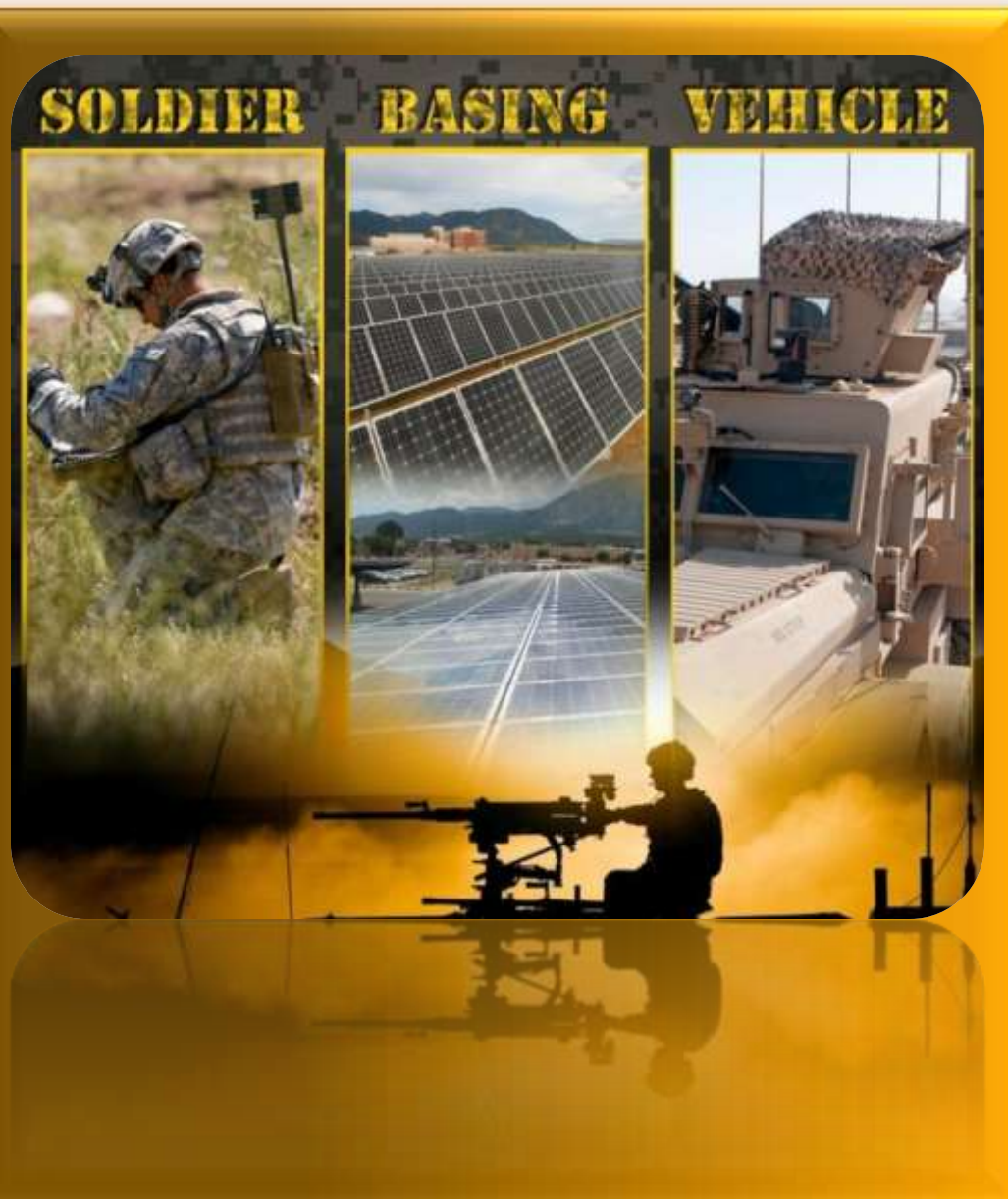


# Army NetZero Initiative



## National Association of State Energy Officials

Mark Mahoney  
Director, Army Regional Environment  
and Energy Office - West

Assistant Secretary of the Army  
(Installations, Energy & Environment)  
17 Sept 2013

# 2013 Army Universe

(Data collected as of 30 Sep 12)

## Land Acreage

• United States	13,428,541
• Europe	133,907
• Asia	22,816
• Other Overseas	1,361

## Roads (paved and unpaved)

- 9,611 Lane Miles

## Paved Area (excludes roads)

(Square yards)

- 255,800,227

## Railroads

- 2,347 (Miles)
- 29,336 (LF (Bridges))

## Buildings

(Square feet)

• United States	776,864,319
• Europe	105,915,310
• Asia	11,899,139
• Other	3,210,417
• Leased	40,955,967
• Privatized	

## Utilities (Miles)

(Electric, Gas, Water, Sewer)

- 45,308

## Army Installations

• IMCOM	66
• Army Reserve	3
• AMC	27
• DLA	5
• National Guard	48
• ARCENT	3

TOTAL

152

## FY12 Army Demographics

**59.8% total married**  
**(8.7% dual military married)**  
**6.6% single parents**  
**880,743 family members**

## Environmental Clean-up Remaining

(Installation Restoration Program & Military Munitions Response Program)

• Active Sites	1,515
• BRAC Sites	310
• Formerly Used Defense Sites	1,738

## Army End-Strength

• Active	550,064
• USAR	201,166
• ARNG	358,078
• Civilians	271,794
• Retired	865,117

## Aviation

• Multi-use	60
• Heliport	28

## Family Housing Units

• Owned	15,281
• Leased	7,945
• Privatized	83,625

## Barracks

Adequate Spaces

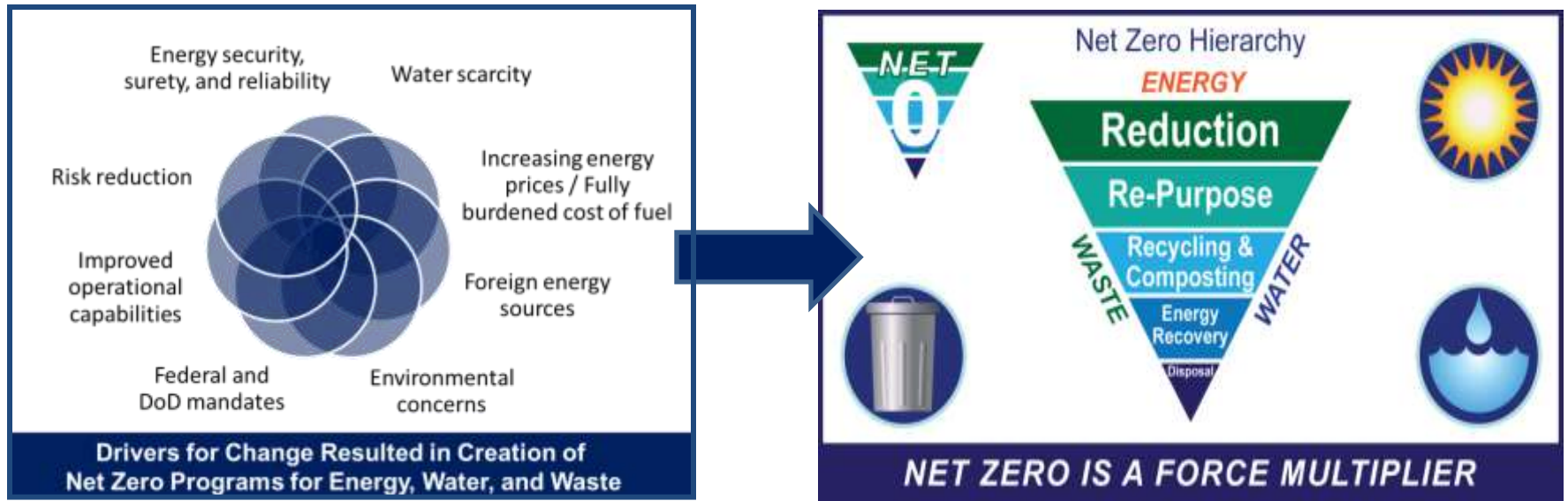
• Permanent Party	148.4K
• Training	71.8K
• ORTC	106.3K

## Plant Replacement Value

- \$314.6B

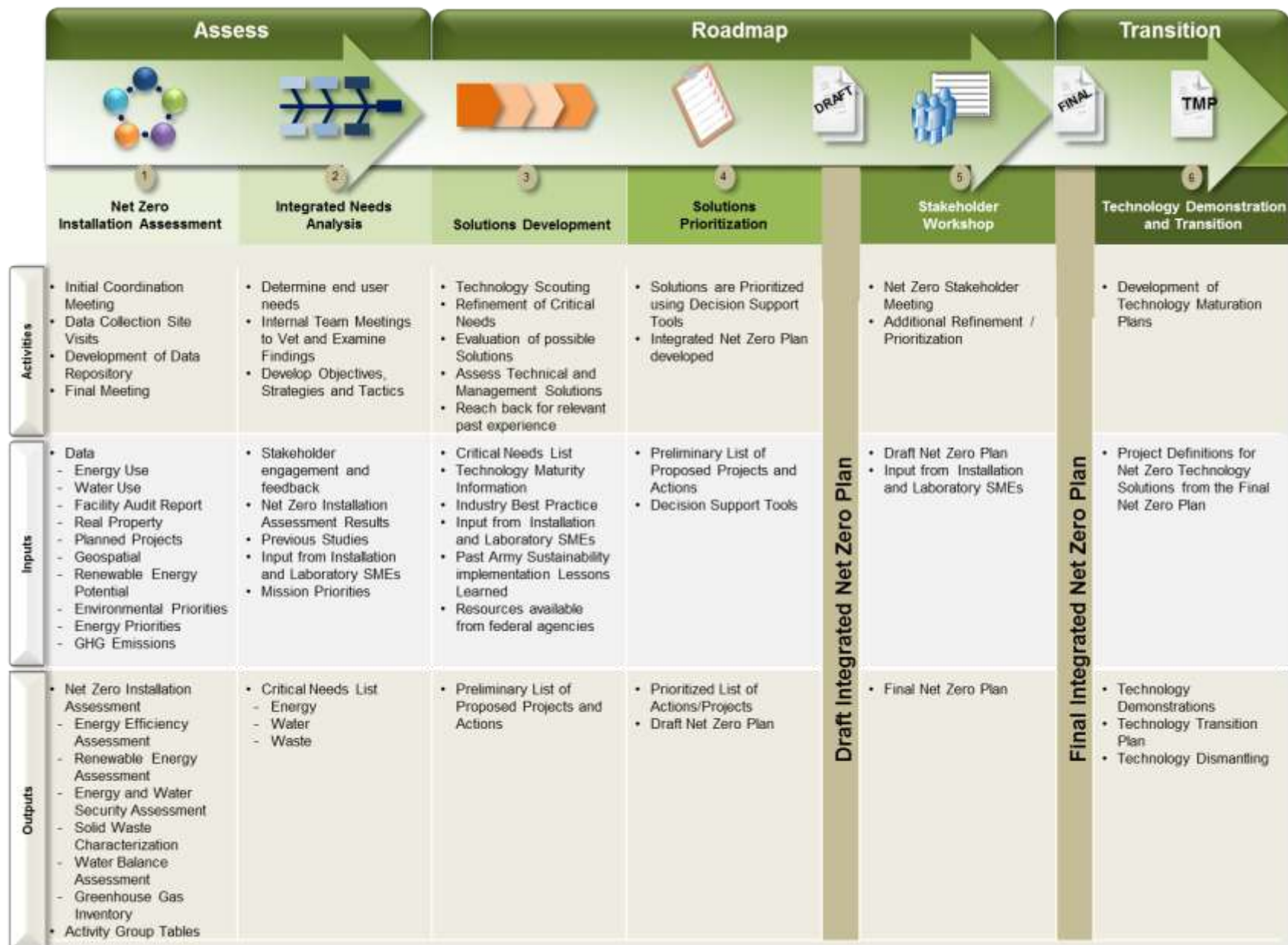
**FY12 Installation Management Resources = \$20.8B**

# Why Army NetZero?



- **A Net Zero ENERGY Installation** is an installation that 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** is an installation that reduces, reuses, and 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, and waste to capture and commercialize the resource value and/or enhance the ecological productivity of land, water, and air.

# Net Zero Planning Concept



# Net Zero Waste



## Waste Reduction

- Improved procurement (e.g., buy less, use “recyclable” content, reduce packaging material) and other P2 efforts

## Re-Purpose

- Furniture donations and re-use centers
- Match waste “products” with potential users (e.g., drywall as soil amendment)

## Recycling and Composting

- Installation recycling centers
- Food waste and organics composting

## Energy Recovery

- After meeting diversion goals
- Only where economically feasible

## Disposal

- Last resort after other economically feasible efforts are implemented

**Goal: No solid waste disposal in landfills by FY2020**

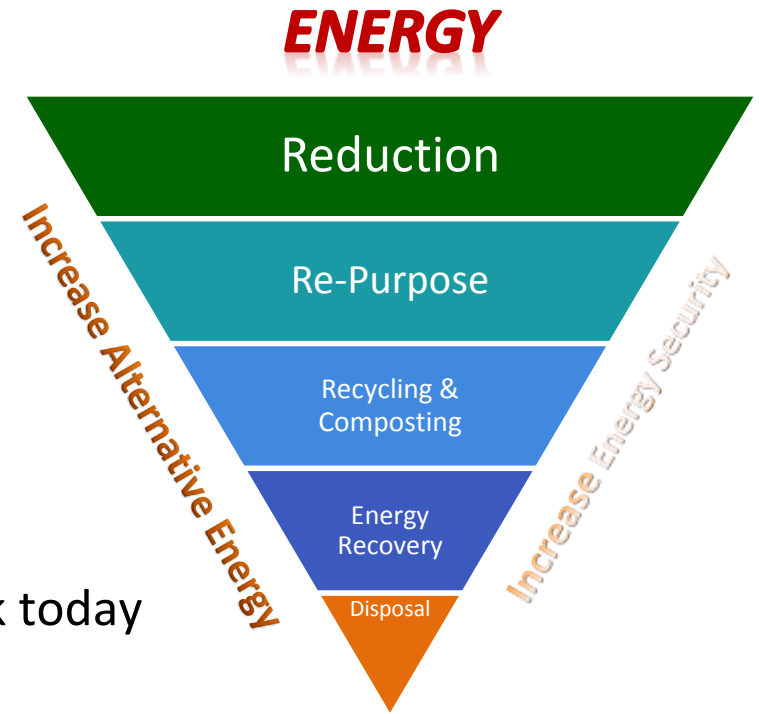
# Net Zero Energy

## A Net Zero **ENERGY** Installation

is an installation that produces as much energy on-site as it uses over the course of a year.

### **Requires integrated approach:**

- Dramatic demand-side energy use reduction
- We must build and retrofit our building stock today with life-cycle costs in mind.
- Right mix of energy generation technologies and strategies that contribute to energy security
- Clear and flexible implementation strategies based on potential technology innovations and mission changes



# The Installation Approach – Fort Carson

- **Net zero must address energy, water, and waste holistically**

- Energy and water
- Water and waste
- Waste and energy



- **Collaboration Across the Fence Line**

- Feds; DoE, EPA & GSA
- Local and regional partnerships to develop regional solutions (e.g., renewable energy, recycling, waste-to-energy)
- Public-private partnerships focused on implementing large-scale renewable energy projects



- **Nation Wide Roll Out**

# LEED Facilities



*Williams Road Solar Array  
St. Vrain, Colorado*

# Coolerado



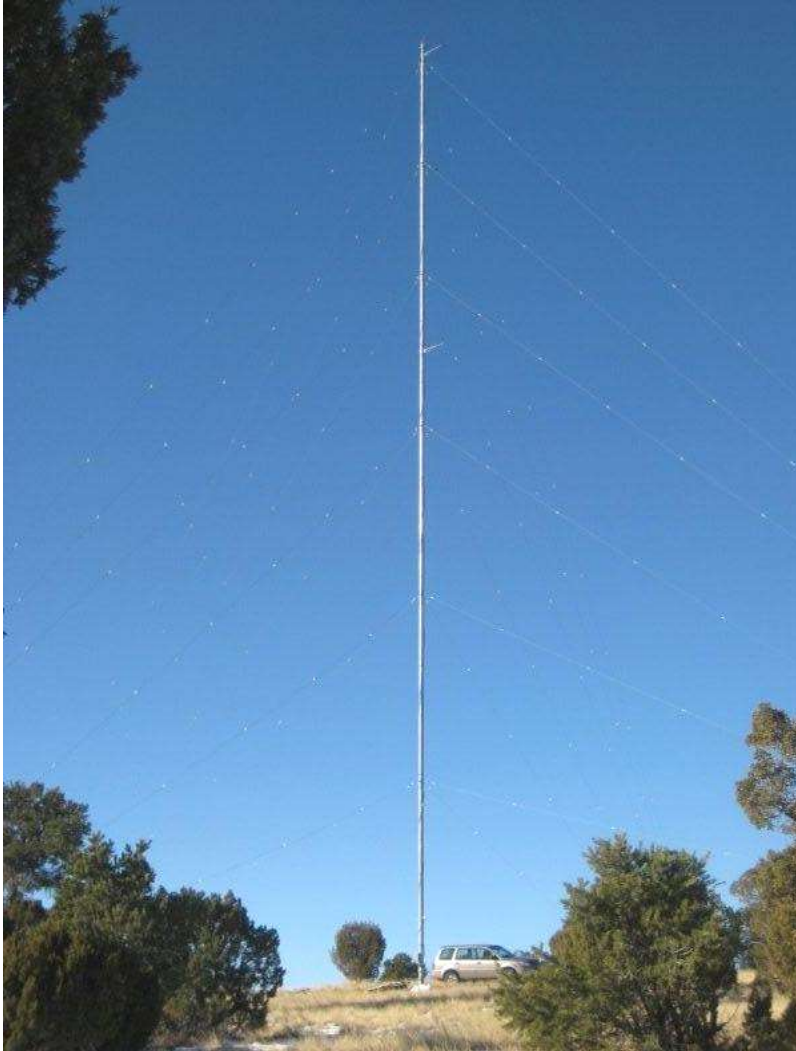
# Solar Ventilation Preheat



## The SPIDERS Microgrid at Fort Carson

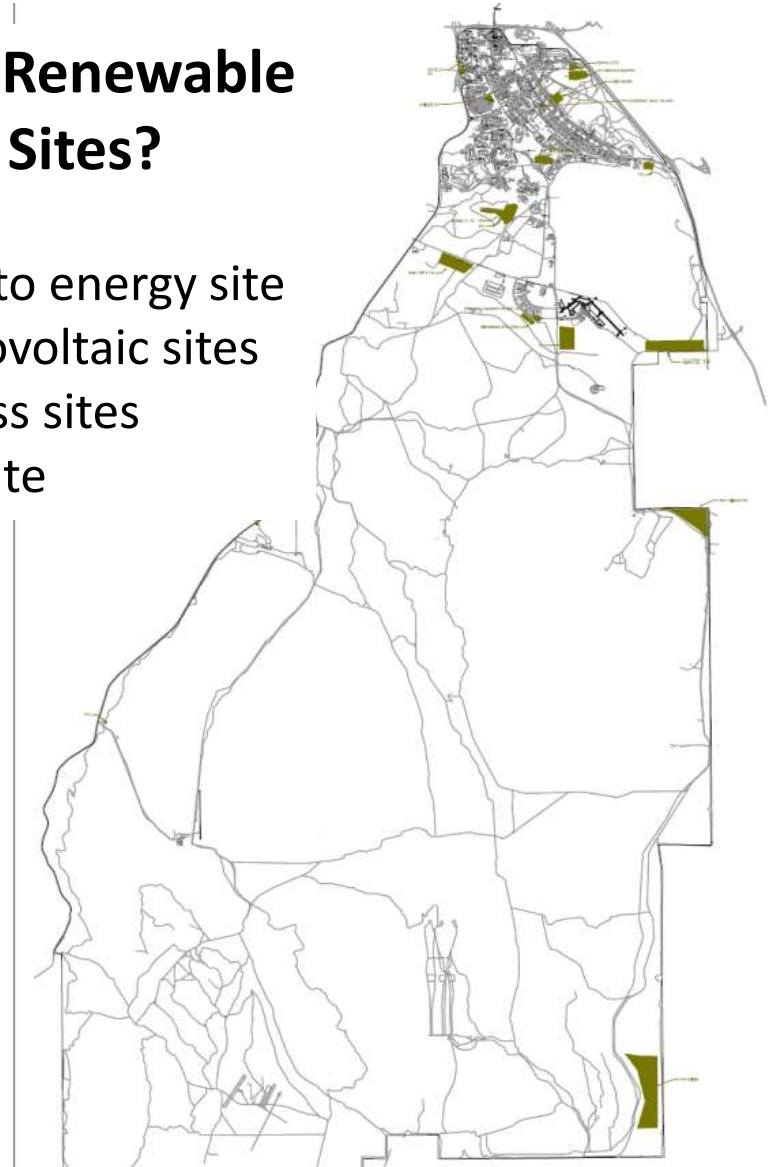


# Fort Carson Energy Resources



## Future Renewable Energy Sites?

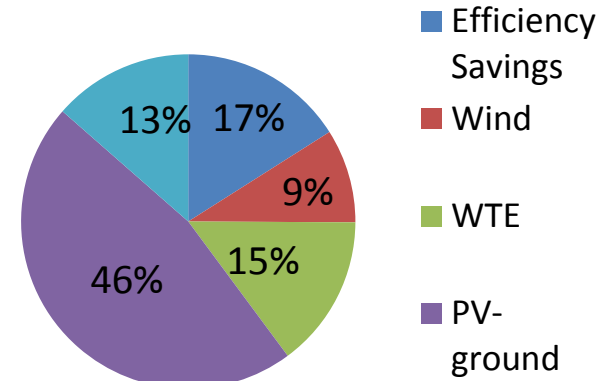
- 1 waste to energy site
- 11 photovoltaic sites
- 2 biomass sites
- 1 wind site



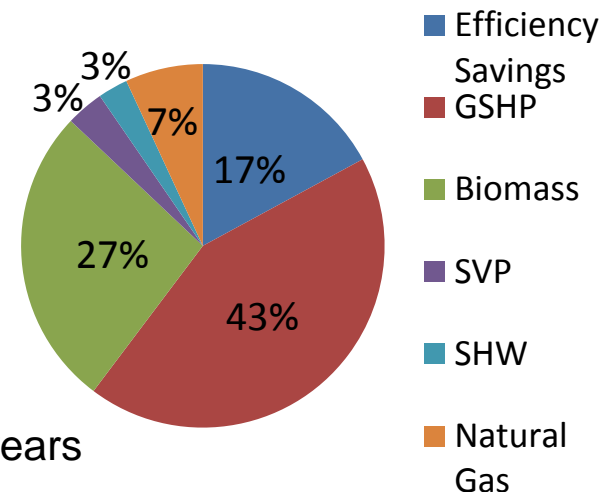
# NREL Recommendations

	Size	Energy Production (MMBtu)	LCOE (cents/kWh)
<b>Electrical:</b>	<b>100% Renewable</b>		
Wind	11.2 MW	84,082	5.80
WTE	5.6 MW	136,952	8.75
PV-Ground	83 MW	431,902	17.45
PV-Roof	24 MW	125,580	19.65
GSHP		-38,268	
<b>Thermal:</b>	<b>93% Renewable (\$/MMBTU)</b>		
GSHP	16,210 tons	410,451	\$2.81–\$4.64
SVP	106,798 ft <sup>2</sup>	31,964	\$3.30
Biomass	45 MMBtu/h	254,617	\$4.28
SHW	52,686 ft <sup>2</sup>	25,334	\$6.34

Electric Energy



Thermal Energy



\*Projected \$514M investment, \$322M premium over next 25 years

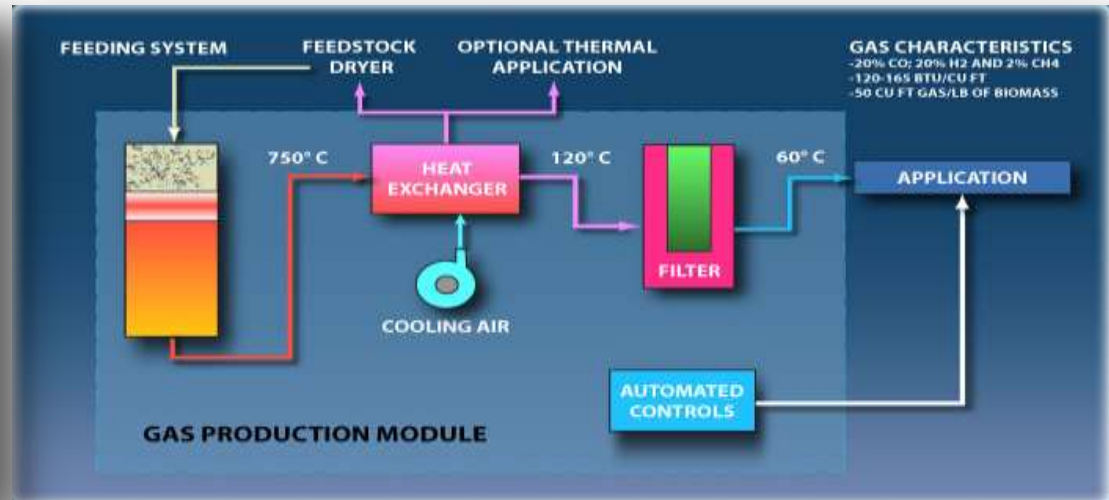
# Carson Solar 1, LLC – 2MW



# Infinia Dish Combined Heat & Power



# BioMax Gasifier



# Army Fleet Electrification Pilot Site

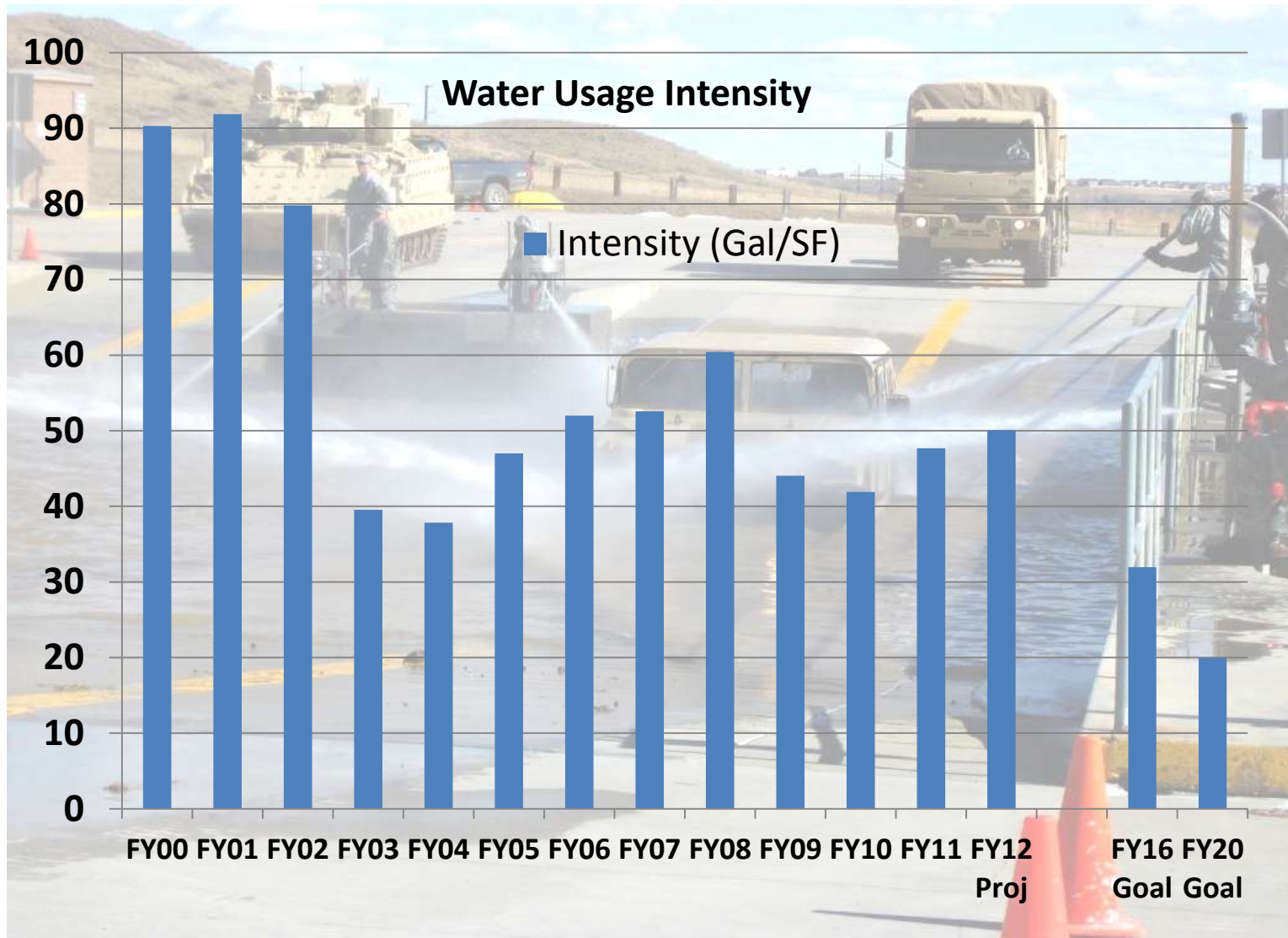


"For what we do on post it works out, excellent," said Ryan Sullivan, DPW recycle operator. "For stop and go (driving), it is ideal."

**Butts Army Airfield Fort Carson, Colorado**

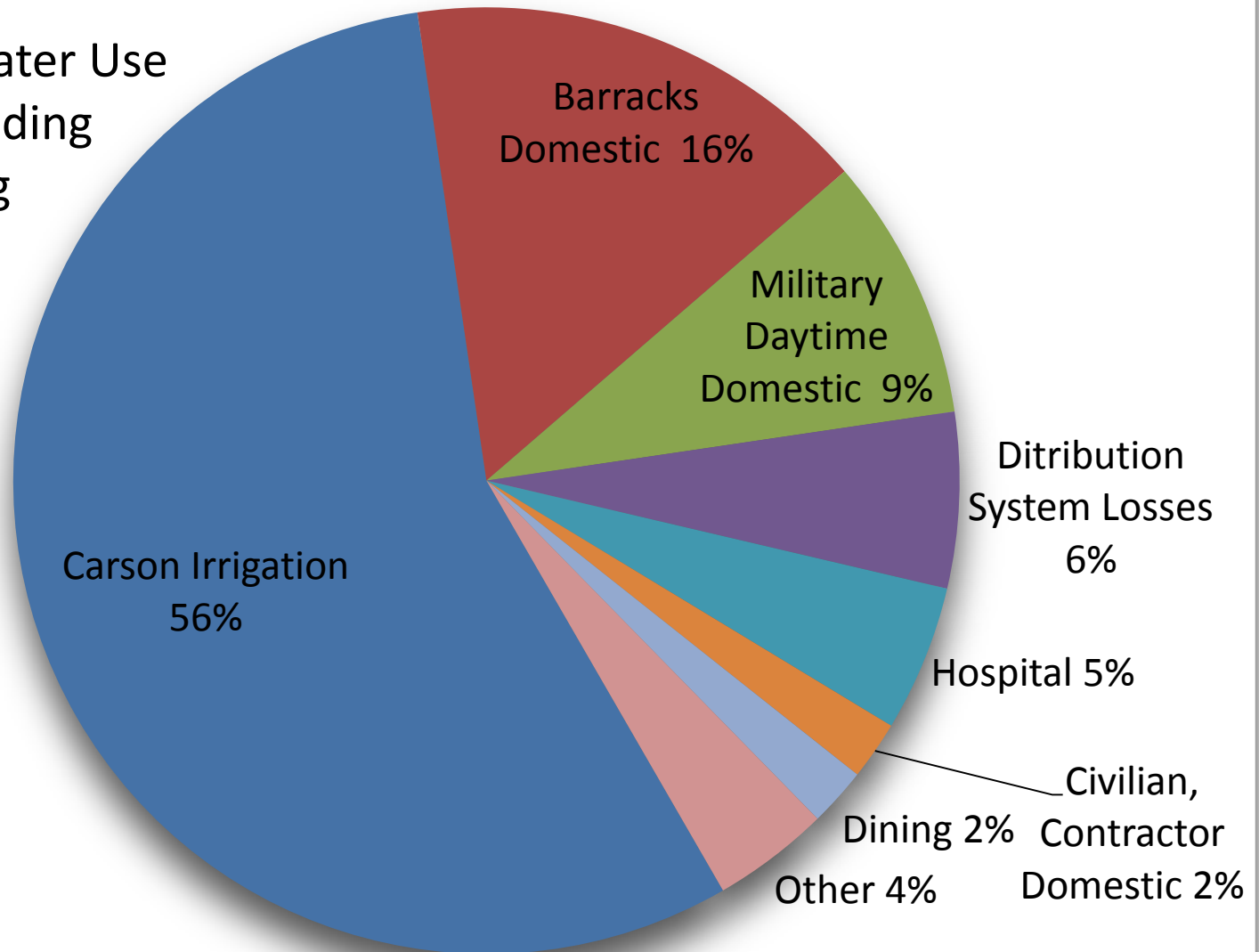


# Net Zero Water Strategy



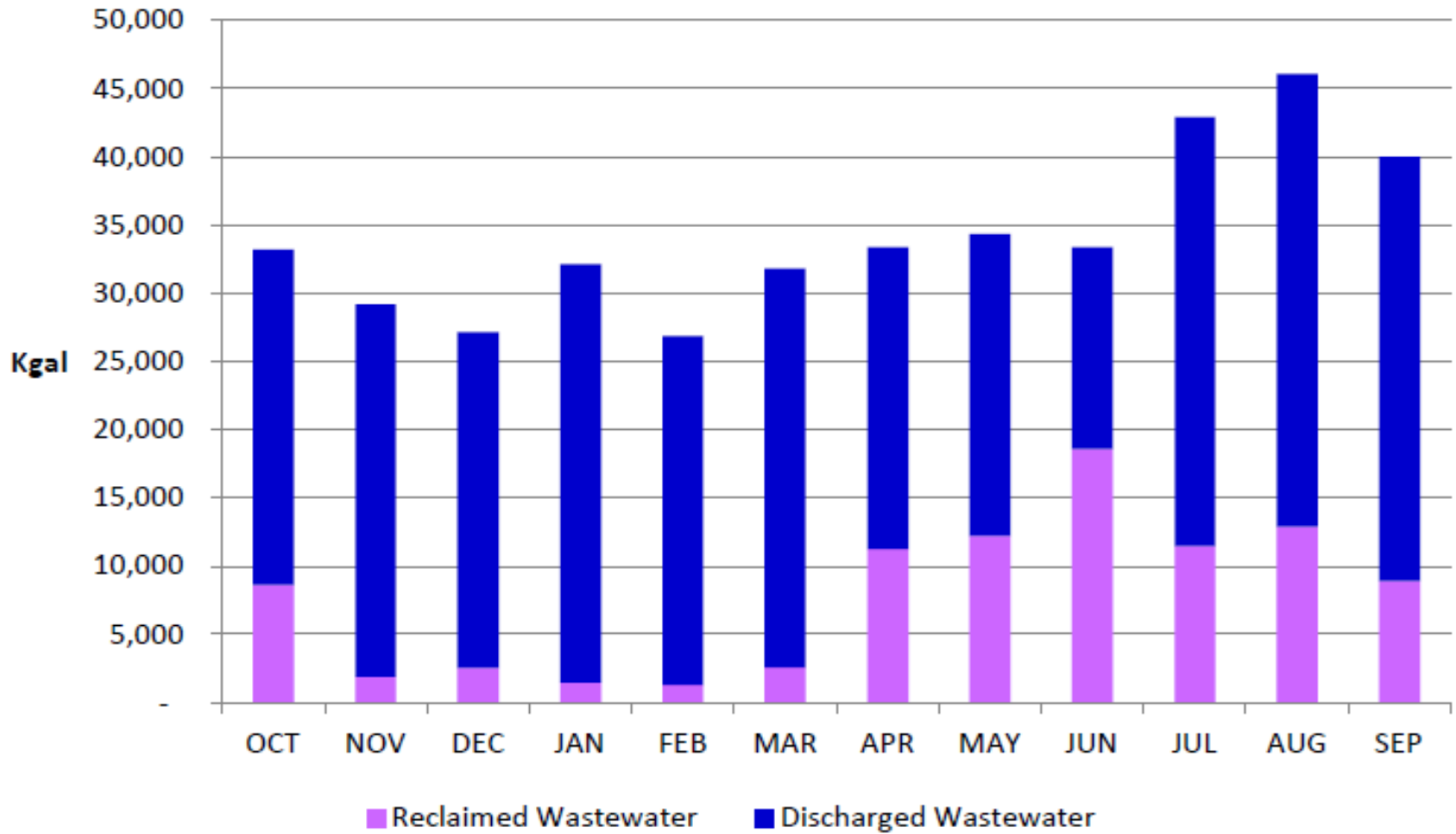
# Water Balance Study

Fort Carson Water Use  
Breakout Excluding  
Family Housing



# Reclaimed Water System Expansion

FY 2011 Treated Wastewater through Fort Carson WWTP



# Stormwater Best Management Practices



# Weather Smart Irrigation System



# Leak Detection Survey



# Achieving Success

- ✓ Leadership
- ✓ Passion
- ✓ Partnerships
- ✓ Funding
- ✓ Policies

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- FY11 Sustainability Report: <http://www.asaie.army.mil/Public/ES/netzero/>
- Army Energy Initiative Task Force: <http://armyeitf.com>