative energy projects – focusing on attracting private investments & delivering the best value to the Army enterprise

## SUMMARY:

- Centrally manage funding & execution to better position Army to identify, prioritize, develop, & implement large-scale renewable & alternative energy projects that deliver the highest & best value to the Army
- Provide expertise to the Installations for development of viable & economically-beneficial RE opportunities
- Transparent / expedited process for large-scale RE project development & approval

***We've got the LAND and the DEMAND!!***

# Basing - Contingency Sites

## *Integrated Base Camp Design Results in 30-60% Savings*

- **Energy Awareness on consumption and efficiencies**

- Energy-informed decision making – Culture Change
- Improved energy measurement and tracking – Tactical Fuels Manager Defense
- Improved energy distribution and grid power management Minigrids
- Systems Integration Lab at Fort Devens, MA

>20%



**Smart and Green Energy for Base Camps (SAGE)**

- **Improved Efficiency**

- Energy efficient generators
- Shower water reuse systems
- Energy Efficient Shelters

20-30%



**Advanced Mobile Medium Power Sources (AMMPS)**

- **Integrate Renewable Energy**

- Solar
- Waste to Energy

10-15%



**Solar Water Heating**



**Tent Insulation**



# Soldier Power

- ***Expeditionary Soldier Power*** is the energy and associated systems, information, and processes **required for a dismounted Soldier**.
  - Key enabler for operations, essential for patrols and required for Soldier sustainment.
  - Alternative energy capabilities and interoperability **builds flexibility and resilience**.
- ***Soldiers of the 1-16<sup>th</sup> Infantry Battalion***, recently deployed to central Afghanistan, prepared to use a suite of advanced soldier power capabilities such as power management devices, fuel cells, and renewable energy alternatives that will help to reduce the volume and weight of their load.
  - Soldier Power Manager (SPM) - state-of-the-art, lightweight, portable power management system.
  - Rucksack Enhanced Portable Power System - state of the art lightweight, portable solar power system
  - 300 Watt Fuel Cell operates on packaged propane canisters. Two 8oz. fuel cans will last up to 4 hours.
  - 1KW JP8 Generator - allows the war-fighter to leverage the existing logistics infrastructure while providing a light weight, man-portable power solution.



# Vehicle Power

## Vehicle Power Initiatives

Research and Development

- *TARDEC – DOE Partnership*
- *Improved Turbine Engine Program*
- *Fuel Efficient Ground Vehicle Demonstrator*

Track Requirements and Fuel Consumption to Inform Decision Making

- *Tactical Fuels Manager Defense*

Diversify the Fleet

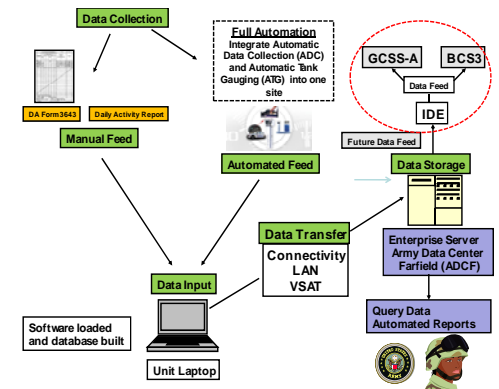
- *Low Speed Electric Vehicles*
- *Hybrid Electric Vehicles*
- *Alternative Fuel Vehicles*

## Army Non-Tactical Vehicle Fleet

- *80,670 non-tactical vehicles (NTVs)*
- *40% of fleet (31,913 NTVs) alternative fuel/hybrid electric vehicles*
- *927 low speed electric vehicles*



*Advanced Vehicle Power Technology Alliance (AVPTA) with DoE*



*TFMD (Tactical Fuels Manager Defense)*

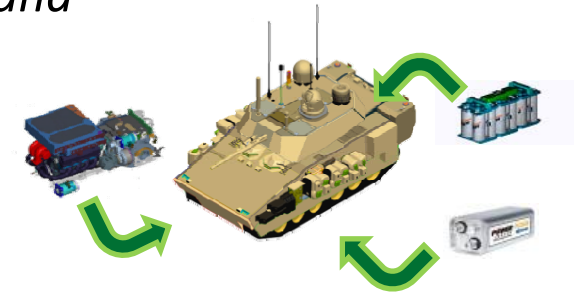


*Fuel Efficient Ground Vehicle Demonstrator (FED-A)*

# Science & Technology Investment Strategy

## **Energy and Power** - *Reduce Fossil Fuel and Battery Demand*

- Reduce platform energy consumption
- More efficient power sources
- Smart energy management
- Proactive thermal management
- Provide energy options (e.g., alternative fuels, solar)



## **Logistics** - *Reduced Fully Burdened Cost of Logistics*

- Reduce fuel and water battlefield delivery
- Develop efficient turbine, hybrid engines and propulsion systems
- Comprehensive condition-based maintenance
- Pursue lightweight materials technologies (e.g., composites, lightweight track)
- Improve precision delivery of Soldiers/equipment (e.g., air drop)



## **Collaborate With the Department of Energy on Research**

# Promising S&T Investments

## *Soldier Power*



*Conformal Soldier Battery*

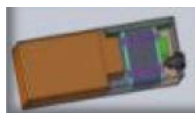


*Wireless Power Transfer*



*Rapid Charging Technology*

## *Basing Power*



*Hybrid Fuel Cells*



*Fuel Cells*



*Scalable Micro Grids*



*Waste -To- Energy*

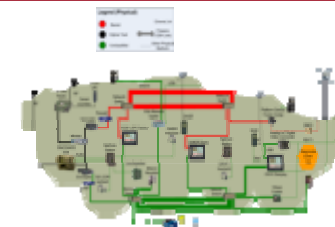
## *Vehicle Power*



*On-Board Power Generation*



*High Temperature SiC Modules*



*Victory Architecture*

# Our Secret Weapon



*The world will not evolve past its current state of crisis by using the same thinking that created the situation.*

*- ALBERT EINSTEIN*