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# US Army Net Zero Installations Integrating a Holistic Approach

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# Perfect Storm

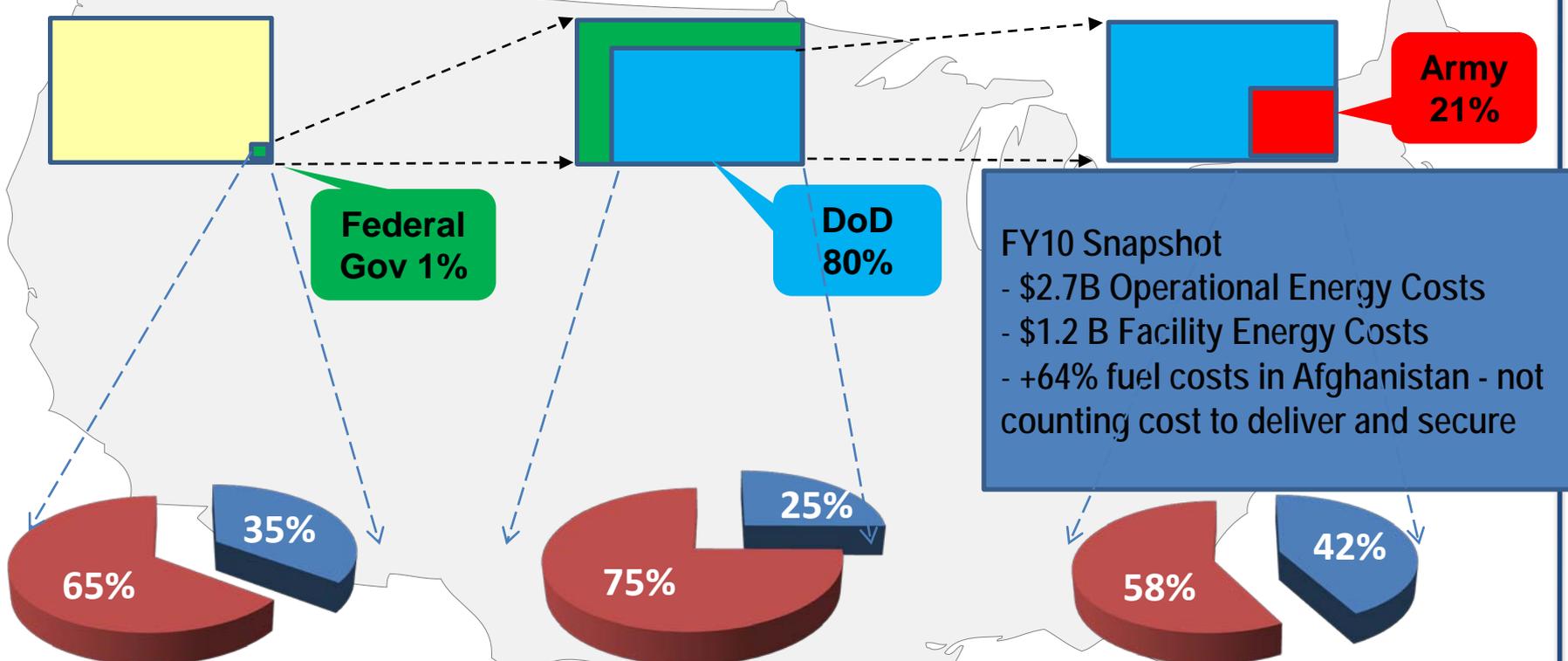


# U.S. Army Energy Consumption, 2009

United States

Federal Government

Department of Defense



■ Facilities  
■ Vehicles & Equipment  
 (Tactical and Non-tactical)

U.S. = 94,578 Trillion Btu

Fed Gov = 1,096 Trillion Btu

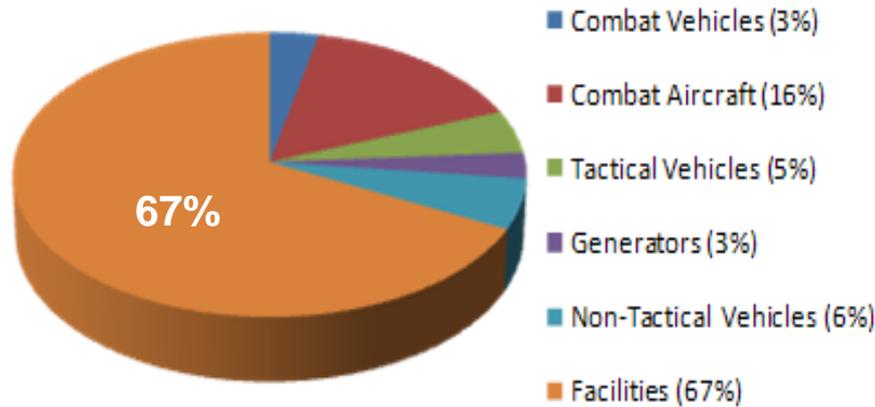
DoD = 880 Trillion Btu

U.S. Army = 190 T Btu

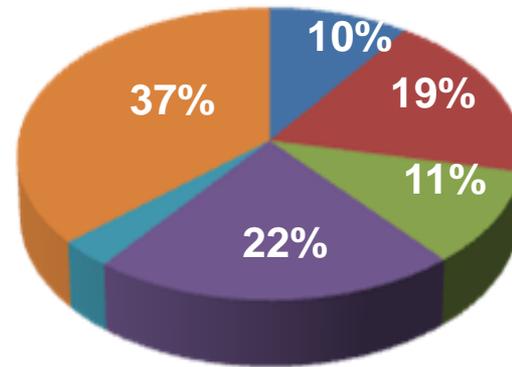
# Army Energy Consumption

Army Energy Requirements are Driven by Mission Requirements

Peacetime



Contingency Operations



## Army Force Moves

**Present**  
Current Army  
Force Structure →



**Future**

- Expanding/closing bases
- Bringing soldiers home
- Additional training for the Guard and Reserve

# Current Mandates

Federal Mandate	Energy Topic	Energy Performance Target
Energy Policy Act of 2005	Electricity use for federal government from renewable sources	<ul style="list-style-type: none"> <li>At least 3% of total electricity consumption (FY07-09), 5% (FY10-12), 7.5% (FY13 +)</li> </ul>
Executive Order 13423	Energy use in Federal buildings	<ul style="list-style-type: none"> <li>Reduce 3% per year to total by 30% by FY2015 (FY2003 baseline)</li> </ul>
	Total consumption from renewable sources	<ul style="list-style-type: none"> <li>At least 50% of required annual renewable energy consumed from "new" renewable sources</li> </ul>
	Fleet vehicle alternative fuel use	<ul style="list-style-type: none"> <li>Increase by 10% annually to reach 100% (Base line FY2005)</li> </ul>
Energy Independence and Security Act of 2007	Total consumption from renewable sources	<ul style="list-style-type: none"> <li>25% by FY2025 - "Sense of Congress"</li> </ul>
	Hot water in new / renovated federal buildings from solar power	<ul style="list-style-type: none"> <li>30% by FY2015 if life cycle cost-effective</li> </ul>
	Fossil fuel use in new / renovated Federal buildings	<ul style="list-style-type: none"> <li>Reduce 55% by FY2010; 100% by 2030</li> </ul>
Executive Order 13514	GHG emission reduction	<ul style="list-style-type: none"> <li>DoD Goal: reduce Scope 1 &amp; 2 GHGs by 34% by FY2020</li> <li>DoD Goal: reduce Scope 3 GHGs by 13.5% by FY2020</li> </ul>
	Net zero buildings	<ul style="list-style-type: none"> <li>All new buildings that enter design in FY2020 and after achieve net zero energy by 2030</li> </ul>
	Water consumption	<ul style="list-style-type: none"> <li>Reduce consumption by 2% annually for 26% total by FY 2020 (FY2007 baseline)</li> </ul>
	Waste minimization	<ul style="list-style-type: none"> <li>Divert at least 50% of solid waste &amp; 50% of C&amp;D waste by FY2015</li> </ul>
National Defense Authorization Act, 2010	Renewable Fuels Use	<ul style="list-style-type: none"> <li>Directs the Secretary of Defense to consider renewable fuels in aviation, maritime, and ground transportation fleets.</li> </ul>
	Facility Renewable Energy Use	<ul style="list-style-type: none"> <li>Produce or procure 25 % of the total quantity of facility energy needs, including thermal energy, from renewable sources starting in FY2025</li> </ul>

# Net Zero Hierarchy



**NET ZERO IS A FORCE MULTIPLIER**

- **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 and returns water back to the same watershed so not to deplete the groundwater and surface water resources of that region in quantity or quality.
- **A Net Zero WASTE Installation** reduces, reuses, and recovers waste streams, converting them to resource values with zero landfill.

**A Net ZERO INSTALLATION** applies an integrated approach to management of energy, water, and waste to capture and commercialize the resource value and/or enhance the ecological productivity of land, water, and air.

# Securing our Energy



- 2009 Electrical grid Crisis Exercise
  - DHS and DoD
- Army is heavily dependent on civilian grid, this must change.

# Securing our Water



- High variability makes it difficult to secure supply.
- Army is heavily dependent on water system to ensure supply.

# Sustaining our Waste Stream



- Army is heavily dependent on civilian waste management systems.

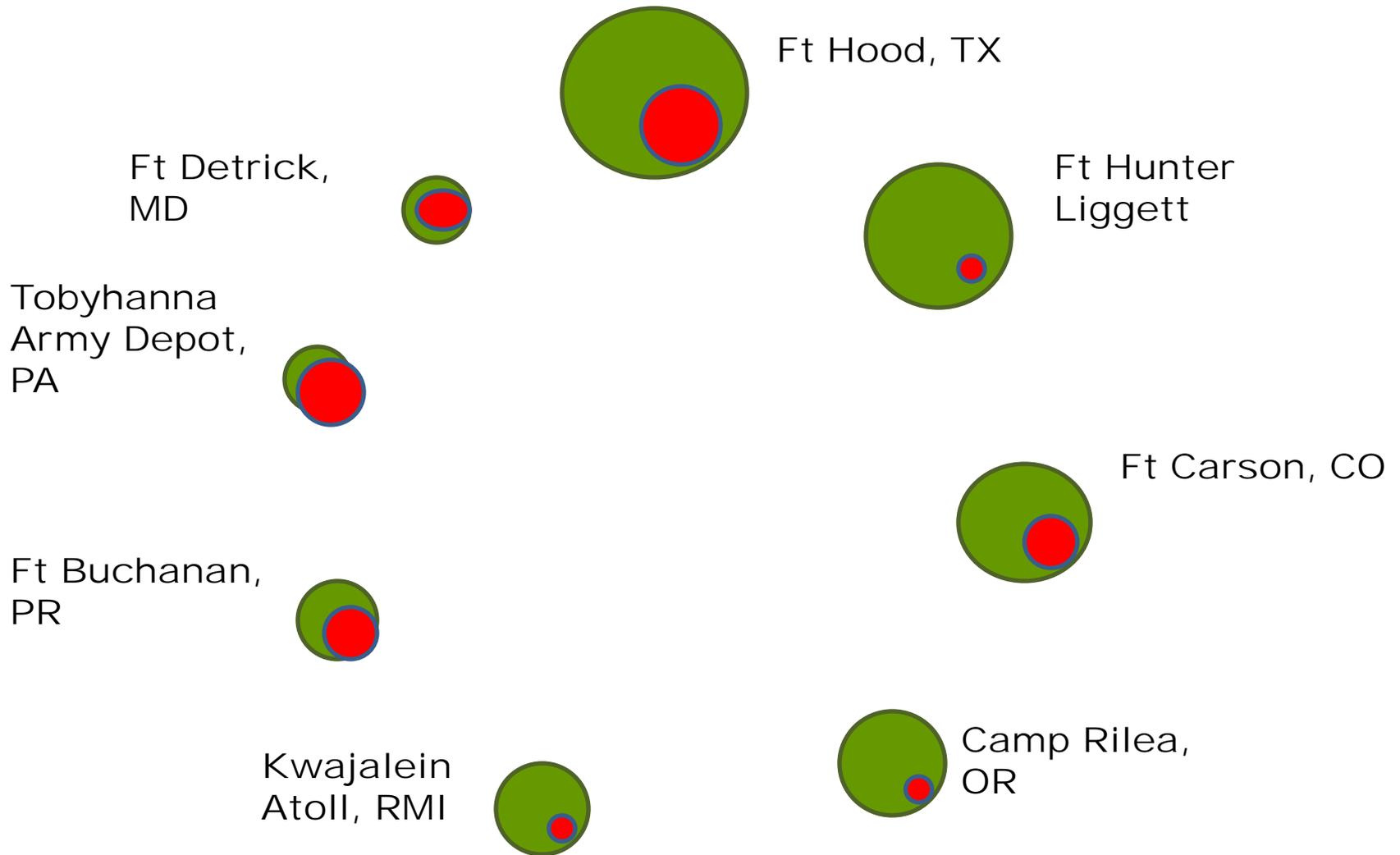
# Installations that Applied



# Pilot Installations



# Diverse Representation – Acreage/Population



# Diverse Representation - Functions

Education

Innovation

Research and Testing



Reset

Soldier and Family Support

# Corporate Comparison

The US Army is comparable to a major corporation in terms of funding, assets and global reach. The Army would rank 3<sup>rd</sup> in comparison to Fortune 500 companies based on funding alone.

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## Army Demographics

**Mission:** “To fight and win our nation’s wars.”

**Operating Locations:** worldwide

**Funding:** **\$245.6 Billion** →

### Personnel

**Active:** 547,400

**Guard:** 358,200

**Reserve:** 205,000

**Civilian:** 300,000

**TOTAL:** **1,410,600**

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## Top 5 Fortune 500 Companies (2009)

Company	Revenue (\$B)
1. Wal-Mart Stores	421.85
2. Exxon Mobil	354.67
3. Chevron	196.34
4. ConocoPhillips	184.97
5. Fannie Mae	153.83

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# Net Zero Hierarchy

## Reduction

- Maximizing energy efficiency and conservation in existing facilities
- Implementing water conservation practices and improved distribution system integrity
- Consider the waste stream when purchasing items to eliminating generation of unnecessary waste

# Net Zero Hierarchy

## Re-Purpose

- Diverting energy, water or waste to a secondary purpose with limited processes
- Using boiler stack exhaust, building exhaust or other thermal energy streams for a secondary purpose
- Utilizing grey water generated from other sources such as showers and sinks

# Net Zero Hierarchy

## Recycling & Composting

- Management of the solid waste stream
- Development of closed loop systems to reclaim water
- Treating and reclaiming wastewater
- Reclaim recyclable and compostable materials

# Net Zero Hierarchy



## Energy Recovery

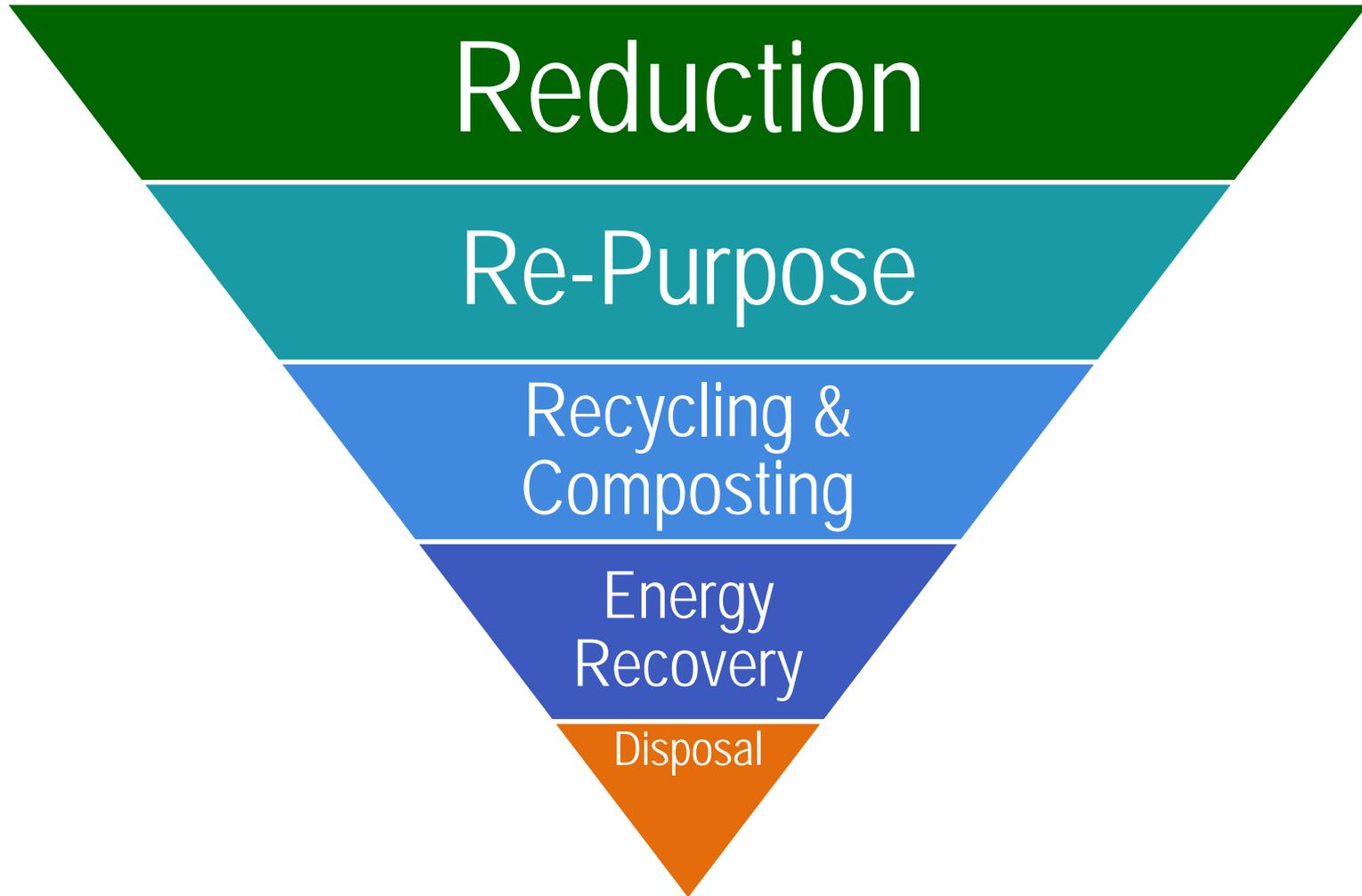
- Converting unusable waste to energy, renewable energy or geothermal water sources
- Cogeneration where two forms of energy (heat and electricity) are created from one source
- Capture bio-gas from waste water treatment

# Net Zero Hierarchy



Final step and last resort after the last drop of water, the last bit of thermal energy and all other waste mitigation strategies have been fully exercised

# Net Zero Hierarchy



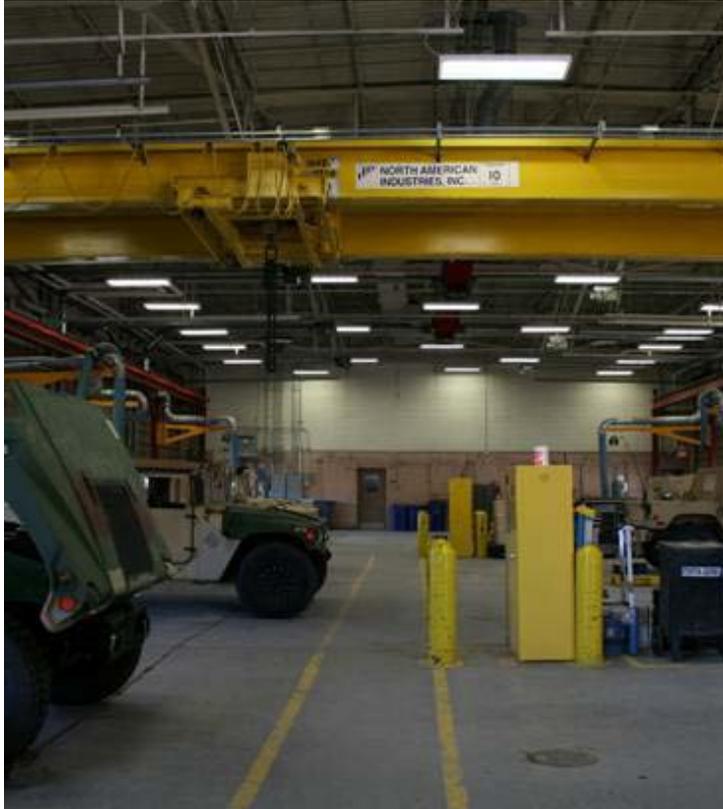
# Fort Carson Case Study



## Current Accomplishments

- 10% Energy Intensity Reduction since 2003
- Technical Assistance from NREL, CERL, Huntsville
- On site Photovoltaic production – 2 MW Solar Array

# Fort Carson Case Study



## Plans and Strategy

- Performing Energy Audits
- Metering Strategy
- Microgrid Testbed
- Culture Change

# Leveraging Private Investments

## **Authorities from Congress (underutilized):**

- Energy Savings Performance Contracts (ESPC)
- Utility Energy Service Contracts (UESC)
- Enhanced Use Lease (EUL)
- Power Purchase Agreement (PPA)

## **Other Authorities (well utilized):**

- Residential Community Initiative (RCI)
- Privatized Army Lodging (PAL)
- Utility Privatization (UP)

# 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