



AMERICA'S ARMY:
THE STRENGTH OF THE NATION

Army Power and Energy

SOLDIER

BASING

VEHICLE



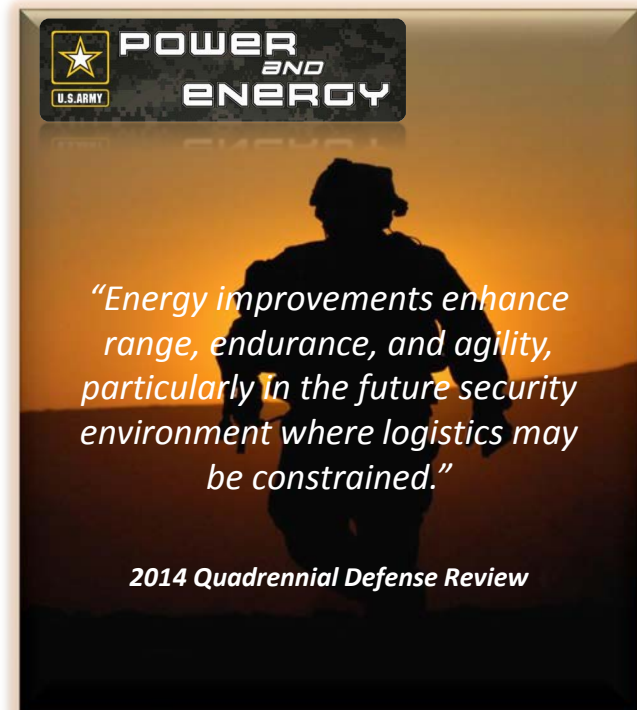
**Deputy Assistant
Secretary of the Army,
Energy and Sustainability**

Mr. Richard Kidd



Energy Security is defined as “having assured access to reliable supplies of energy and the ability to protect and deliver sufficient energy to meet mission essential requirements.”*

- The Army has historically undervalued energy and energy security
 - Evolving from a framework that viewed resource considerations as constraints on operational effectiveness to a perspective that considers the critical role of resources as mission enablers
- Treating energy as a “free good” (unintentionally) creates vulnerabilities and risks
- Energy is a vulnerability that can be exploited and energy shortfalls can increase mission risk
- A ready and resilient Army has secure access to energy, which allows it to act in a complex and rapidly evolving world



“Maintaining our tactical and strategic edge heavily depends upon the wise use of our resources — energy, water, and land — to preserve future choices through superior knowledge, technologies, and execution.”
– ES² Strategy, May 2015



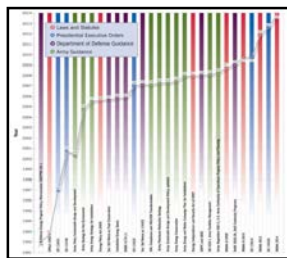
Dynamic Threat Environment



A power plant in the Crimean region of Ukraine



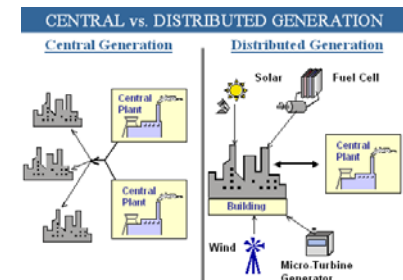
Increasing Requirements



Legislative & EO requirements continue to increase

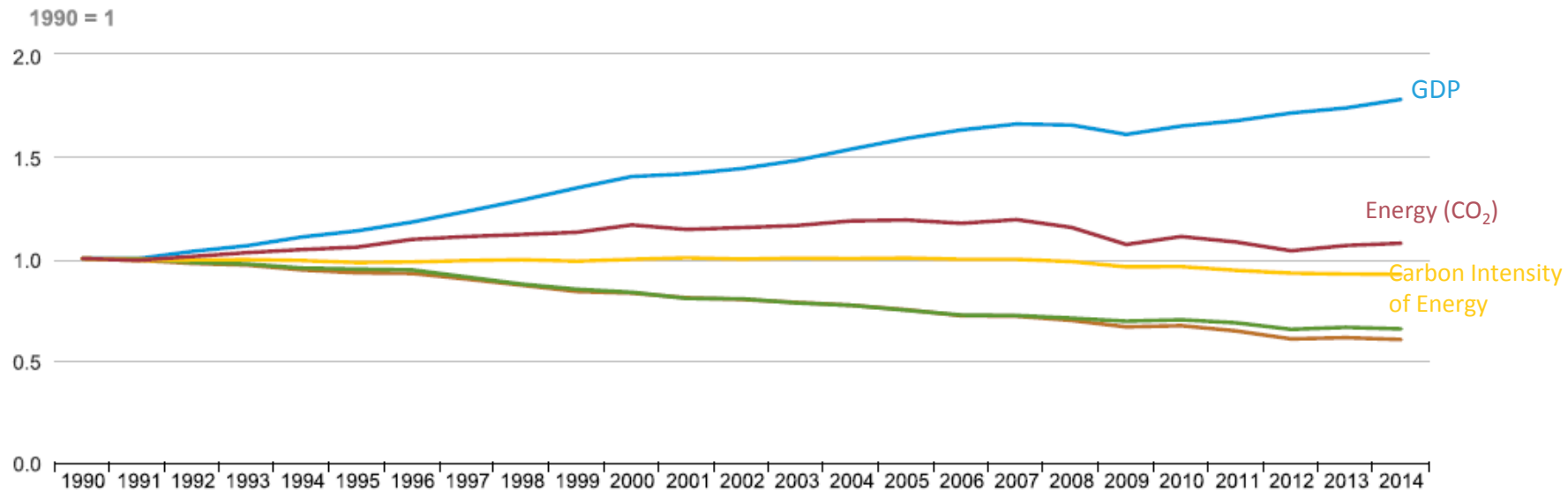
Increased Opportunity and Requirement for Installation Resiliency

Changing Energy Reality





Index of Key Energy-Related Emissions Drivers



GDP is increasing, but energy consumption remains flat

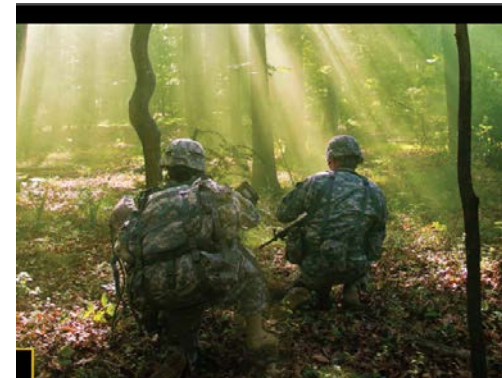


Purpose: The ES² Strategy is designed to explain the Army's energy and sustainability posture and establish the underlying basis for an Army that adopts "security," "resiliency," and "future choice" as organizing approaches

Vision: A ready and resilient Army strengthened by secure access to the energy, water, and land resources in order to preserve future choice in a rapidly changing world

Task:

- Replace the 2009 Army Energy and Sustainability Implementation Strategy (AESIS)
- Integrate energy security and sustainability into a resiliency framework
- Expand Army-wide awareness of energy and sustainability concepts, leading to energy-informed decision making



ENERGY SECURITY
& SUSTAINABILITY
(ES²) STRATEGY

Army Energy Security
& Sustainability
Strategic Goals

1. Inform Decisions
2. Optimize Use
3. Assure Access
4. Improve Resiliency
5. Drive Innovation

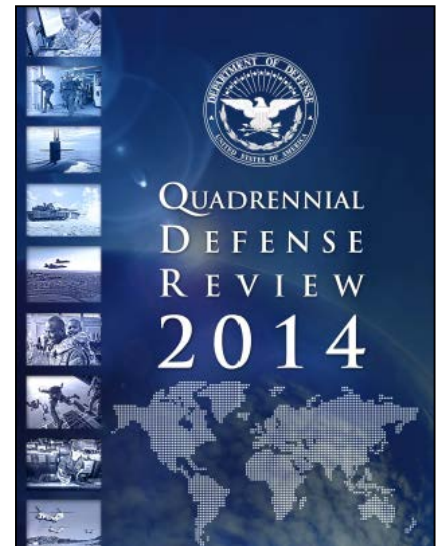
VISION



ES² Foundation



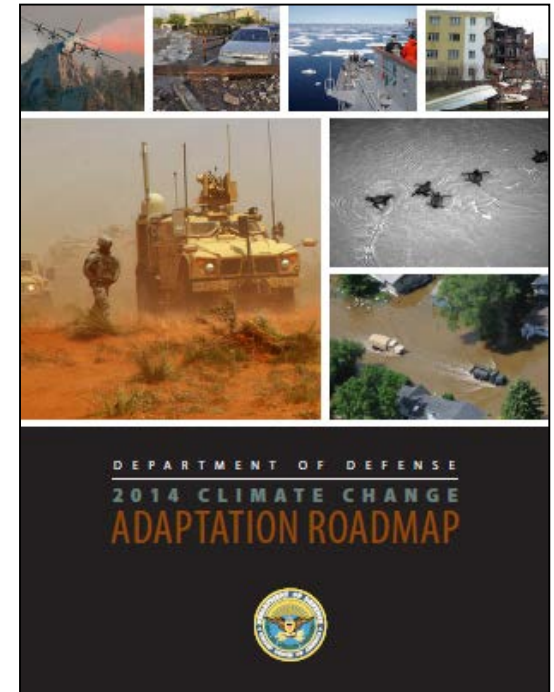
- “The impacts of climate change may increase the frequency, scale, and complexity of future missions, including defense support to civil authorities, while at the same time undermining the capacity of our domestic installations to support training activities.” (pg. vi)
- “Climate change poses another significant challenge for the United States and the world at large. ... These effects are threat multipliers that will aggravate stressors abroad such as poverty, environmental degradation, political instability, and social tensions...” (pg. 8)
- “Finally, the Department will employ creative ways to address the impact of climate change, which will continue to affect the operating environment and the roles and missions that U.S. Armed Forces undertake.” (pg. 25)
- “We will complete a comprehensive assessment of all installations to assess the potential impacts of climate change on our missions and operational resiliency, and develop and implement plans to adapt as required.” (pg. 25)

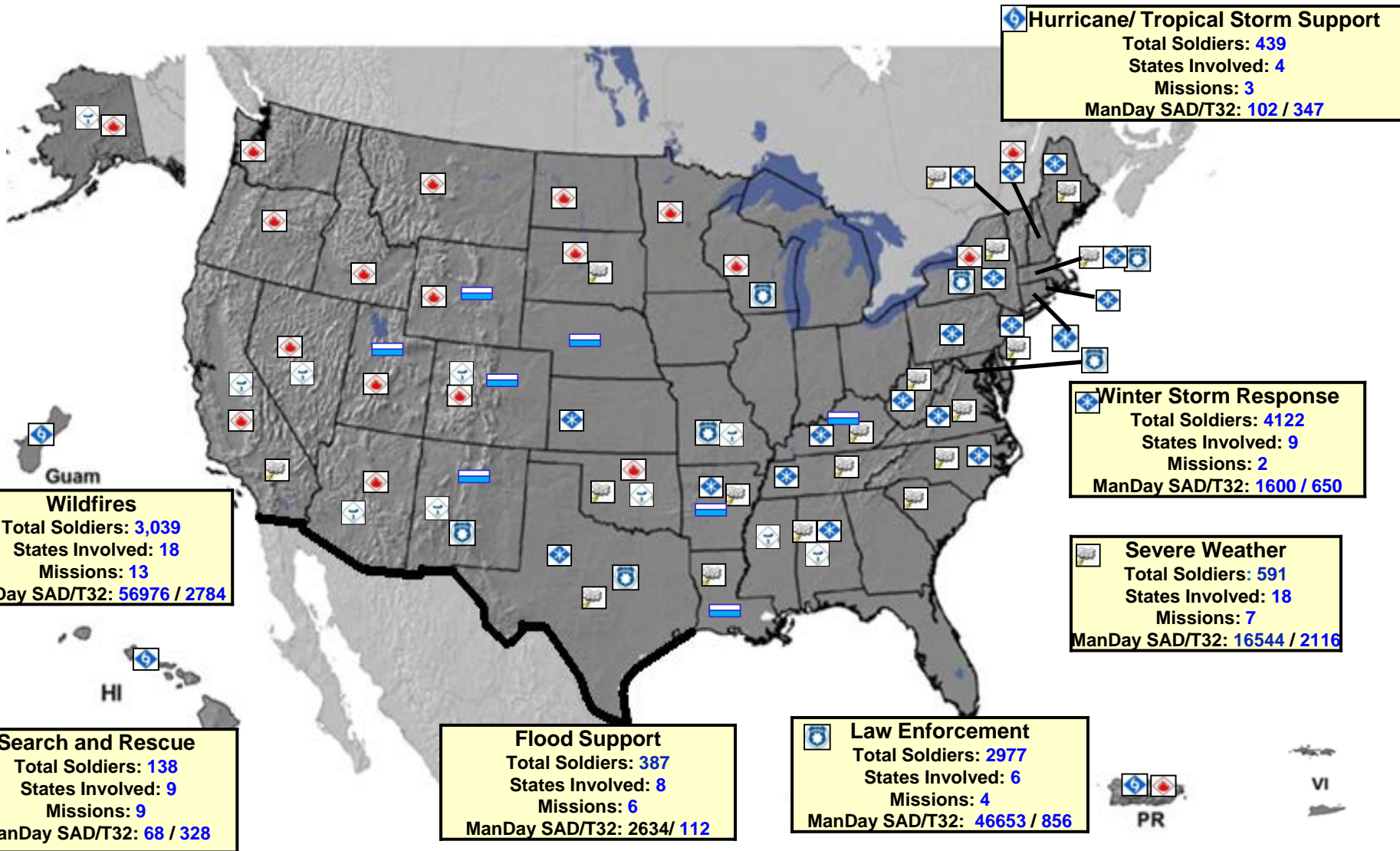




2014 DoD Climate Change Adaptation Roadmap

- Required under EO 13653
- Four Lines of Effort set enterprise-wide approach:
 1. Plans & Operations
 2. Training & Testing
 3. Built & Natural Infrastructure
 4. Acquisition & Supply





Wildfires
 Total Soldiers: 3,039
 States Involved: 18
 Missions: 13
 ManDay SAD/T32: 56976 / 2784

Hurricane/ Tropical Storm Support
 Total Soldiers: 439
 States Involved: 4
 Missions: 3
 ManDay SAD/T32: 102 / 347

Winter Storm Response
 Total Soldiers: 4122
 States Involved: 9
 Missions: 2
 ManDay SAD/T32: 1600 / 650

Severe Weather
 Total Soldiers: 591
 States Involved: 18
 Missions: 7
 ManDay SAD/T32: 16544 / 2116

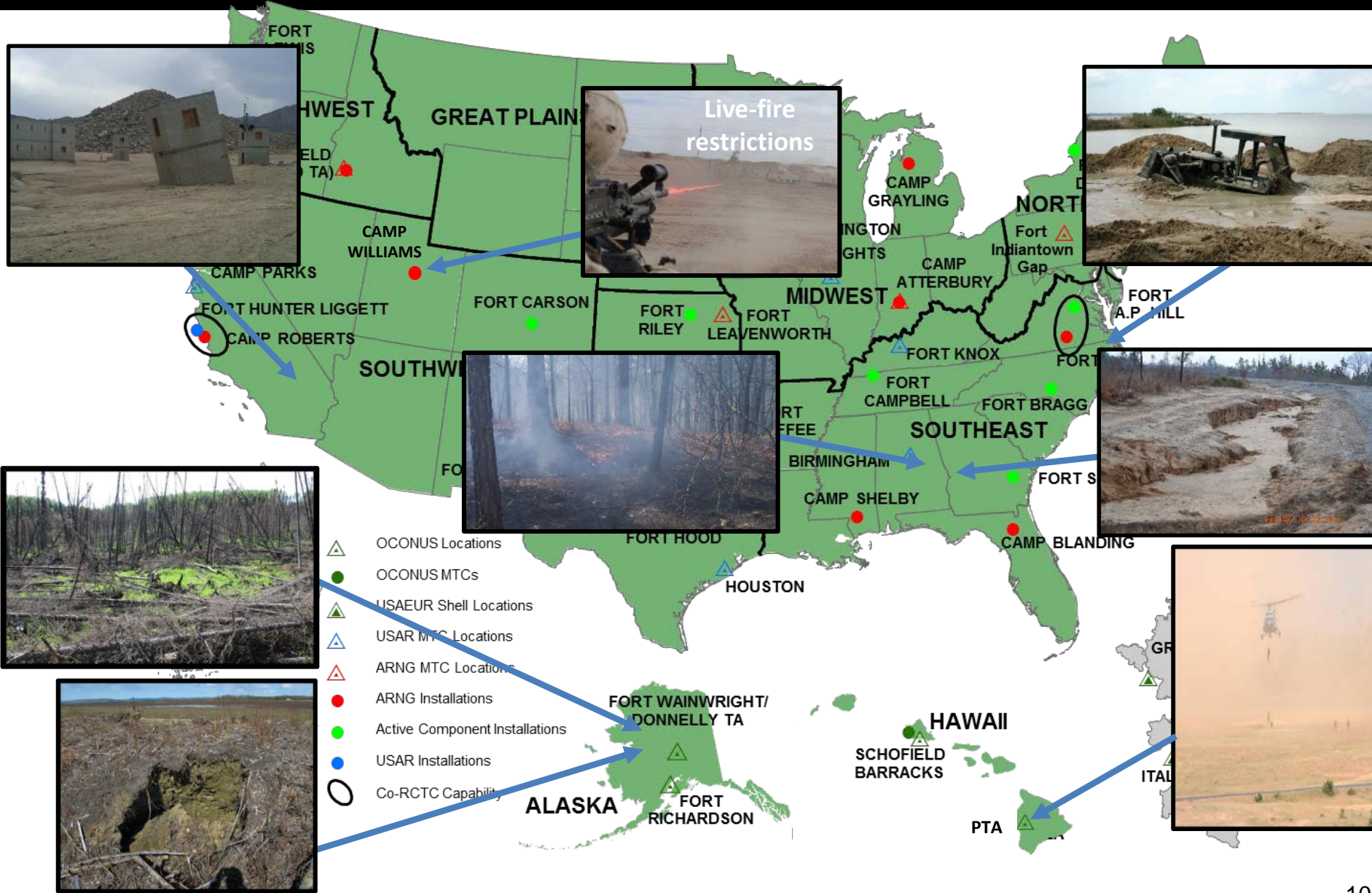
Search and Rescue
 Total Soldiers: 138
 States Involved: 9
 Missions: 9
 ManDay SAD/T32: 68 / 328

Flood Support
 Total Soldiers: 387
 States Involved: 8
 Missions: 6
 ManDay SAD/T32: 2634 / 112

Law Enforcement
 Total Soldiers: 2977
 States Involved: 6
 Missions: 4
 ManDay SAD/T32: 46653 / 856

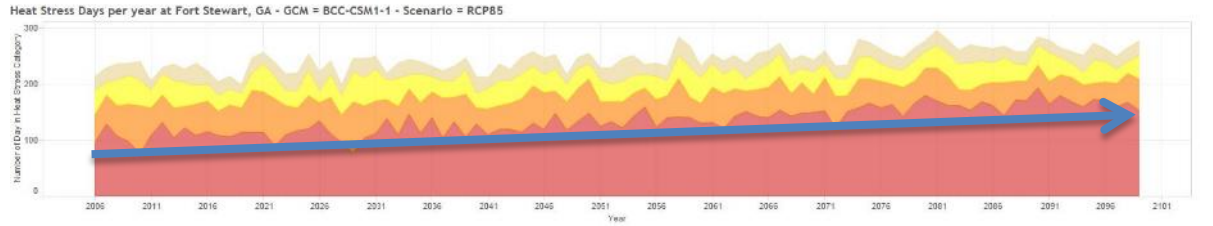
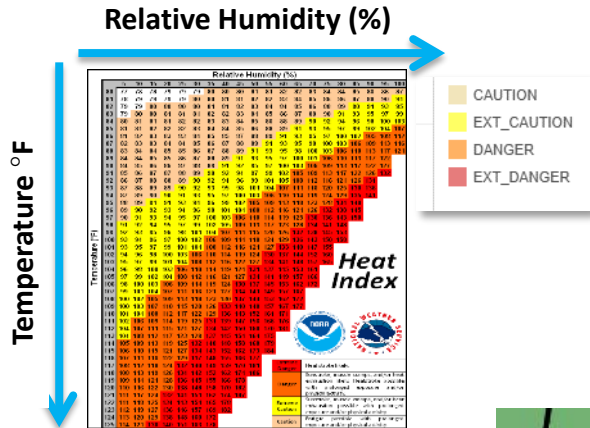


LOE 2: Training & Testing





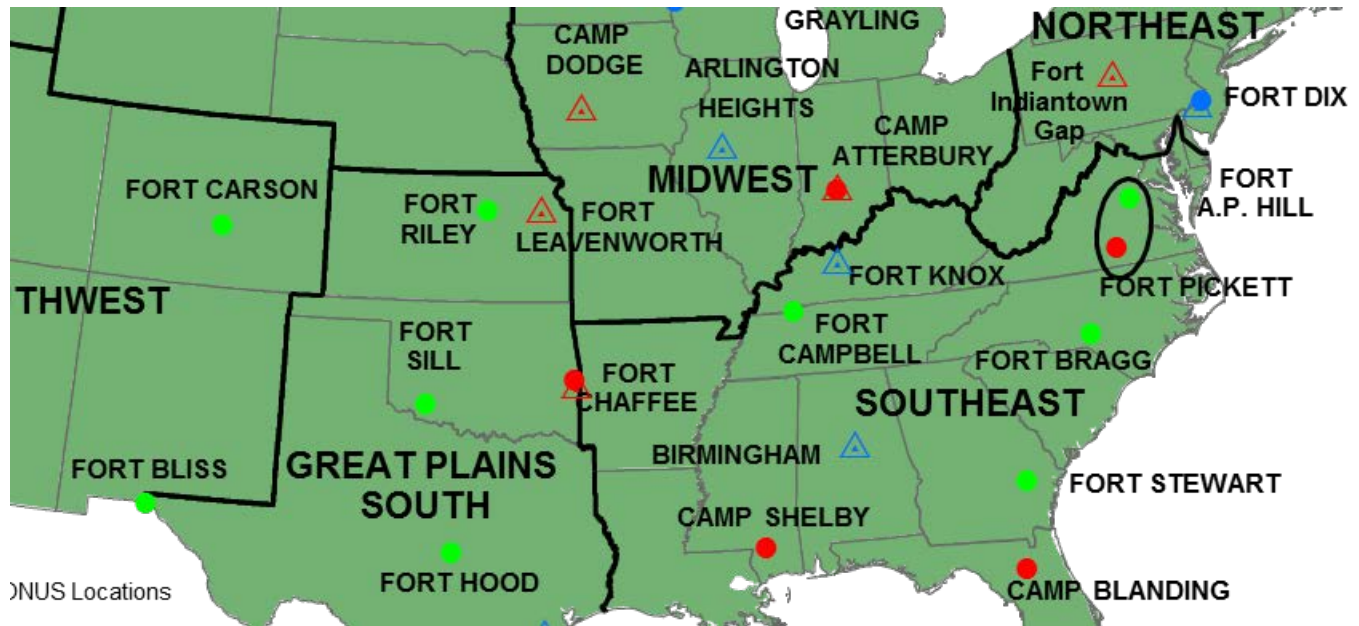
Training & Heat Stress



2010
~80 days/yr

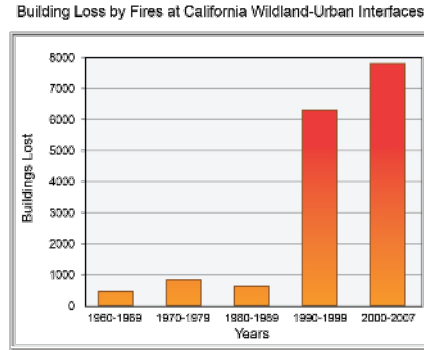
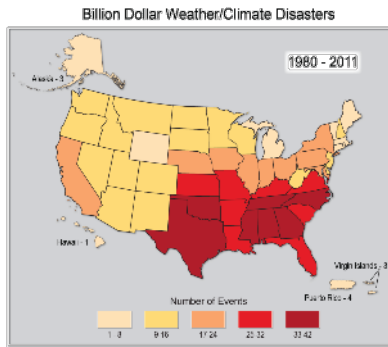
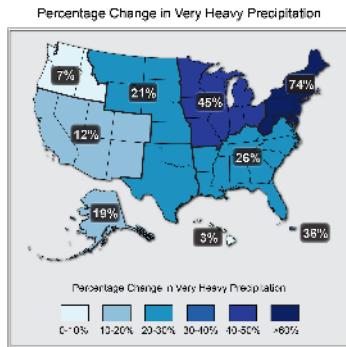
2100
~135 days/yr

can be translated into the Army Wet Bulb Globe Temperature categories





National Climate Assessment:



Ft Irwin, Aug 2013: an extreme rainfall event caused severe erosion, washed out roads, & toppled structures & support electronics in the training range, resulting in \$64M in damages



Source: U.S. Army Corps of Engineers Los Angeles District video footage



Ft Jackson, Oct 2015:
 “The weather forced us to cease daily operations, close schools, coordinate with state government and support local (and federal emergency) response,” said R.J. Frazier, Fort Jackson's emergency manager.

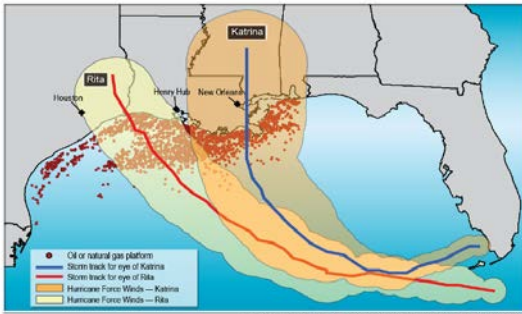


Photo Credit:
 Wallace McBride, Fort Jackson Leader

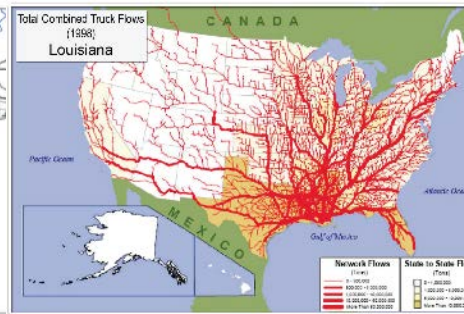
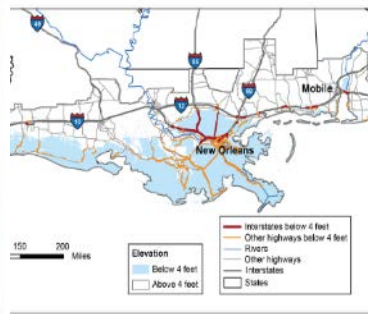


National Climate Assessment

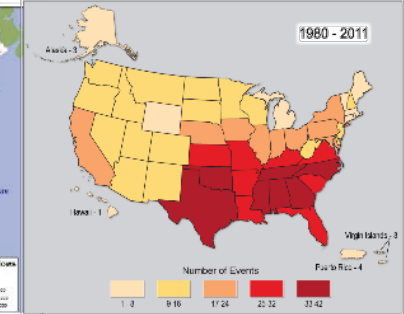
Paths of Hurricanes Katrina and Rita Relative to Energy Production Facilities



Gulf Coast Transportation Hubs at Risk



Billion Dollar Weather/Climate Disasters



Water Supplies Projected to Decline

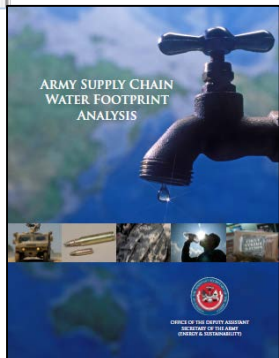
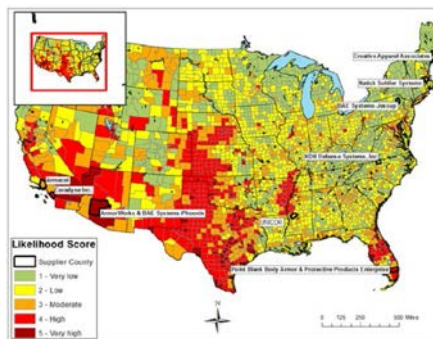
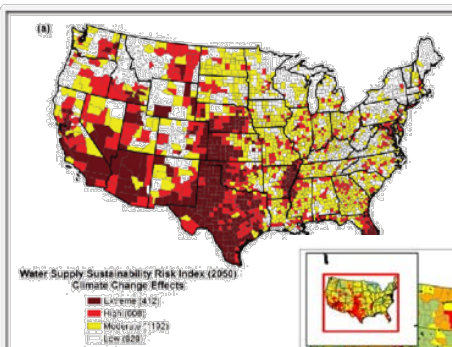


Figure 4: Improved Interceptor Body Armor: Tier 1 and 2 Suppliers and Water Supply Disruption Likelihood in 2050

Prolonged droughts & increased severe weather events:

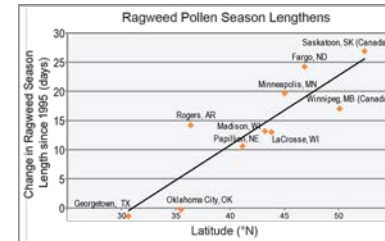
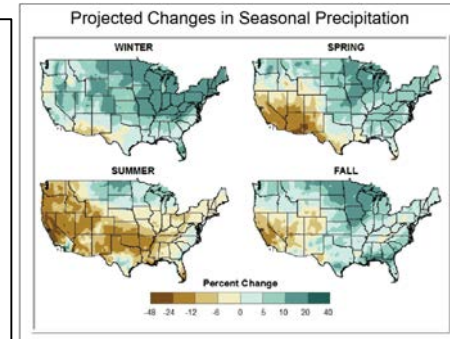
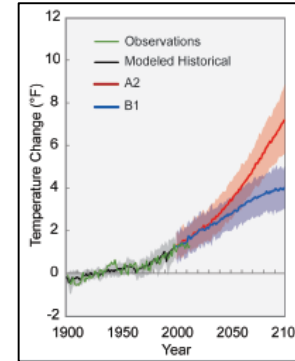
- More frequent production disruptions
- Affects on water-intensive manufacturing
- Disruptions to key transportation modes and routes
- Higher cost of commodities & goods
- Cumulative impact on critical suppliers



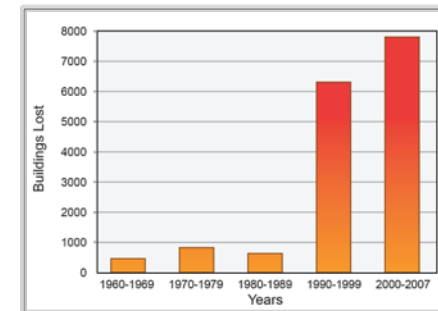
What is the impact of climate change on:

- **Housing & barracks**
 - Mold & air-born pollutants
 - Repair frequency
 - HVAC operations & utility costs
- **CDCs**
 - Landscaping & artificial turf
 - Adequate outdoor shade/cooling
- **Pest management**
 - Shift in species? new species?
 - Extended periods of exposure?
- **Water systems**
 - Maintenance (freeze/thaw; disinfection residual)
 - Regional availability? Outages?
- **Emergency response planning**
 - Increased wildfire risk? severe storms?
- **Natural Resources**
 - Impacts to TES? land management?

National Climate Assessment:



Building Loss by Fires at California Wildland-Urban Interfaces





Adaptive & Resilient Installations

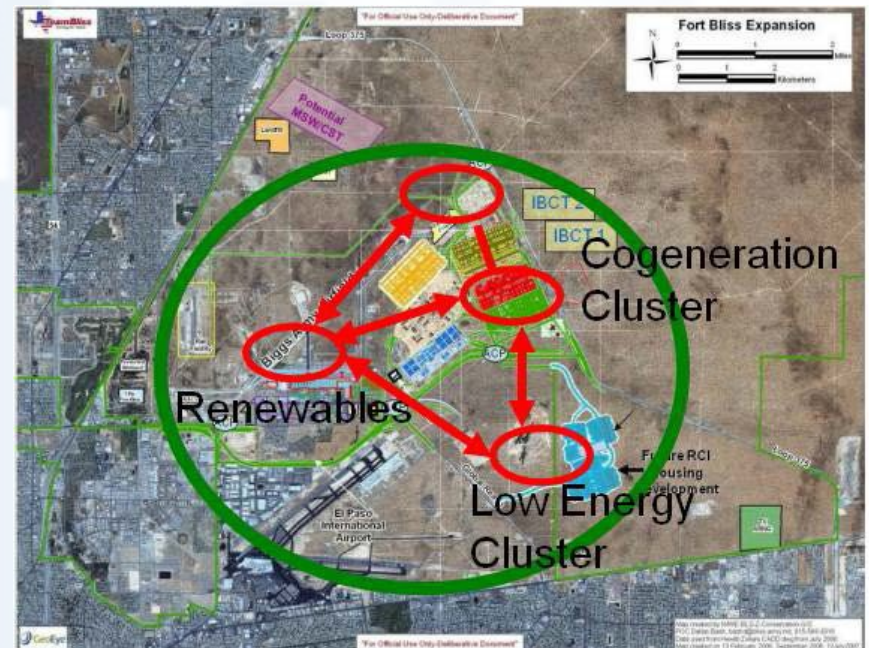
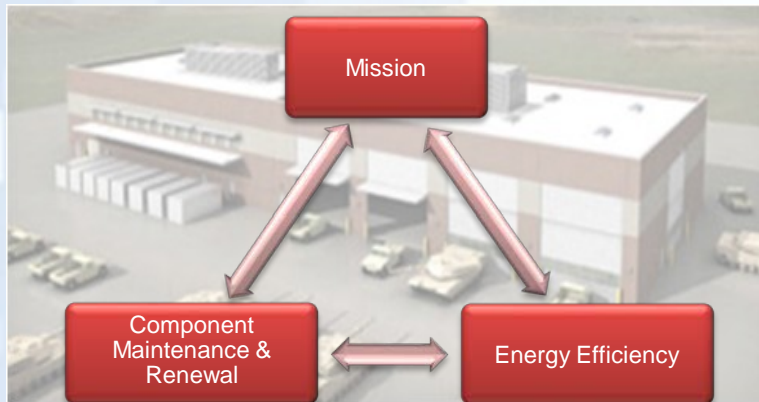
Research and Development of innovative S&T solutions to more efficiently plan, design, construct, operate and maintain installations, including contingency bases

Purpose:

- Increase installation mission readiness
- Increase installation energy and water security, decrease waste, while reducing overall costs and usage rates
- Support highly sustainable installations
- Reduce installation lifecycle costs

	BUILDER for all Building Components
	PAVER for Airfields and Roads
	RAILER for Track
	ROOFER for Roofing

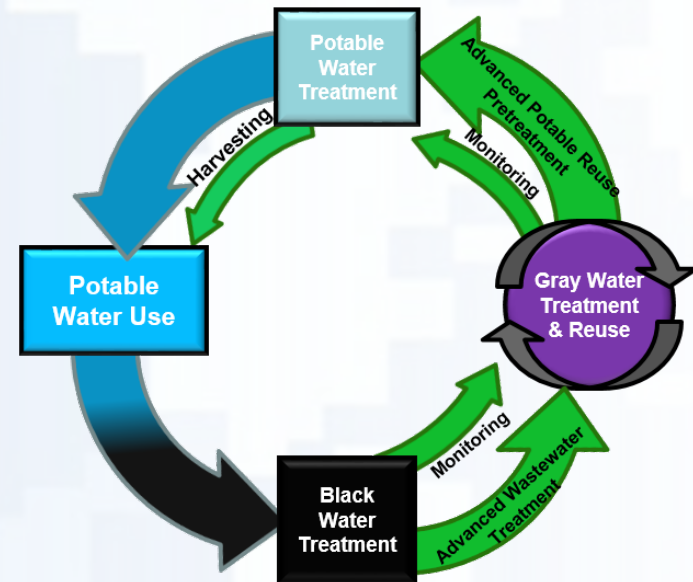
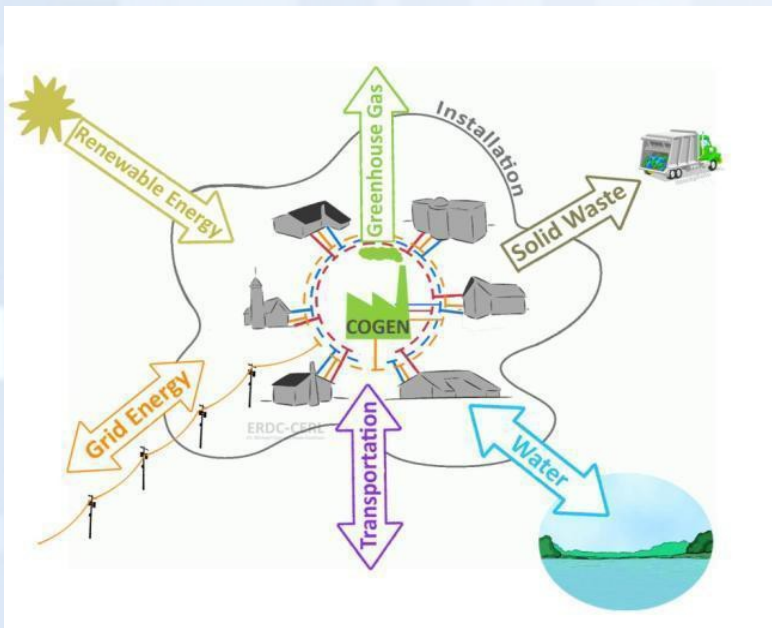
Asset condition prediction-developed condition analysis capability, established science based prediction of maintenance requirements using systematic assessment of condition analysis.



Systems-of-Systems Approach for Planning & Operation

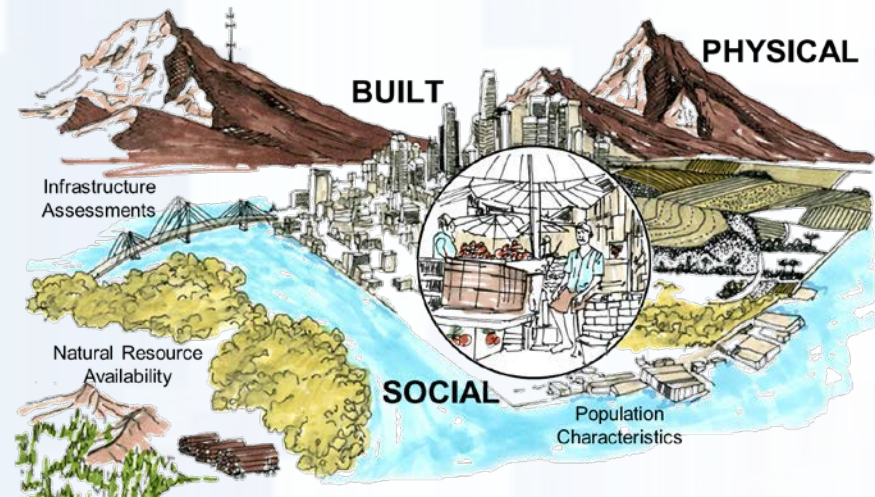
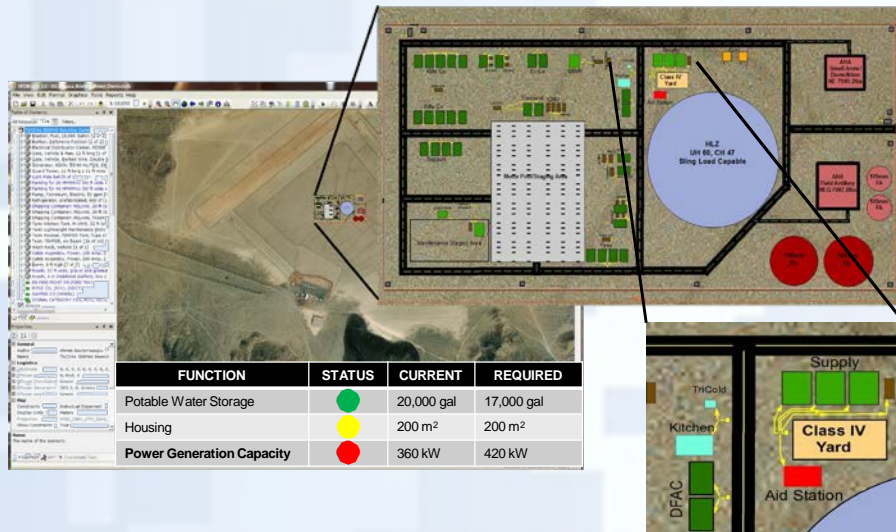
- **Integrated modeling to support Installation master planning for Energy, Water, and Waste (EW²) resource optimization**
 - Reduced energy, water, waste, and GHG to meet Army requirements
 - Integrated approach to management of resources progressing toward net-zero end states
 - Improved local and regional security

- **Practical/efficient water sustainment technologies enabling maximal water reuse, harvesting, and monitoring at Army CBs**
 - 25% reduction in net water demand
 - \$2M/year savings per 1000 PAX base
 - Reduced manpower and energy
 - Increased security



Integrated Planning, Assessment & Design Tools

- **Integrated planning, design & analysis toolset for contingency base (CB) camps**
 - Rapid assessment of the serviceability/life cycle sustainability of CB designs
 - Simulates CB operations to identify areas to improve mission effectiveness & efficiency
 - Training tool for personnel (CB design, planning, operations and management activities)
- **Tools to assesses impact of physical, ecological, and sociocultural environments for CB site selection, design, operations and maintenance**
 - Increased mission effectiveness through operational environmental assessment of CB site selection, design, and O&M
 - Reduced logistical burdens through optimal CB site selection and design
 - Improved acceptance by the local population of military presence, CB construction, O&M activities, and transition through consideration of sociocultural values





The Army Office of Energy Initiatives (OEI) centrally manages, develops, and executes large-scale renewable energy projects, 10 MW or greater, by leveraging private Financing.

Renewable energy produced on Army installations increases energy security and enhances mission effectiveness.



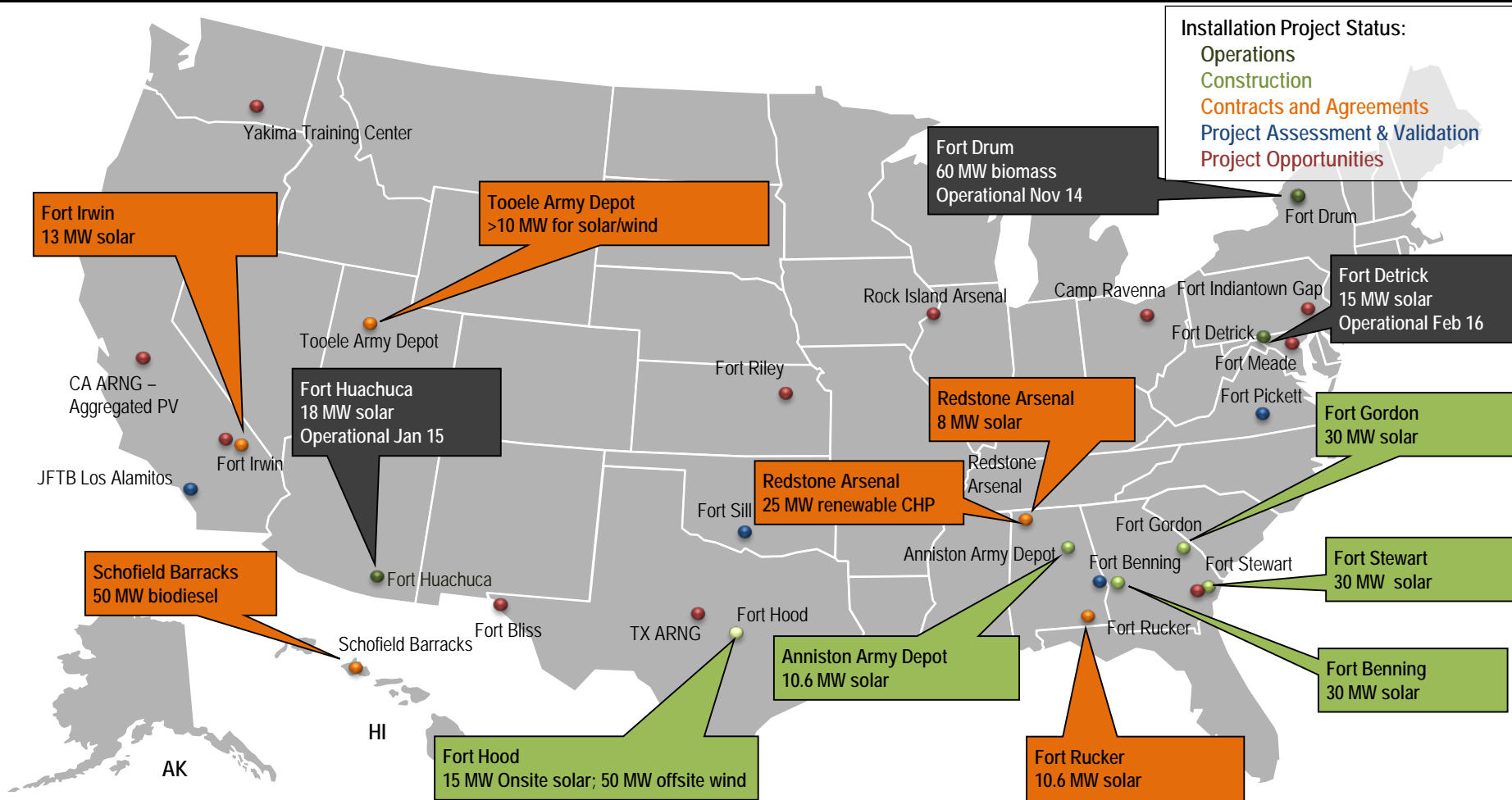
28 MW Biomass Plant
Fort Drum, NY, Feb 2014



65 MW Hybrid Solar and Wind
Project, Fort Hood, TX,
Groundbreaking Jan 2016

30 MW Solar Array, Fort Benning GA, Jan 2016
>133,000 Solar Panels

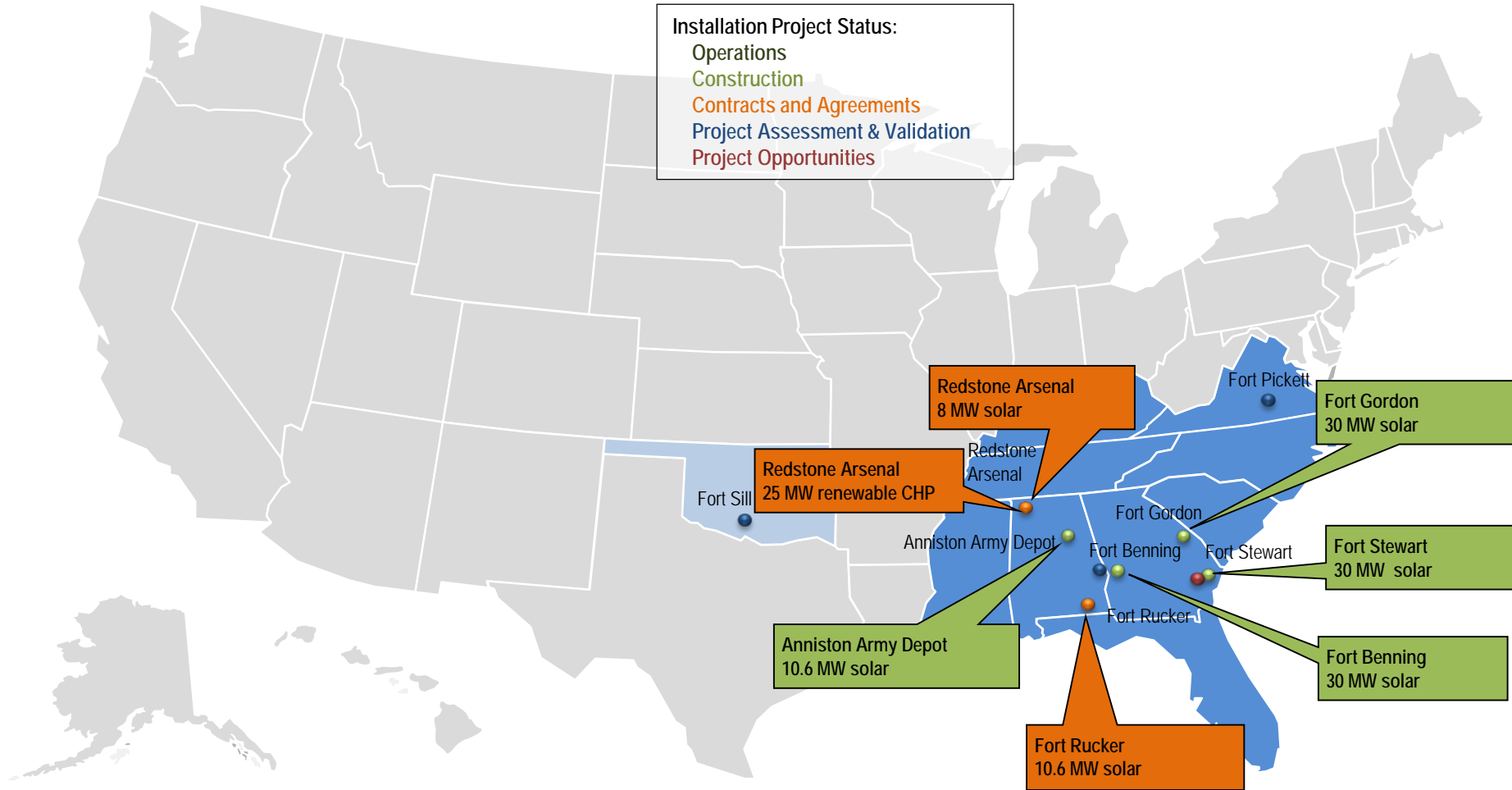
Good for the Army, Good for Industry, Good for Communities



Increasing Energy Security and Resiliency Across Army Installations



Army on the Geographic Frontier of U.S. Renewable Energy Market

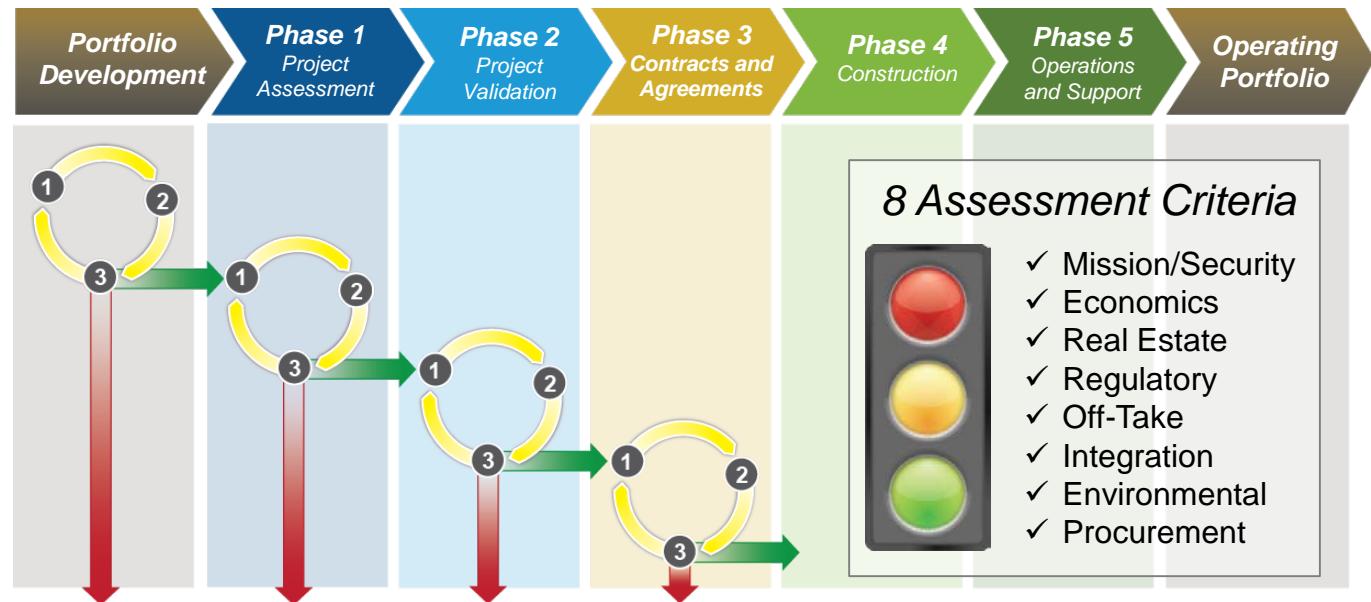
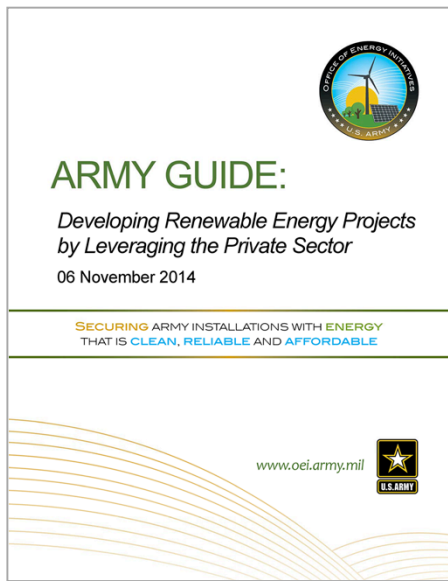


Solar projects at Ft. Gordon, Ft. Stewart, and Ft. Benning (~90 MW) have **TRIPLED** PV capacity in Georgia



The Army Guide outlines the approach and processes for project development

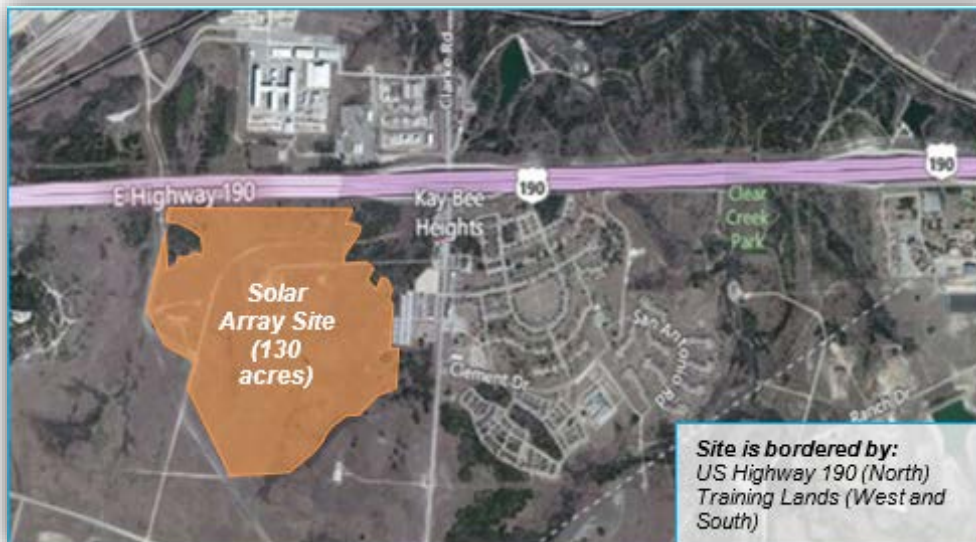
- The development and due diligence process can be used across each of the early phases of the lifecycle
- Projects should be analyzed using the 8 Assessment Criteria and evaluated for viability
- Projects with sufficient viability to justify increased investment should be moved forward; those that are not viable should be suspended





FORT HOOD 15 MW Solar and 50 MW Wind

- Army's first hybrid (solar and wind AC) renewable energy project
- Army's first project to include both on and off installation generation
- Army's largest single renewable energy project to date
- Provides long term price stability and reduces price risk
- \$168 Million in projected present value cost avoidance for Army over life of contract
- Brings in more than \$1 million in fair market rental revenue over the 30 year term
- Over the life of the contract the project is expected to deliver at least 30% cost savings from the conventional rate

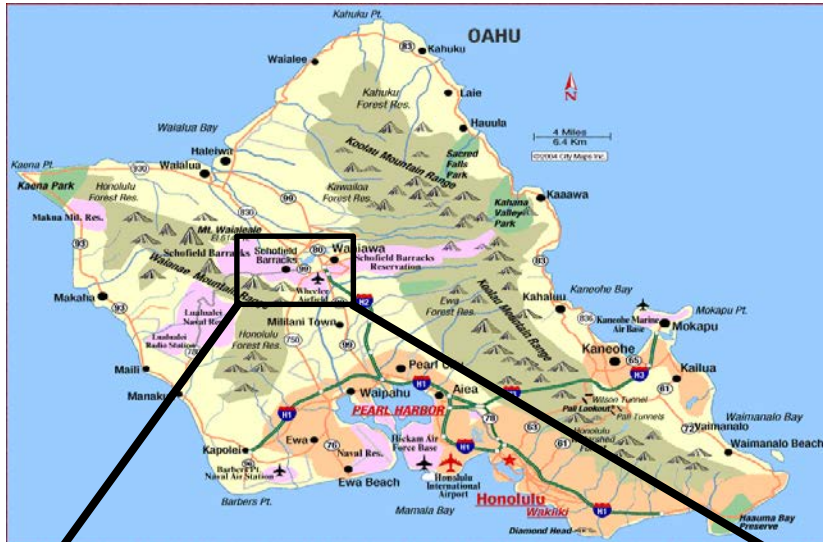




FORT DRUM 60MW Biomass

- Biomass Generation Facility (BGF) supplies 100% of garrison's electricity
- The system operates independent of the local utility, National Grid
- Fort Drum's electricity supply and consumption are not affected by outages National Grid may experience
- Should the BGF go offline, Fort Drum's substations automatically revert to taking electricity from National Grid





- Army is providing land at Schofield Barracks for Hawaiian Electric to construct, own, operate and maintain a 50 MW biofuel-capable power generation plant
- As consideration for the lease, Hawaiian Electric will give the Army “first call” on the electricity it produces during sustained outages or security threats
- 50 MW of firm power is sufficient to meet the peak electricity requirements at Schofield Barracks, Wheeler Army Airfield, and Field Station Kunia
- Ensures that Army critical national security and first response missions can be carried out even when the island wide utility grid has been compromised
- Energy security benefits extend beyond Army
 - Shortens the time required to restore power to the surrounding community
 - Provides capability and capacity to start up other Hawaiian Electric generation units



- Integrated and Distributed Technologies
 - Critical Systems Remain operational in the face of disruptive events
 - Flexible and Diverse Capabilities
 - Adaptability to Uncertain and Changing Conditions
 - Reduced Resource Resupply Burden



Improved Efficiency Space Heater



Black Waste Remediation

Results measured as
increased capability,
reduced vulnerability,
and dollars saved




Distributed Renewable Generation



Energy Efficient Shelters



Before	After	Results
<p>VSP LAM/COP GIRO</p> <ul style="list-style-type: none"> • Multiple Generators running at sub-optimal levels • Generator wetstacking • High Generator Maintenance • Resupplied by airdrop (LAM), Sling Load (GIRO) • Significant equipment and manpower requirement for resupply 	<p>VSP LAM/COP GIRO</p> <ul style="list-style-type: none"> • Balanced generator with loads to remove excess generators • Installed hybrid energy solutions to meet energy demands of mission critical systems • Improved reliability of supply • Provided OE Subject Matter Expertise to Leaders & Soldiers 	<p>VSP LAM</p> <ul style="list-style-type: none"> • Reduced fuel consumption 120 Gallons per Day (GPD) • Reduced # of Generators online 60% • Enhanced mission effectiveness <p>Savings: - ROI 6 months</p> <ul style="list-style-type: none"> • FBCF: <u>\$12.60</u> • Fuel: 43,800 Gal • Dollars: \$551,880 • Equipment: 25 (C17) Flight Hours • Soldier: 228 Man-Hours <p>COP GIRO</p> <ul style="list-style-type: none"> • Reduced fuel consumption 107 GPD • Reduced # of Generators online 40% • Enhanced mission effectiveness <p>Savings: - ROI 4 months</p> <ul style="list-style-type: none"> • FBCF: <u>\$20.38</u> • Fuel: 38,520 Gal • Dollars: \$785,037.60 • Equipment: 216 (UH60) Flight Hours • Soldier: 1771 Man-Hours
<p><u>POTENTIAL IMPACTS OF OE INVESTMENTS ACROSS ALL OF AFGHANISTAN</u></p> <p>- 6.2 M gallons fuel -> \$107,000,000 -> 160,000 man hrs -> 63,000 gen hrs > 15,000 C-17 hrs -> 190,000 UH-60 hrs - near total readiness for sensitive electrons</p>		
		



- **ASA(IE&E):** <http://www.asaie.army.mil/> **ACSIM:** <http://www.acsim.army.mil/> **USACE:** <http://www.usace.army.mil/>

- **Renewable Energy on Army Lands**
 - Large Scale Renewable Energy Projects (>10MW): <http://www.asaie.army.mil/Public/ES/oei/>
 - Siting Clearinghouse: <http://www.acq.osd.mil/dodsc/>

- **Science and Technology**
 - Army Acquisition Business Website: <https://acquisition.army.mil/asfi/>
 - Base Camp Integration Laboratory: <https://pmfss.natick.army.mil/>
 - Communications-Electronics Research, Development and Engineering Center: <http://www.cerdec.army.mil/business/index.asp>
 - Natick Soldier Research, Development and Engineering Center: <http://nsrdec.natick.army.mil/business/index.htm>
 - National Defense Center for Energy and Environment: <http://www.ndcee.ctc.com/>
 - Network Integration Evaluation: <http://integration.army.mil/>
 - Rapid Equipping Force: <http://www.ref.army.mil/>

- **Facilities Energy Innovation**
 - Net Zero: <http://www.asaie.army.mil/Public/ES/netzero/>
 - Strategic Environmental Research and Development Program (SERDP) & Environmental Security Technology Certification Program (ESTCP): <http://www.serdp.org/>
 - Energy Security and Sustainability (ES2) Strategy: <http://usarmy.vo.llnwd.net/e2/c/downloads/394128.pdf>

- **Vehicle Innovation**
 - Tank Automotive Research, Development and Engineering Center: <http://www.army.mil/tardec>
 - Aviation & Missile Research, Development & Engineering Center: <http://www.redstone.army.mil/amrdec/Business/index.html>

- **Small Businesses**
 - Army Small Business Innovation Research Program: <https://www.armysbir.army.mil/sbir/Default.aspx>