



Energy Security Army Priority and National Imperative



**Office of the Assistant Secretary of the Army,
(Installations & Environment)**

April 2010



Leadership Supports Energy Initiatives



“We're making our government's largest ever investment in renewable energy – an investment aimed at doubling the generating capacity from wind and other renewable[s]... “ 9/23/09



-President Barack Obama

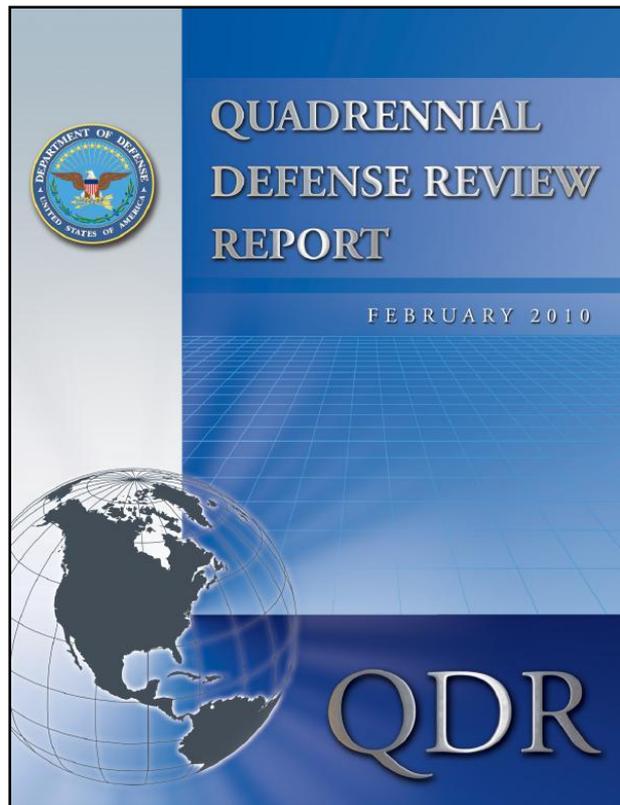
“...[T]he Army is actively supporting advanced technologies and increases in energy efficiencies at our installations, in our weapon systems, and in operations.” 10/09

Army Energy Awareness Month Letter

“As long as we're dependent on those fossil fuels, we're dependent on the Middle East. If we are not victims, we're certainly captives.”



**- John McHugh,
Secretary, U. S. Army**



Focused on four specific issues where reform is imperative:

- security assistance
- defense acquisition
- defense industrial base
- **energy security**
and climate change

Energy Security – “assured access to reliable supplies of energy and the ability to protect and deliver sufficient energy to meet operational needs”

- DoD will
 - conduct a coordinated energy assessment
 - prioritize critical assets
 - promote investments in energy efficiency
 - ensure that critical installations are adequately prepared for prolonged outages caused by natural disasters, accidents, or attacks
- Balance energy production and transmission to preserve test and training ranges and operating areas needed to maintain readiness

QDR energy security discussion is consistent with Army approach and priorities

“Energy efficiency can serve as a force multiplier, because it increases the range and endurance of forces in the field and can reduce the number of combat forces diverted to protect energy supply lines...”

- DoD will fully implement the energy efficiency KPP and fully burdened cost of fuel



October -- National Energy Awareness Month Senior Leader Engagement

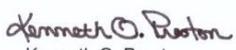


Army Energy Awareness Month – October 2009

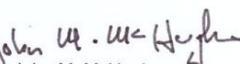
October is designated as National Energy Awareness Month and this year's theme is "A Sustainable Energy Future; We're putting all the pieces together." This theme highlights how the federal government, private sector, and the public have a role in shaping our energy future and moving our Nation towards energy independence. Every day, each of us make decisions that can stimulate a new energy economy and impact the national goals.

Through legislative action and executive orders the federal government is charged to implement bold, innovative energy initiatives to be less dependent on foreign sources of fuel and better stewards of our Nation's energy resources. The Army Energy Security Implementation Strategy articulates the Army's vision, mission, and goals for achieving greater energy security and ensuring energy is a key consideration in all decision-making, while fostering a culture of awareness and accountability. In addition, the Army is actively supporting advanced technologies and increases in energy efficiencies at our installations, in our weapons systems, and in operations. We are pursuing projects such as large scale solar, wind, and geothermal power sources; electric and hybrid vehicles; improved insulation of temporary facilities; and designing new facilities to Leadership in Energy and Environmental Design (LEED) Silver Standards.

We ask each member of the Army community (Soldiers, Family members, civilian employees, and contractors) to promote energy security and improve energy conservation. At a minimum, these actions include turning off interior and exterior lighting when not required, shutting down equipment when not in use, and limiting the idling of vehicles. Achieving and sustaining energy security requires all of us to be proactive in conserving our precious energy resources.


Kenneth O. Preston
Sergeant Major of the Army

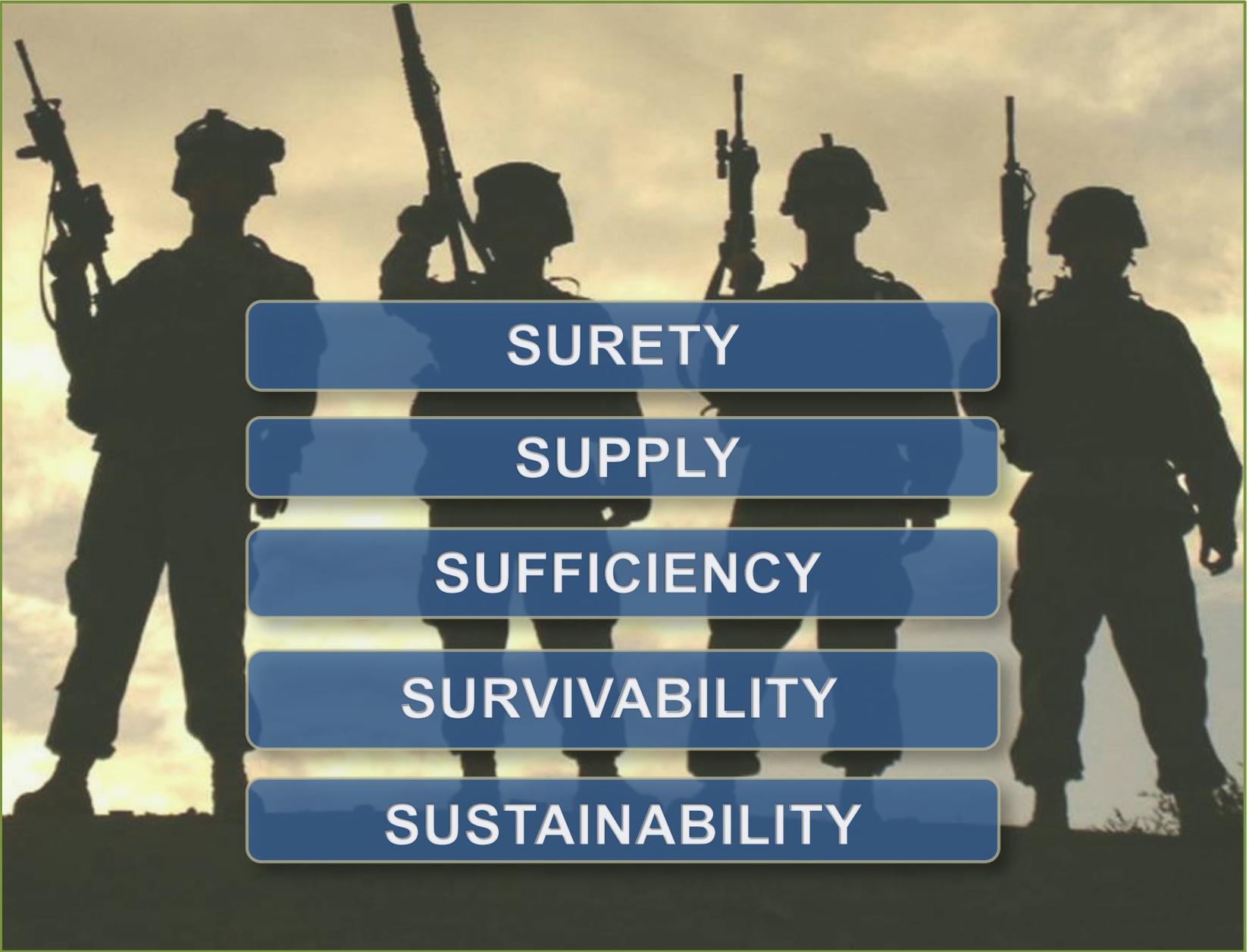

George W. Casey, Jr.
General, United States Army
Chief of Staff


John M. McHugh
Secretary of the Army

- Energy Security is a critical priority for the Army and an essential element of Army installations, weapon systems and operations.
- Energy Security is an integral component of mission readiness and unit preparedness – it is an operational imperative.
 - America's Army is an expeditionary force and energy dependence puts our deployed Soldiers at risk and vulnerable to enemy attack.
 - Any loss of energy threatens to undermine our deployed soldiers, mission readiness and unit preparedness.
 - Deployed Soldiers, Army installations and Soldier training require secure / uninterrupted access to fuel and power.



ENERGY SECURITY



SURETY

SUPPLY

SUFFICIENCY

SURVIVABILITY

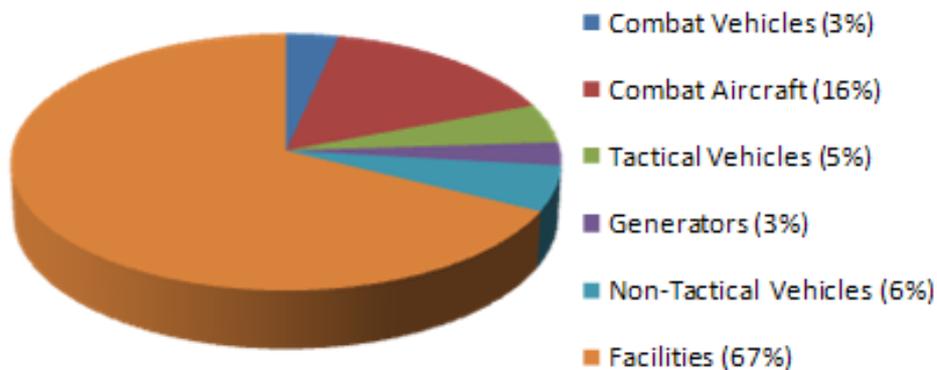
SUSTAINABILITY



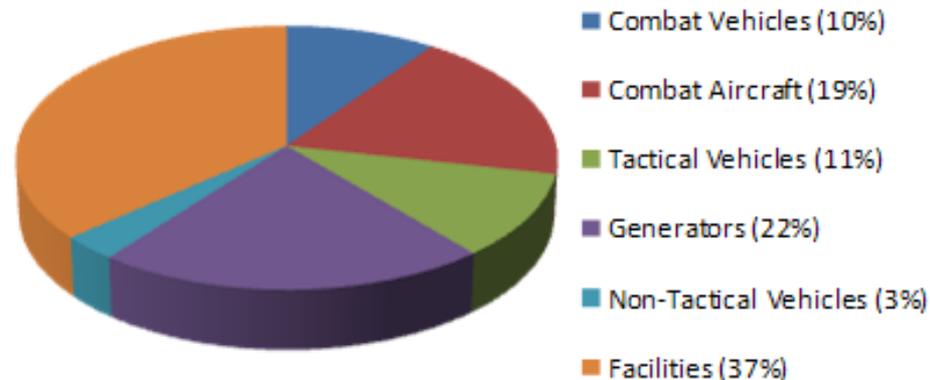
Army Energy Consumption



Peacetime



Contingency Operations



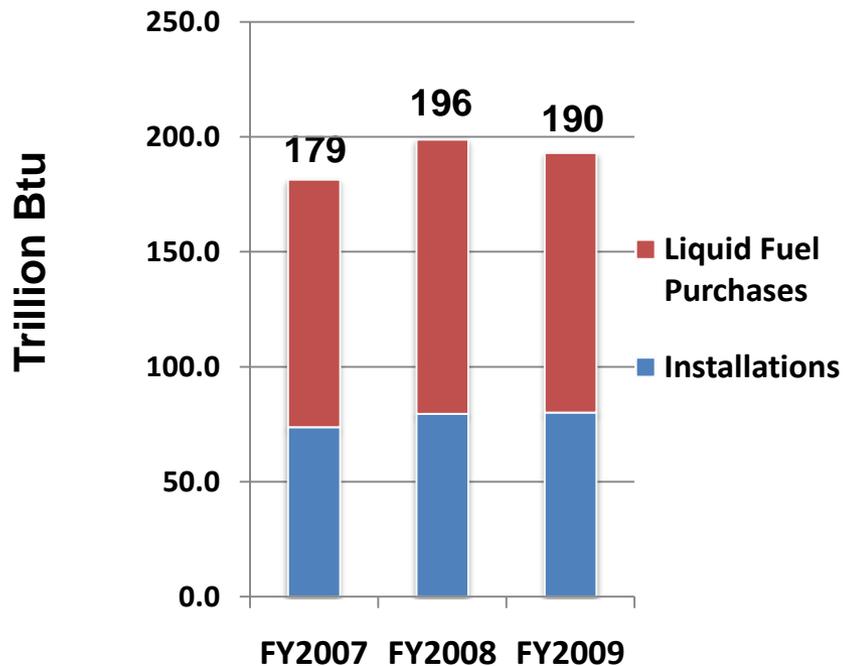
Sources: Defense Science Board. More Fight – Less Fuel (February 2008); Department of the Army FY07 Annual Energy Management Report (December 2007)



Army Energy Consumption and Cost

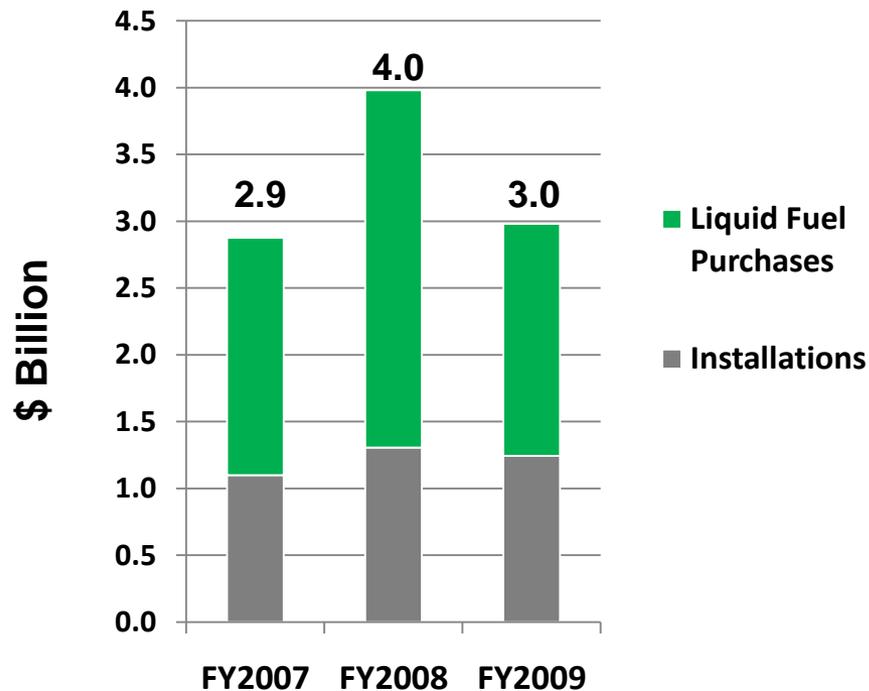


Consumption & DESC Purchases



FY 2008 – FY 2009 Trillion Btu Decrease = 3%

Cost



FY 2008 – FY 2009 Cost Decrease = 25%

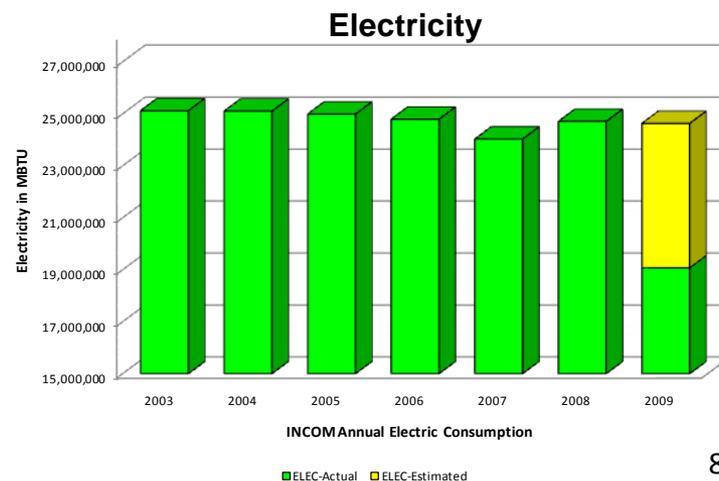
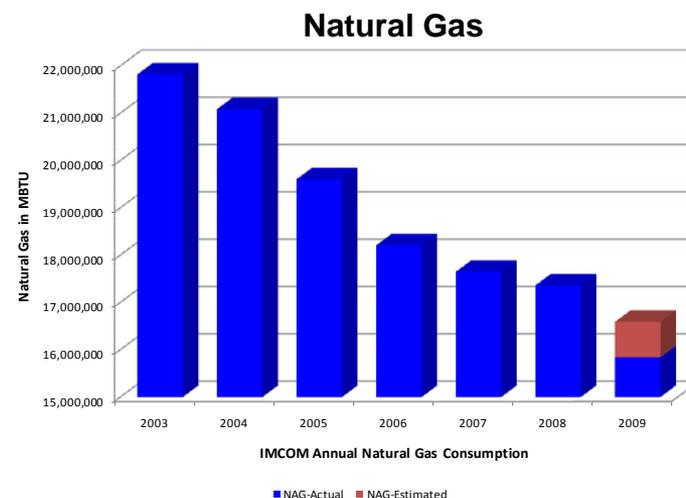


Energy Management: Challenges



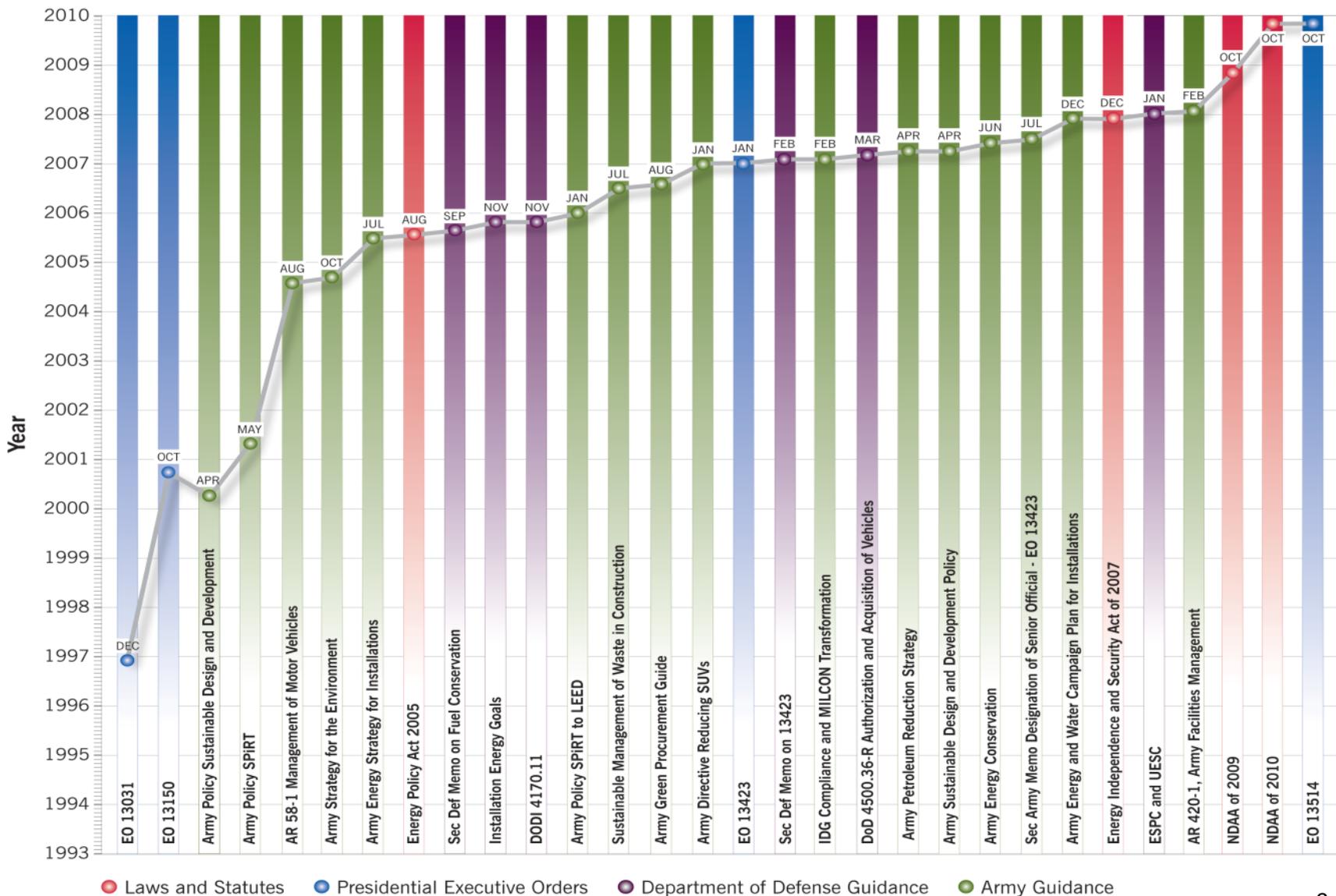
Current metric of performance measurement is energy per square foot

- Managing energy reduction for fixed installations responsible for housing an Expeditionary Army
- IMCOM has made significant progress in reducing natural gas consumption while electric remains a challenge
- Challenges:
 - BRAC construction
 - Grow the Army
 - Large energy consuming activities not included in real property





Key Energy Directives



● Laws and Statutes ● Presidential Executive Orders ● Department of Defense Guidance ● Army Guidance



Example Directives and Metrics



Directive Topic	Energy Performance Target [Source]
Installations energy use	Reduce by 30% by 2015 from 2003 baseline [EO 13423 / EISA 2007]
Non-tactical vehicle (NTV) fuel consumption	Reduce 2% per year through 2015, 20% by 2015 [EO 13423]
Electricity from renewable sources	A “Sense of Congress” goal - 25% by 2025 [EISA 2007 / NDAA 2007]
Fossil fuel use in new/renovated buildings	Reduce 55% by 2010; 100% by 2030 [EISA 2007]
Hot water in new/renovated buildings from solar power	30% by 2015 if life cycle cost-effective [EISA 2007]
Non-petroleum fueled vehicles use (ethanol, natural gas)	Increase by 10% annually [EO 13423]
Energy metering for improved energy management	Meter electricity by Oct 2012 [EPAct 2005] Meter natural gas and steam by Oct 2016 [EISA 2007]



Defense Science Board



- On May 2, 2006 the (USD(AT&L)) directed the Defense Science Board to create a Task Force to examine DoD Energy Strategy
- Citing significant risks to both our nation and our military forces, he challenged the Task Force to find opportunities to reduce DoD's energy demand, identify institutional obstacles to their implementation, and assess their potential commercial and security benefits to the nation.
- Key Finding: ***Critical national security and Homeland defense missions are at an unacceptably high risk of extended outage from failure of the grid.***
- Recommendation: ***Reduce the risk to critical missions at fixed installations from loss of commercial power and other critical national infrastructure.***

*Report of the
Defense Science Board Task Force
on
DoD Energy Strategy
“More Fight – Less Fuel”*



February 2008

*Office of the Under Secretary of Defense
For Acquisition, Technology, and Logistics
Washington, D.C. 20301-3140*

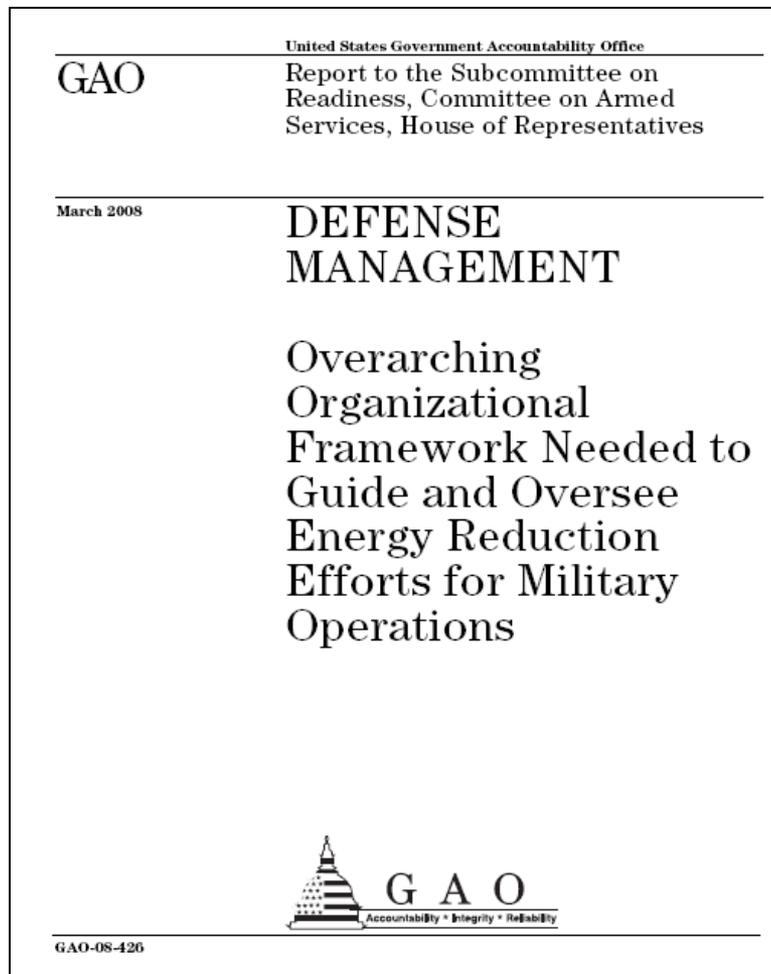


GAO Report 08-426



Key Findings

- Establish an overarching framework for mobility energy to improve the department's ability to guide and oversee mobility reduction efforts
- DoD should designate an executive office at the SecDef level to be accountable for mobility matters
- Develop a comprehensive strategic plan
- Military Services should designate executive-level focal points to establish effective communication and coordination





Army Energy Security Task Force



- **FEB/MAR 2008:** DSB / GAO Energy Reports Issued
 - Highlighted needs in enterprise leadership and operational focus
- **15 APR 2008:** Secretary Geren Directs ASA (I&E) to stand up Army Energy Security Task Force (AESTF)
 - To develop a governance framework for all Army energy security efforts
 - To “incorporate activities across a full spectrum of Army missions and functions
 - Provide initiatives focused on “increasing the ability to implement the Army’s four imperatives: Sustain, Prepare, Reset, Transform
- **AESTF Recommendations**
 - Establish the Deputy Assistant Secretary of the Army for Energy & Partnerships (DASA (E&P)) responsible for development of an Army Energy Security Strategic Implementation Plan.
 - Create an Army Senior Energy Council (SEC)
 - Designate DASA(E&P) as Senior Energy Executive.



Army Energy Security Implementation Strategy

- 13 JAN 2009 -

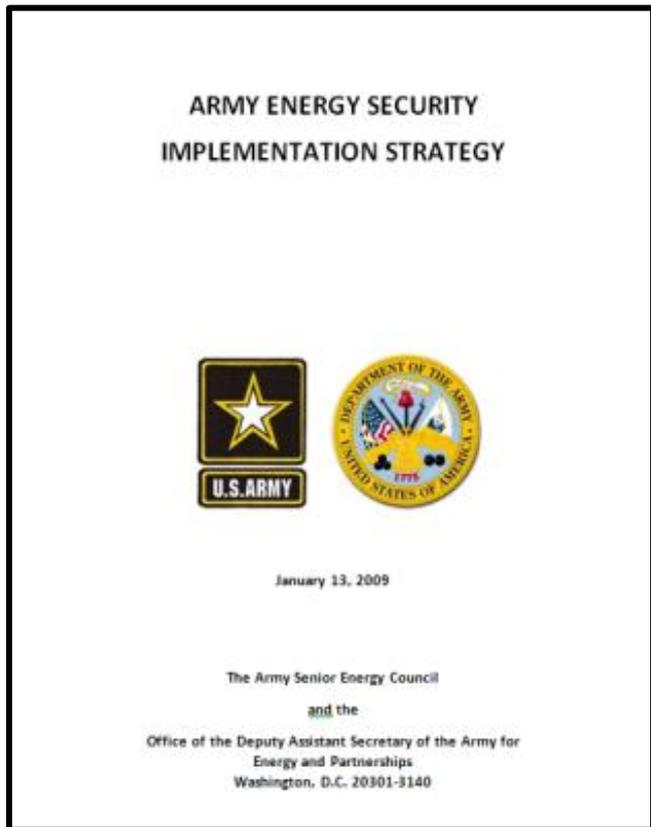


Army Energy Security Vision

An effective and innovative Army energy posture, which enhances and ensures mission success and quality of life for our Soldiers, Civilians and their Families through Leadership, Partnership, and Ownership, and also serves as a model for the nation.

Army Energy Security Mission

Make energy a consideration for all Army activities to reduce demand, increase efficiency, seek alternative sources, and create a culture of energy accountability while sustaining or enhancing operational capabilities.



Peter W. Chiarelli
General, U. S. Army
Vice Chief of Staff
Co-Chair, Senior Energy Council

Keith E. Eastin
Assistant Secretary of the Army
for Installations and Environment
Co-Chair, Senior Energy Council



Senior Energy Council (SEC)



SEC provides enterprise leadership, strategy and accountability for energy security

Army Directive 2008-04 Army Energy Enterprise

Senior Energy Council Charter (dated, 26 SEP 08)

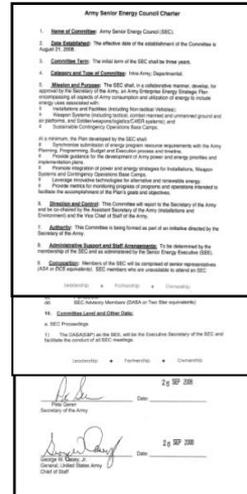
Formalizes:

- Senior Energy Executive
- Senior Energy Council
- Energy Enterprise Strategic Plan

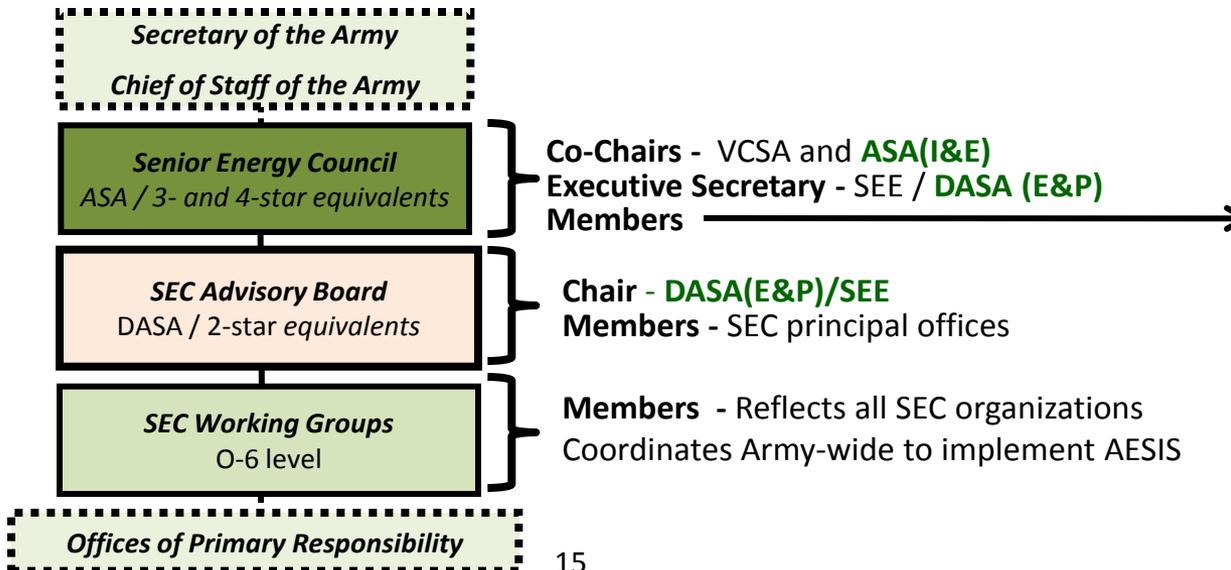
Establishes Army Energy Enterprise Governance Structure

Includes all aspects of Army energy consumption and utilization:

- Installations
- Facilities
- Weapon Systems
- Sustainable Contingency Operations Base Camps



Army Energy Enterprise Governance Structure



SEC membership	
VCSA	co-chair
ASA(I&E)	co-chair
DUSA	G-1
DAS	G-2
SMA	G-3/5/7
AMC	G-4
AASA	G-8
ACSIM	G-8, PAE
ASA(ALT)	OCAR
ASA(CW)	OCLL
ASA(FM&C)	OCPA
ASA(I&E)	OGC
ASA(M&RA)	OTJAG
CIO/ G-6	TRADOC
DARNG	FORSCOM
USACE	MEDCOM
DUSA-BT	ATEC



ARMY ENERGY SECURITY IMPLEMENTATION STRATEGY



Legislation

- EPA Act 2005
- EISA 2007
- NDAA 2007

Executive Order

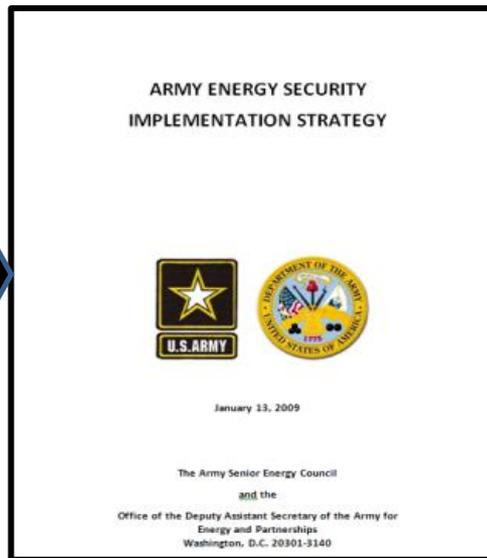
- EO 13423

OSD Policy

- DODI 4170.11, DOD Managers Handbook

Army Policy

- Army Regulation 420-1
- Army Energy & Water Campaign Plan



Energy Security Goals (ESGs)

1. Reduce Energy Consumption
2. Increase Energy Efficiency Across Platforms and Facilities
3. Increase Use of Renewable / Alternative Energy
4. Assure Access to Sufficient Energy Supplies
5. Reduce Adverse Impacts on the Environment



Army Senior Energy Council



Energy Management: Challenges



Large energy consuming facilities are not included in real property but count against reduction goals

Fort Bliss
Large Area Maintenance Tent



Growing trend of deploying these types of facilities across the enterprise

Fort Hood Simulators



Fort Leonard Wood Tent





Renewable & Alternative Energy



Renewable Energy - energy produced from renewable fuel resources such as biomaterial (biomass, landfill gas (LGS) and municipal solid waste (MSW)), hydropower, geothermal, wind, ocean (tidal, wave, current, and thermal), biofuels, thermal and solar.

Alternative Energy - any source of energy (e.g., nuclear, clean coal technologies, hydrogen) that can supplement or replace fossil fuels (oil, coal and natural gas) and other conventional energy sources.

Source: AESIS, Jan 13, 2009

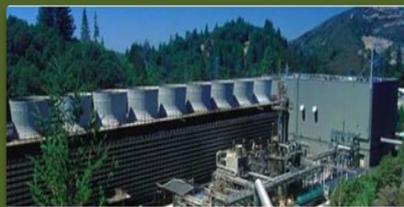


Major Army Energy Initiatives



Acquisition of Electric / Hybrid vehicles

- Army Order of 502 hybrid vehicles
- Acquisition of 4000 Low Speed Electric Vehicles (LSEV)
- One of the Largest Federal Electric & Hybrid fleets



Build 30 MW Geothermal Power Plant at Hawthorne Army Depot, NV

- Meet all of Hawthorne's electrical power requirements
- Releases essentially no greenhouse gas emissions
- Available 24/7
- Partnership with Navy and USACE



Develop 500 MW Solar Thermal Energy Plant at Fort Irwin, CA

- Supports Energy Security for the Installation
- Estimated \$20.8M utility cost reduction to Army over 25 years
- Partnership with Industry through Enhanced Use Lease (EUL) and Power Purchase Agreement (PPA)
- Developer Announced July 09



Existing Renewable Projects



Ft. Drum Solar Wall



Ft. Huachuca Photovoltaic Roof



Ft. Carson Solar Array



- 2 Megawatt array generates ~3,200 MWh/year
- Ground-mounted, fixed-tilt, ~12 acres on former landfill

Renewable Energy Project 2009 Summary

Electricity Generation (40)

Solar	34
Wind	05
Hydro/Ocean	01

Natural Gas (1)

Landfill / Biomass

Thermal Energy (25)

TOTAL PROJECTS – 66

363 Million Btu = Renewable Energy Generation
(23.8 GWH = Renewable Electricity)

Note: Source: FY 2009 Army Energy Mgt Data Rpt



US Army Facilities – Nuclear Energy



Nuclear Energy Certificates – US Army Facilities

*In permitting process awaiting final site closure

NDA 2010 - SEC. 2845. STUDY ON DEVELOPMENT OF NUCLEAR POWER PLANTS ON MILITARY INSTALLATIONS

White Sands Missile Range, NM
(Active Test Site for a Fast Burst Reactor)

*Fort Greely, AK
(power)

*Diamond Ordnance Radiation
Facility (DORF)
Adelphia, MD
(test)

*Aberdeen Proving Ground, MD
(test)

*Fort Belvoir, VA
(power)

*James River Reserve Fleet, VA
(power)

President Obama's proposed 2011 budget , if approved by Congress, would provide \$36B in loan guarantees for nuclear power plants



Fort Knox Ground-Coupled Heat Pumps



A typical example of many large ground-coupled heat pump projects constructed at Fort Knox. This 5-building complex (140K sq ft) was disconnected from natural gas and connected to a geothermal ground-coupled heat pump system (containing 130 500-ft deep wells)





Fort Knox Heat Pumps



Maple Ridge Housing

Entire housing area uses ground-coupled heat pumps





Fort Knox Renewable Methane Gas



Fort Knox is utilizing renewable shale methane gas in lieu of fossil fuel natural gas. Methane gas is collected from wells on Fort Knox property.





Fort Knox Solar



Solar Arrays

100kw Solar Photovoltaic (PV)





Renewable Projects – Fort Irwin



- **Strategically located in sunny southern California with over 1,000 square miles of land**
 - **Good potential for large scale renewable project**
 - **Identified as one of 5 SecArmy energy initiatives**
- **The U.S. Army Corps of Engineers, Baltimore District, Enhanced Use Leasing (EUL) program**
 - **Prepared solicitation to test market viability for large scale EUL**
 - **Good industry response to solicitation**
- **Corps selected Irwin Energy Security Partners LLC to develop, construct and manage the largest solar power project proposed to date within the Department of Defense**
- **Solar energy EUL will entail a flexible, phased, multi-technology approach to delivering up to 500 megawatts (MW) of power generation**
- **Improves Fort Irwin's overall energy security posture**



ACCIONA's Nevada Solar One



Fort Huachuca ESPC



Energy Savings Performance Contract (ESPC) at Fort Huachuca, AZ

- Fort Huachuca was one of the first to use an ESPC
- The current cumulative savings for the first 3 task orders - \$6.14M
- 90% has gone to the contractor to pay his original investments for the first 3 task orders
- The fourth task order has a 20 year term with savings/payments of \$777.5K per year
- Technologies have included energy efficiency, water conservation and renewable energy projects



LEED Platinum



Fire Station
Fort Bragg, NC



LEED Gold



BCT Headquarters

Fort Carson, CO



AMERICAN RECOVERY & REINVESTMENT ACT PROJECTS



- Energy Conservation Investment Program (ECIP)
 - MILCON appropriation
 - 17 Projects; 13 Installations
 - \$32M

- Sustainment, Restoration, And Modernization (SRM)
 - 280+ Projects
 - \$385M; \$222M NGB

- Research, Development, Test and Evaluation (RDT&E)
 - 7 Research Topics
 - \$75M



ENERGY RELATED STIMULUS PROJECTS



Energy Conservation Investment Program (ECIP) - \$32M

TX	Install 8,000 Motion Sensors
AK	Facility Energy Improvements
VA	High Eff. Lighting, Ph III
NM	Install Direct Digital Controls
VA	High Efficiency Lighting (Phase III)
OK	Solar Water Preheater
NY	Solar Walls, Energy Improvements
AK	Wind Turbine & PV Panels
NJ	Install 1.5 MW Wind Turbine
NC	EMCS
IA	GSHP & PV for Bldg 100-101
KY	Replace A/C with GSHP, Efficient Boilers
KY	Barracks GSHP, Ph 5
KY	Barracks GSHP, Ph 6
UT	Solar Walls on 14 Buildings
NV	Geothermal Test Wells, Phase 2
KY	Solar Walls & Day Lighting



American Reinvestment and Recovery Act



Provides \$75 million of RDTE funding for improvements in energy generation and efficiency, transmission, regulation, storage, and for use on military installations and within operations forces, to include research and development of energy from fuel cells, wind, solar, and other renewable energy sources to include biofuels and bioenergy.

<u>Army RDTE ARRA Efforts</u>	<u>Amount</u>
Advanced Power Electronics Ground Systems Testbed Equipment	\$14,580,000
High Temperature Silicon Carbide (SiC) Power Semiconductors (Applied Research)	\$12,150,000
High Temperature Silicon Carbide (SiC) Power Semiconductors (Adv. Tech. Development)	\$12,150,000
Ultra Low Energy Community Systems	\$2,916,000
Energy Security Audit & Islanding Methodology	\$6,804,000
Lightweight, Flexible, Cost Effective Solar Energy Photovoltaics	\$14,580,000
Develop smaller, lighter cogeneration and absorption environmental control systems	\$6,318,000
Micro-Grid Field Scaled Demonstration	\$3,402,000
Small Business Innovative Research/Small Business Technology Transfer	\$2,100,000



INSTALLATION ENERGY PROJECTS



Motion Sensor Light Controls
High Efficiency Lighting
Energy Management Control Systems (EMCS)
Solar Water Heating
Wind Turbines
Photovoltaic Panels
Ground Source Heat Pumps
Solar Walls
Daylighting
Photovoltaic Roof Systems
Solar Tubes (daylighting)
Geothermal Test Wells
Decentralize Steam/Boiler Plants
Neighborhood Electric Vehicles (NEVs)

Solar Energy Fields
Bio-Mass to Fuel (biodiesel)
Bio-Mass to Energy
Fuel Cell Generator
HVAC System Repairs for Energy Conservation
Hydro Electric Power Generation
Upgrades to Building Envelope for Energy Conservation
Install New/Replace Generator Sets
Lighting Retrofits
Install Electric Meters
Install Cool Roofs



Fort Bliss Energy Security Tiger Team



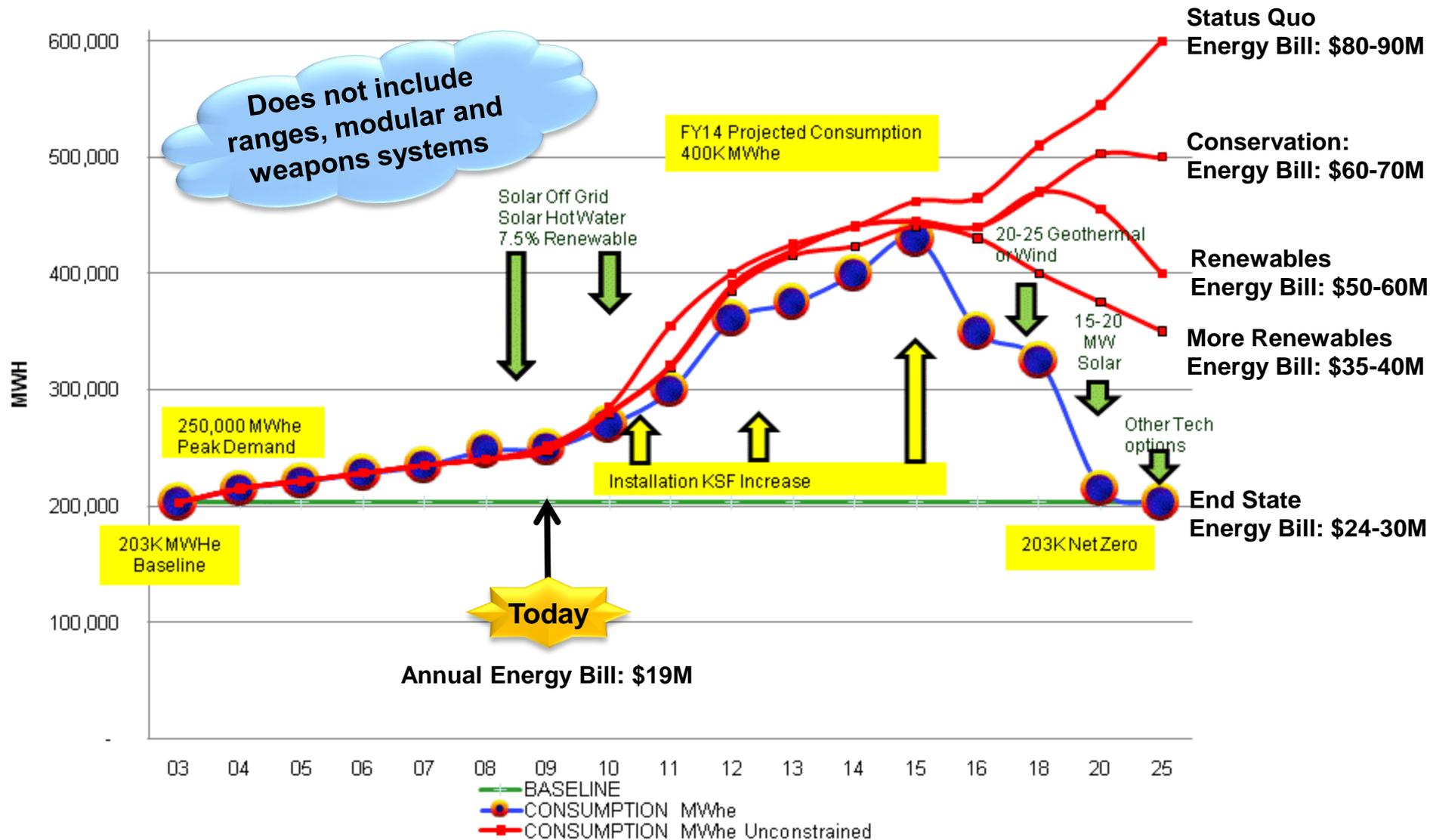
- Post Expansion
 - Installation will become the nation's 4th largest in population
 - 260% total population growth (from 2005 to 2012)
 - More than \$4B in construction doubling building space from 10 to 20 million sq. ft.
- Opportunities Explored
 - Improve energy services
 - Efficient energy use
 - Energy security

Recommendation Topic Areas		Time Frame*
New Construction		Mid-term
Renewable Power and Energy		
	Solar Hot Water	Near-term
	Solar Photovoltaic Power Plant	Near-term
	Geothermal Power Plant	Long-term
	Integrated Municipal Solid Waste/ Concentrated Solar Power Plant	Long-term
	Wind Farm Power Plant	Long-term
Transportation Planning and Energy Use		Mid-term
Installation Energy Management		Mid-term
Installation Energy Surety and Critical Infrastructure Planning		Near-term
Existing Infrastructure		Near-term

* Near-term = FY 09-10, Mid-term = FY 09-12, and Long-term = FY 09-15.



Ft. Bliss Energy Milestone Projection

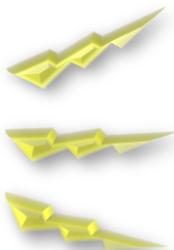
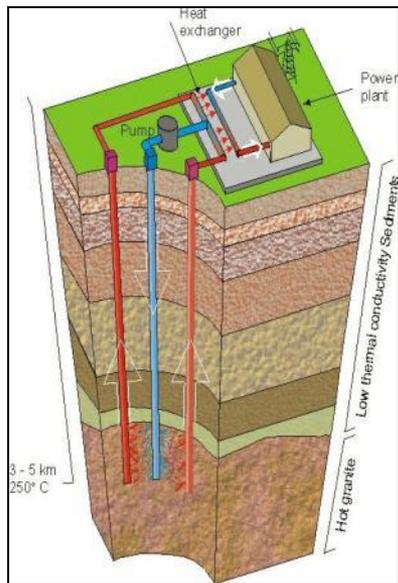




Geothermal Example – Ft Bliss



McGregor Range Base Camp



**Training
Mission
Continues**

- **The best evaluated in the Army renewable assessment**
- **1996 test wells found 170° - 190°F water**
- **Minimized environmental impacts**
- **Takes the base camps and other training camps off the grid**
- **Cost effective – once implemented, price is fixed**
- **Great potential for PPP venture**



Tactical Fuel Logistics & Protection



EXAMPLE

2007 Kuwait/OIF/OEF Fuel to FOB (M gal)...	431
Fuel trucks needed.....	140,075
Convoys needed.....	9,332
Soldiers per convoy trip (Fuel trucks, protection, other support).....	120
Soldier trips.....	644,360
Fewer Soldier trips.....	6,444

(Resulting from 1% Fuel Savings)



Deployed Operations – “Beans, Bullets and BTUs”



The Challenge

- Fuel logistics, management and protection are key for contingency operations

Key Energy Opportunities

- Distributed Generation
- Tactical Grid Management
- Renewable/Alternative Power
- Lightweight, Flexible, Structural, or Integrated Solar
- Alternative Fuels
- Standardized Deployable Kits
- High Efficiency Systems
- Leveraging Local Opportunities





Army TARDEC RDT&E



Ground Vehicle Power and Energy Technology

Prime & Non-Primary Power





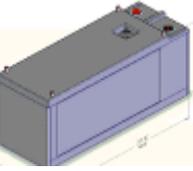








Energy Storage

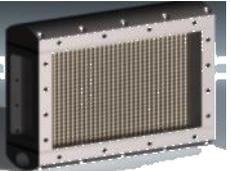
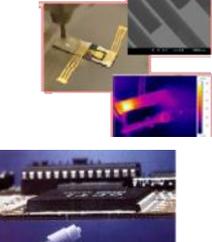


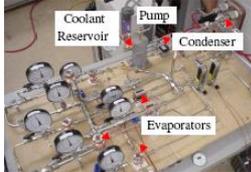


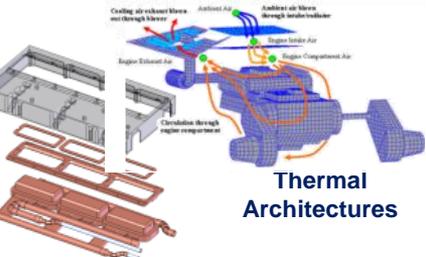




Thermal Management

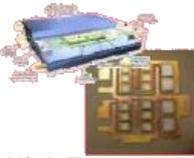
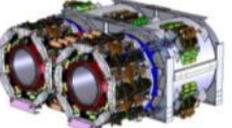



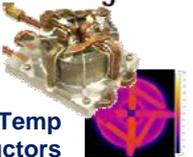




Power Management

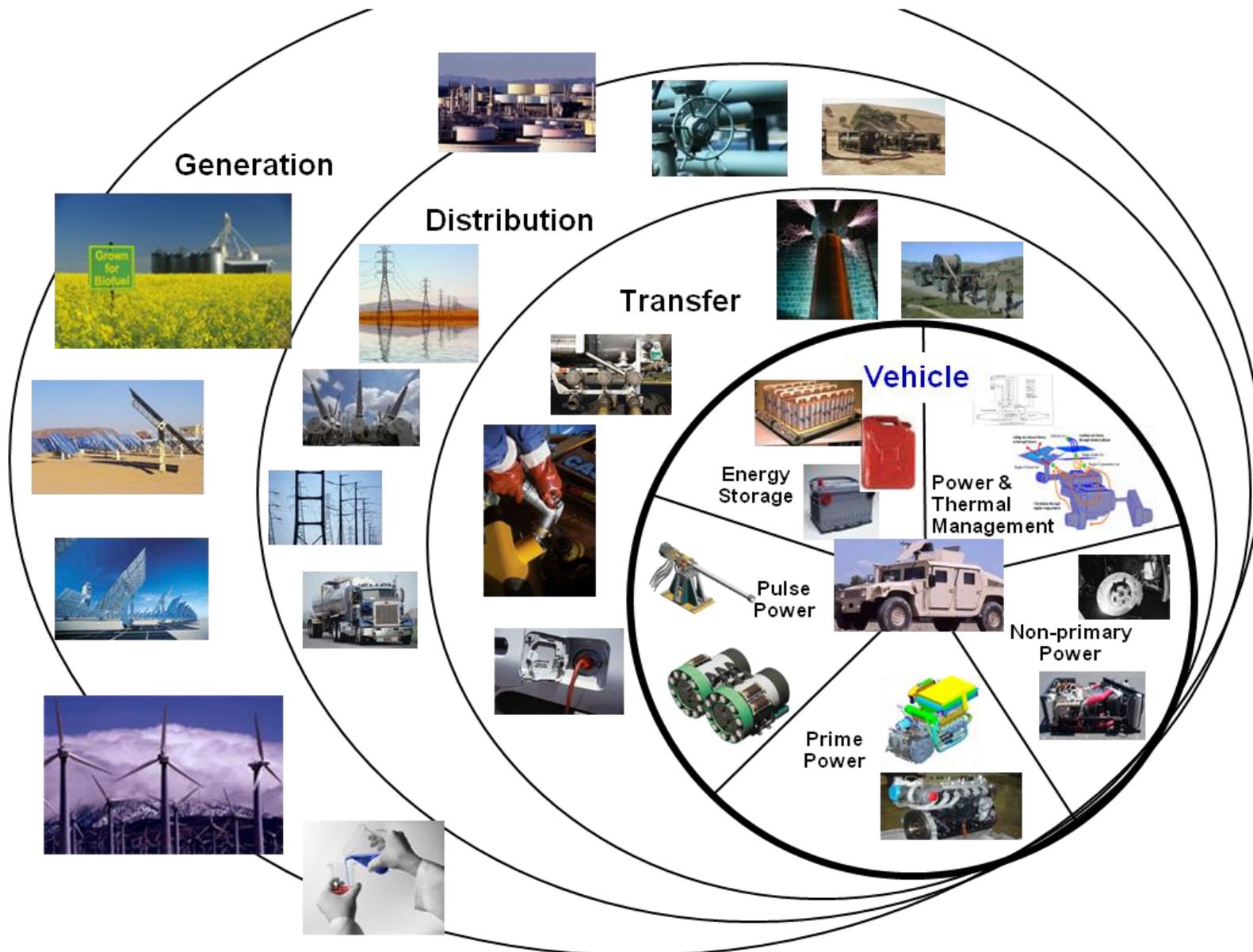






TARDEC's End to End Energy Business: From Generation to Application





Managing the Army's Fleet as a System



Tactical Quiet Generator (TQG)



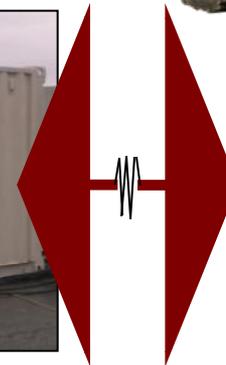
Mobile Encampment Waste to Electrical Power (MEWEPS)



Electric Power Control and Conditioning (EPCC)



Solar



A system of systems approach optimizes scarce energy resources



S&T Strategy for Power and Energy

- **Reduce platform energy consumption**

- **Lightweight materials**
- **Lower power electronics**
- **Unmanned vs. manned platforms**

- **More efficient power sources**

- **Batteries with higher energy/power density**
- **Fuel cells**
- **Hybrid power sources**

- **Smart energy management**

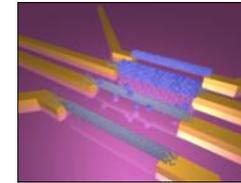
- **Proactive thermal management**

- **Higher temperature materials**
- **Harvesting of thermal energy**

- **Provide energy options (e.g., alternative fuels, solar)**



Low Power
Color Helmet-mounted Display



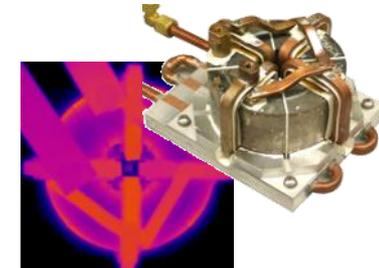
Virus-based Self-Assembling Electrodes



Direct Methanol
Soldier Fuel Cell



Vehicle Power Distribution



Vehicle Thermal
Management

Reduce Fossil Fuel and Battery Demand



Rucksack Enhanced Portable Power System (REPPS)

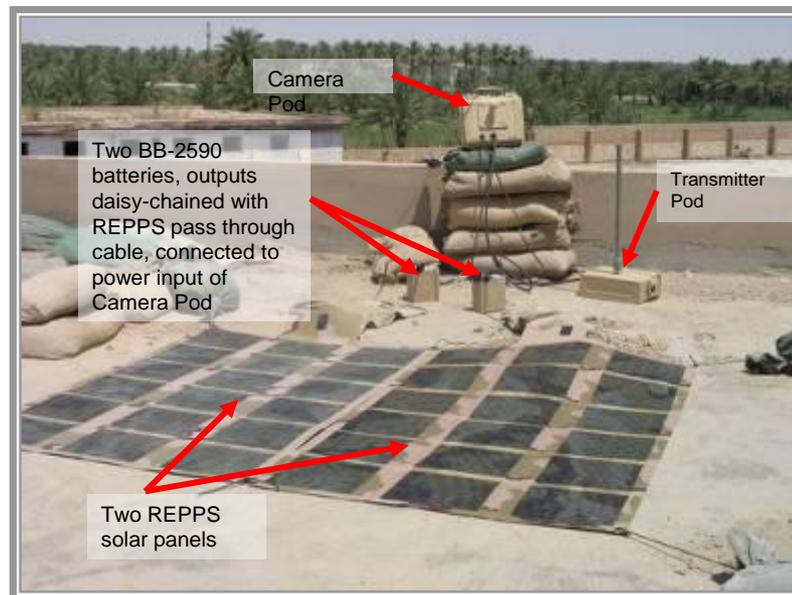


- Provides device power or battery recharging capability from solar, AC, Military Batteries, NATO plug, and Cigarette adapter.
- Provides continuous power for unattended ground sensors (UGS) and surveillance cameras.



Soldier Feedback:

"I wanted to thank you again for everything. The camera system [using a REPPS system for 24 hour operation] has been a huge success thus far and I believe has saved lives by keeping our soldiers out of harms way."
SPC Fiorino, David G.





Summary



A New Energy Focus for America's Expeditionary Army

- ***Energy Security is*** an integral component of mission readiness and unit preparedness – it is an operational imperative.
- The ***Army is answering and leading*** the call to the nation "to face one of the great challenges of our time: confronting our dependence on foreign oil, addressing the moral, economic, and environmental challenge of global climate change, and building a clean energy future that benefits all Americans."
- ***Leveraging the inter-agency process*** to lead in the transformation of the ways we produce and use energy for the sake of our environment, our economy, and our security.
- Continue to ***lead by example in using public and private cooperation*** to meet our nation's security needs.



Thank You

