Army Net Zero

Progress and Barriers to Becoming Net Zero

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Interagency Sustainability Working Group

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FY14 Army Universe

Land Acreage (Summary Data)
- United States 13,482,669
- Europe 133,906
- Asia 27,491
- Other Overseas 1,361

Roads (paved and unpaved)
- 55,308 Lane Miles

Paved Area (excludes roads)
- 267,033,417 Sq. Yards

Railroads
- 2,252 (Miles)
- 57,742 (LF Bridges)

Buildings (Square feet)
- United States 680,159,316
- Europe 105,867,428
- Asia 42,549,120
- Other 3,204,439
- Leases 37,746,313
- Privatized 120,507,597
- WWII Wood 16,524,530

1 Billion Square Feet

Utilities (Systems)
(Electric, Gas, Water, Wastewater)
- Army-Owned 210
- Privatized 144

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

TOTAL 152

152 Small Cities

FY13
Army Demographics
59% total married
(8.7% dual military married)
6.2% single parents
837,052 family members

Environmental Clean-up Remaining
(Installation Restoration Program & Military Munitions Response Program)
- Active Sites 1,392
- BRAC Sites 275
- Formerly Used Defense Sites 1,717

Army End-Strength
- Active 532,506
- USAR 198,209
- ARNG 354,735
- Civilian 255,566
- Retired 834,674

2.2 Million People

Aviation
- Multi-use 60
- Heliport 28

Family Housing Units
- Owned 16,009
- Leased 6,432
- Privatized 86,277

108,000 Homes

Adequate Barracks
- Permanent Party 127.2K
- Training 148.4K

Plant Replacement Value
- $304.4B

FY13 Installation Management Resources = $18.9B

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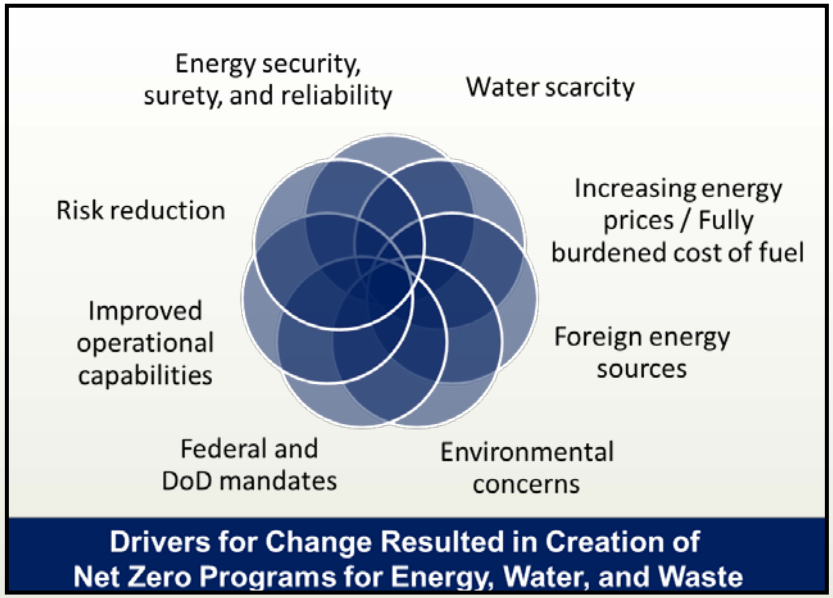
Drivers of Change

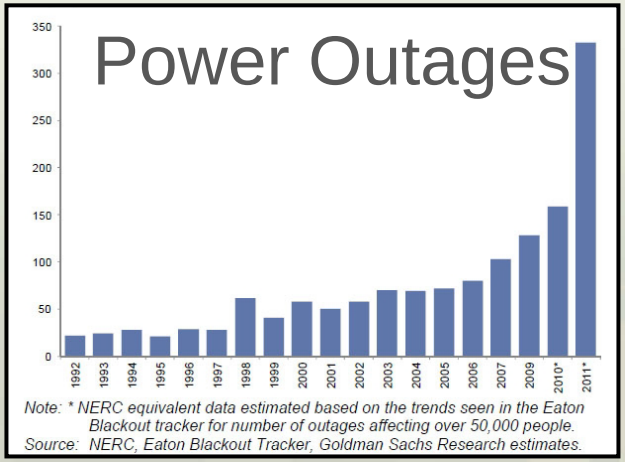
Risk factors and competing priorities include:



Drivers for Change Resulted in Creation of Net Zero Programs for Energy, Water, and Waste

Federal Mandate	Focus Area	Performance Target
Energy Policy Act of 2005	Electricity use for federal government from renewable sources	• At least 3% of total electricity consumption (FY07-09), 5% (Fy10-12), 7.5% (FY13 +)
Executive Order 13423	Energy use in Federal buildings	• Reduce 3% per year to total by 30% by FY2015 (FY2003 baseline)
	Total consumption from renewable sources	• At least 50% of required annual renewable energy consumed from "new" renewable sour
	Fleet ve alternative fuel use	Increase by nually to reach 100% (FY2005 baseline)
Energy Independence & Security Act of 2007	Total consum renewabl sour	gress"
	Hot water in federal	
	Fossil fuel use Fed	020
Executive Order 13514	GHG emission redu	2 GHGs by 34% by FY2020
	Net zero buildings	e Scop Gs by 13.5% by FY2020 new bu that enter des in FY2020 & after achieve net zero energy by FY 30
	Water consumption	Reduce consumption by 2% annually for 26% total by FY2020 (FY2007 baseline)
	Waste minimization	• Divert at least 50% of solid waste & 50% of C&D waste by FY2015
National Defense Authorization Act, 2010	Renewable fuels use	• Directs the Secretary of Defense to consider renewable fuels in aviation, maritime, and ground transportation fleets.
	Facility renewable energy use	• Produce or procure 25 % of the total quantity of facility energy needs, including thermal energy, from renewable sources starting in FY2025

Performance Targets

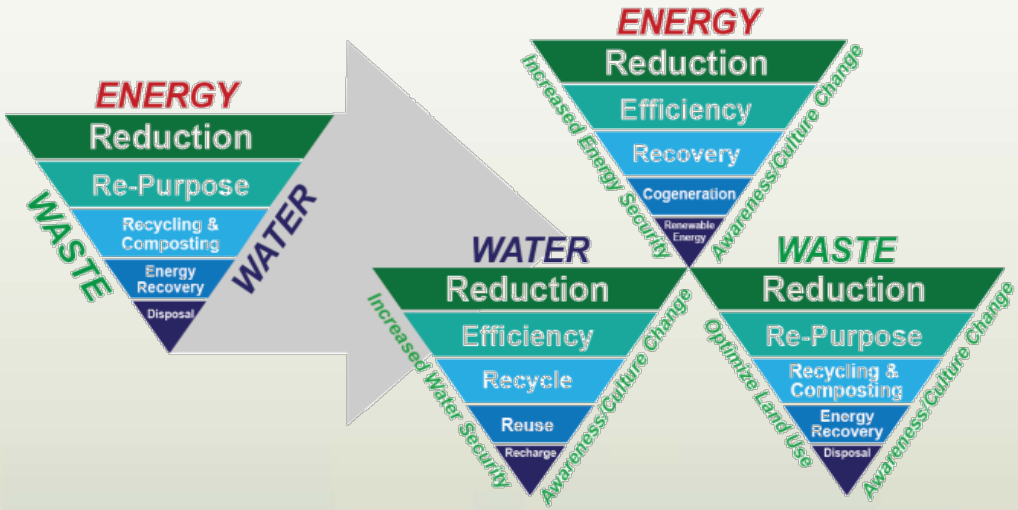


*Note: * NERC equivalent data estimated based on the trends seen in the Eaton Blackout tracker for number of outages affecting over 50,000 people.*
Source: NERC, Eaton Blackout Tracker, Goldman Sachs Research estimates.

Evolution of Army Net Zero

17 Net Zero Pilot Installations

Evolution of Net Zero Hierarchies



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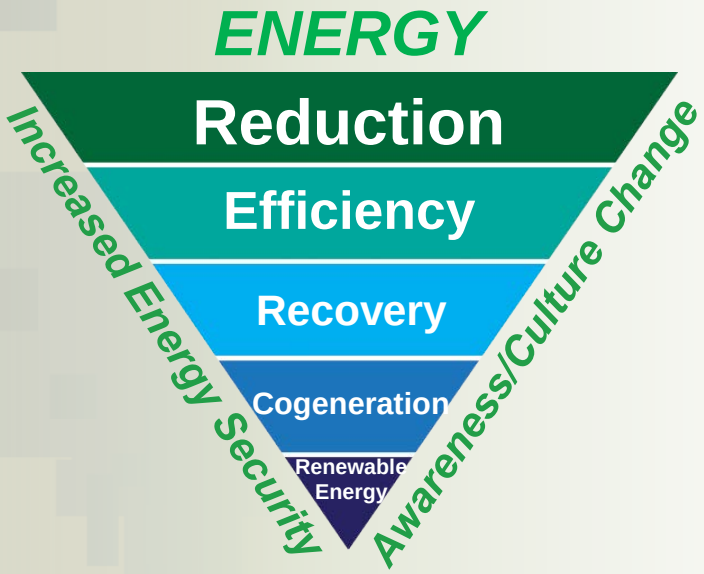
Net Zero Energy



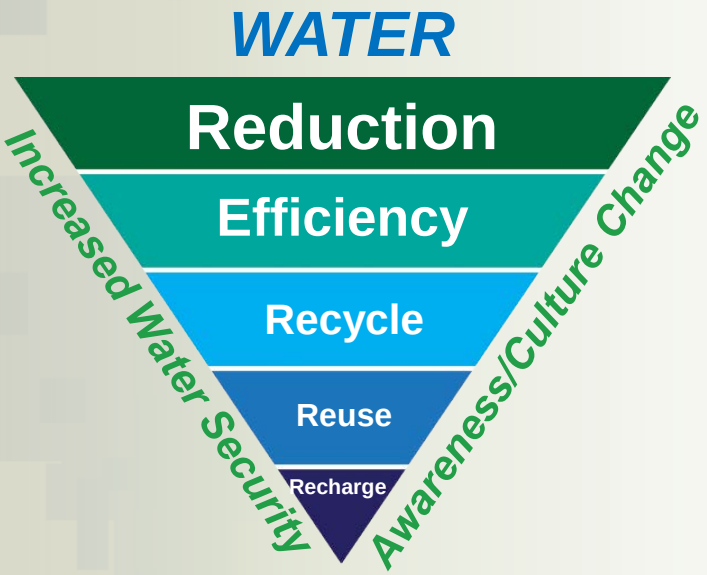
Net Zero ENERGY:

Reduce overall energy use, maximize efficiency, implement energy recovery and cogeneration opportunities, and then offset the remaining demand with the production of renewable energy from on-site sources

Holistic Approach Includes:

- Demand-side energy use reduction
- Energy generation technologies and strategies that also increase energy security
- Building clusters served by smaller central utility plants and microgrids
- Flexible implementation strategies

Net Zero Water



Net Zero WATER:

Reduce overall water use, regardless of the source; increase use of technology which uses water more efficiently; recycle and reuse water, shifting from potable water use to non-potable sources as much as possible; and minimize inter-basin transfers of any type of water, potable or non-potable

Holistic Approach Includes:

- Water conservation and efficiencies
- Water reuse strategies
- Water security and reliability strategies

Net Zero Waste

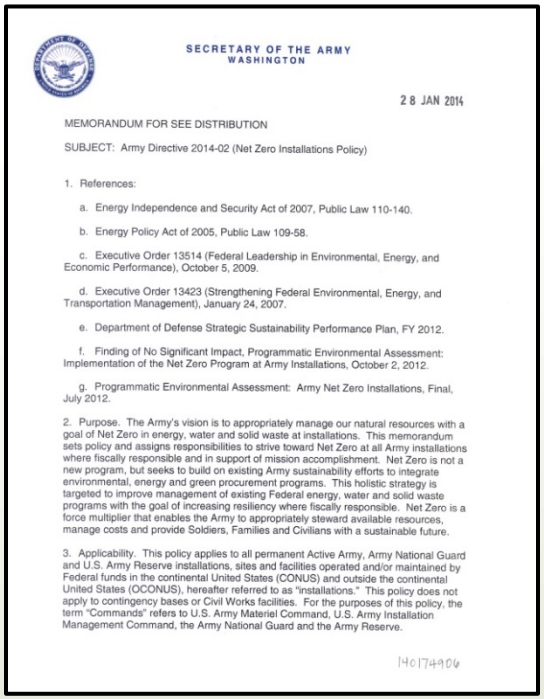
Net Zero WASTE:

Reduce, reuse, recycle/compost, and recover solid waste streams, converting them to resource values, resulting in zero landfill disposal

Holistic Approach Includes:

- Improved purchasing practices
- Recognition that waste is a resource
- Increased recycling and composting
- Energy recovery

Net Zero Army Wide



SECRETARY OF THE ARMY
WASHINGTON

28 JAN 2014

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Army Directive 2014-02 (Net Zero Installations Policy)

1. References:

a. Energy Independence and Security Act of 2007, Public Law 110-140.

b. Energy Policy Act of 2005, Public Law 109-58.

c. Executive Order 13514 (Federal Leadership in Environmental, Energy, and Economic Performance), October 5, 2009.

d. Executive Order 13423 (Strengthening Federal Environmental, Energy, and Transportation Management), January 24, 2007.

e. Department of Defense Strategic Sustainability Performance Plan, FY 2012.

f. Finding of No Significant Impact, Programmatic Environmental Assessment: Implementation of the Net Zero Program at Army Installations, October 2, 2012.

g. Programmatic Environmental Assessment: Army Net Zero Installations, Final, July 2012.

2. Purpose. The Army's vision is to appropriately manage our natural resources with a goal of Net Zero in energy, water and solid waste at installations. This memorandum sets policy and assigns responsibilities to strive toward Net Zero at all Army installations where fiscally responsible and in support of mission accomplishment. Net Zero is not a new program, but seeks to build on existing Army sustainability efforts to integrate environmental, energy and green procurement programs. This holistic strategy is targeted to improve management of existing Federal energy, water and solid waste programs with the goal of increasing resiliency where fiscally responsible. Net Zero is a force multiplier that enables the Army to appropriately steward available resources, manage costs and provide Soldiers, Families and Civilians with a sustainable future.

3. Applicability. This policy applies to all permanent Active Army, Army National Guard and U.S. Army Reserve installations, sites and facilities operated and/or maintained by Federal funds in the continental United States (CONUS) and outside the continental United States (OCONUS), hereafter referred to as "installations." This policy does not apply to contingency bases or Civil Works facilities. For the purposes of this policy, the term "Commands" refers to U.S. Army Materiel Command, U.S. Army Installation Management Command, the Army National Guard and the Army Reserve.

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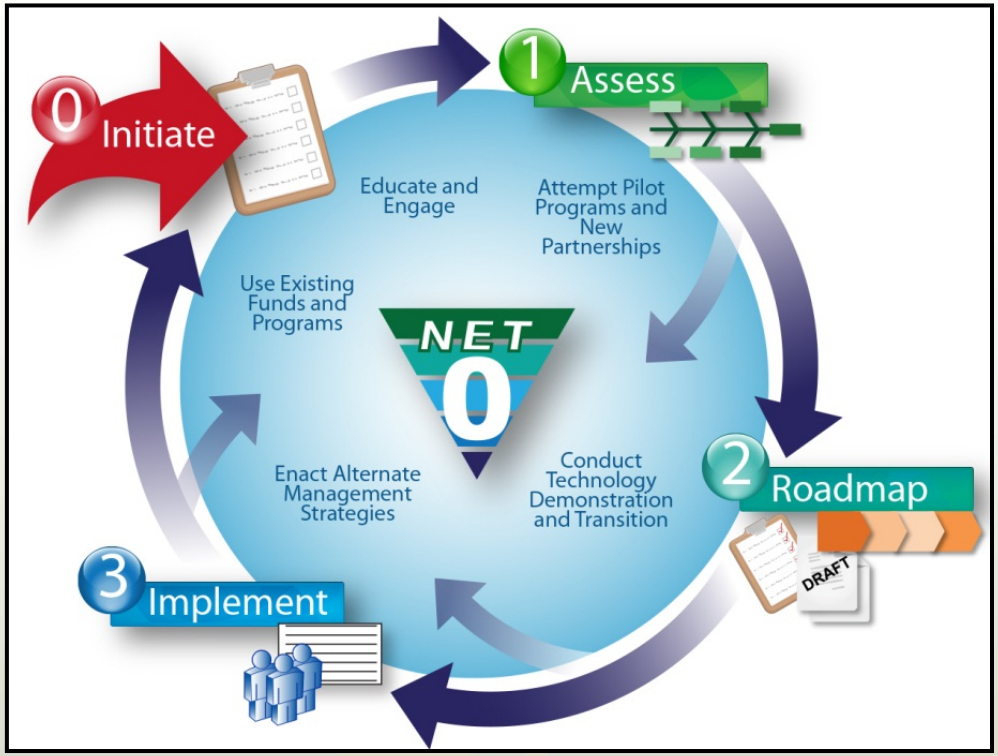
Net Zero Installations Policy: Army Directive 2014-02

NZ Implementation Approach: Initiate, Assess, Roadmap and Implement



Net Zero Implementation

Implementation Activities

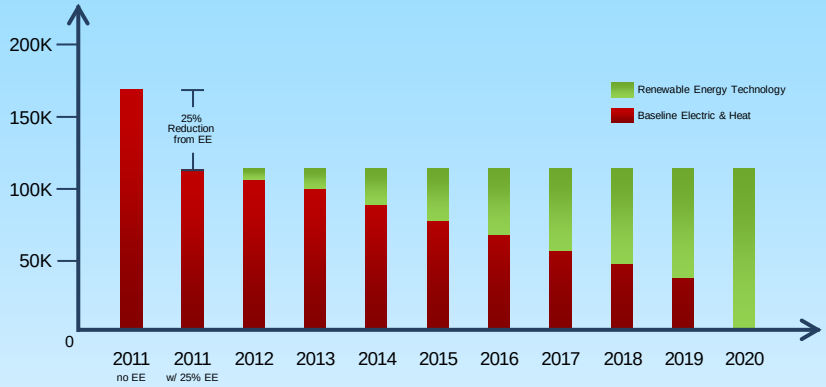
Initiate: Establish a baseline

Assess: Determine potential

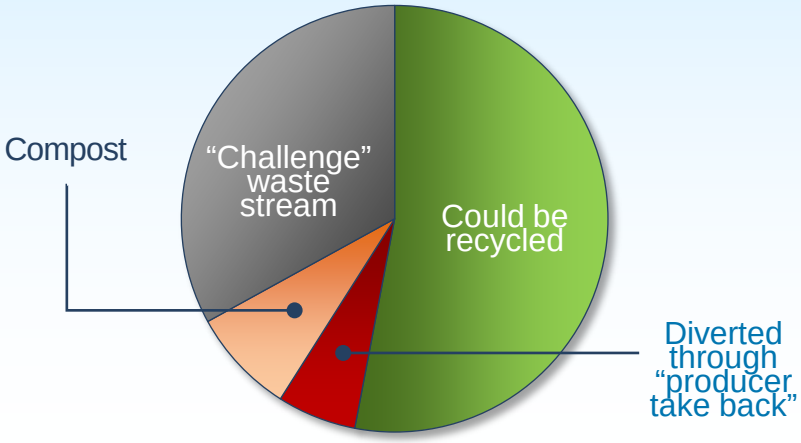
Roadmap: Plan and integrate the results into existing programs

Implement: Collaborate and act

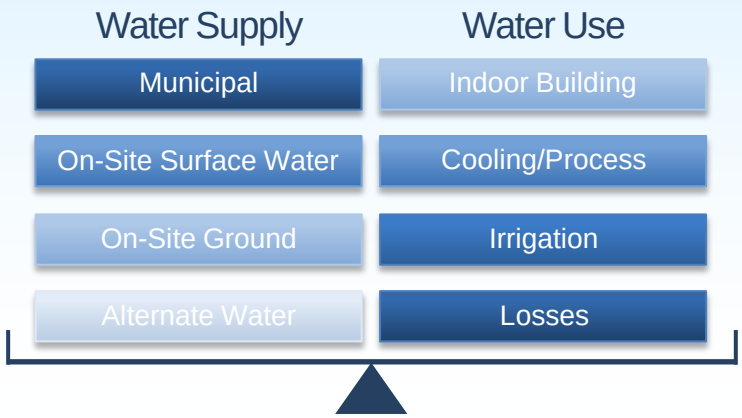
Load Reduction and Renewable Energy Integration Roadmap



Material Flow Analysis



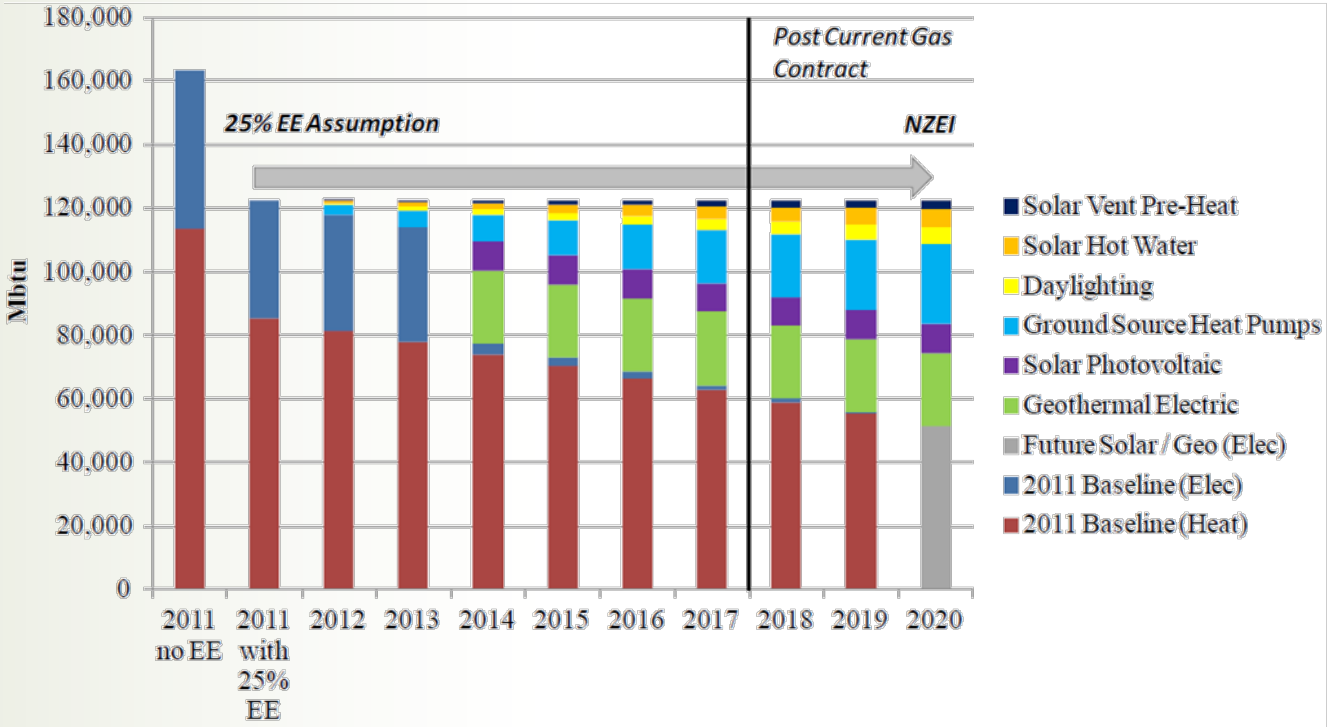
Water Balance Framework



Energy Roadmaps

- Energy Baseline
- Energy Efficiency Assessments
- Renewable Energy Assessments
- Energy Security Assessments
- Energy Project List & Implementation Recommendations

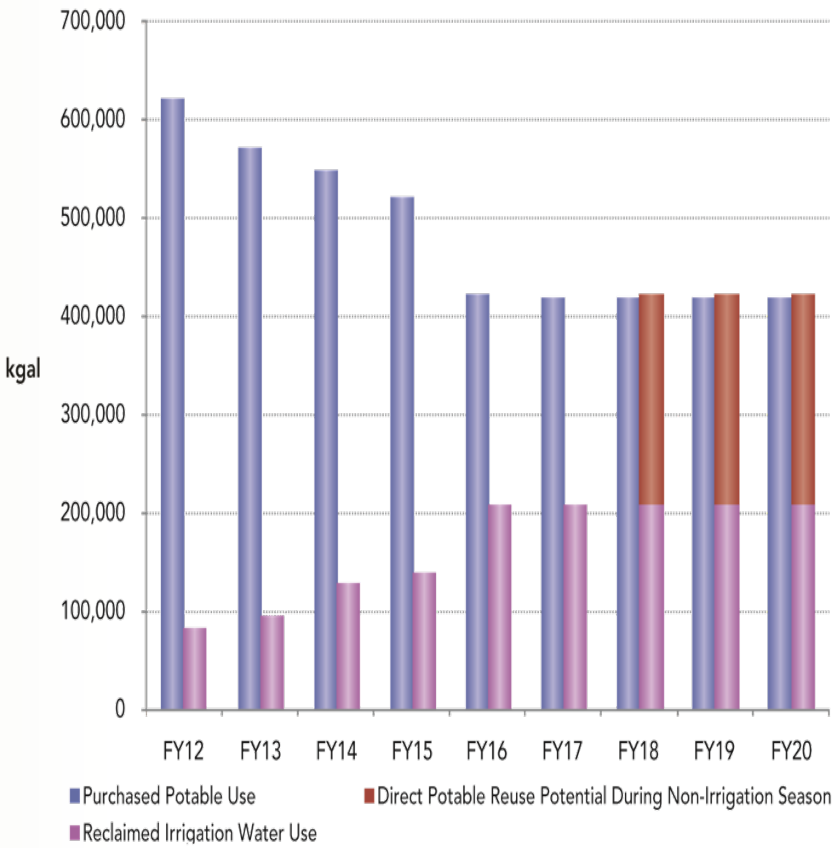
Sierra Army Depot Load Reduction and Renewable Energy Integration Roadmap



Water Roadmaps

- **Water Balance**
  - Identify largest end-users
  - Set priorities
- **Water Efficiency**
  - Perform LCC analysis on measures
  - Rank order projects
  - Include technology and behavioral changes needed
- **Roadmap Workshop**
  - Collaborate with site
  - Set priorities
  - Identify funding
  - Determine acquisition strategy
- **Roadmap and Master Planning**
  - Finalize strategy
  - Incorporate into master planning

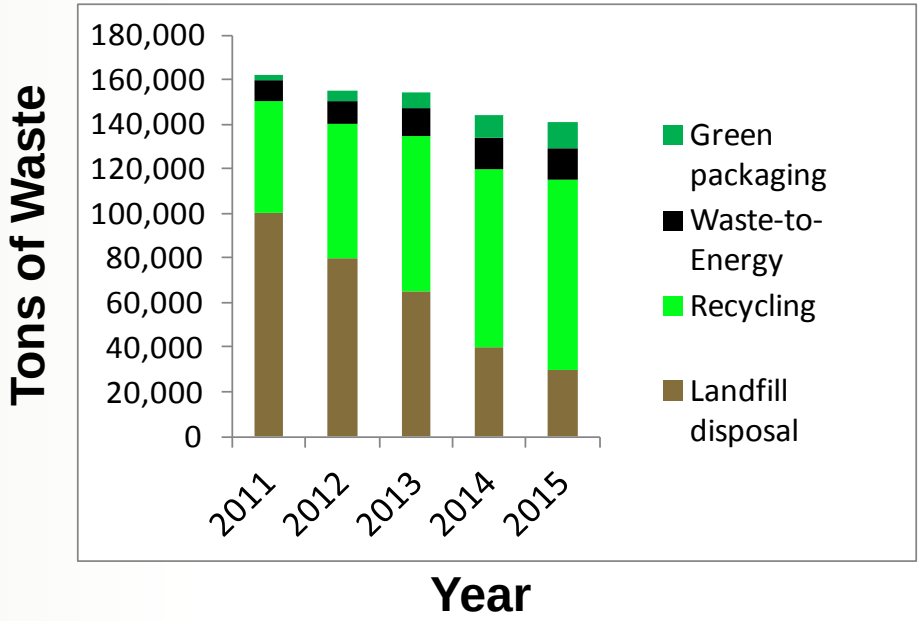
Fort Carson Water Roadmap



Waste Roadmaps

- Material flow analysis
- Improved procurement practices
- Re-purpose / Re-use strategy
- Recycling & composting strategy
- Potentially viable technologies

Example Installation Waste Profile



Material Flow Survey → Waste Characterization → Technology / Opportunity Analysis → Action Plan

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Internal Collaboration

- Share and document lessons learned
- Build cross-functional Net Zero teams
- Assist each other with challenges
- Conduct monthly calls and periodic progress meetings

External Collaboration

- Local and regional authorities
- Federal Government
- Public-private partnerships

NZ Water – Fort Riley

EPA United States Environmental Protection Agency

Membrane Bio-reactor
Waste Water Treatment Technology

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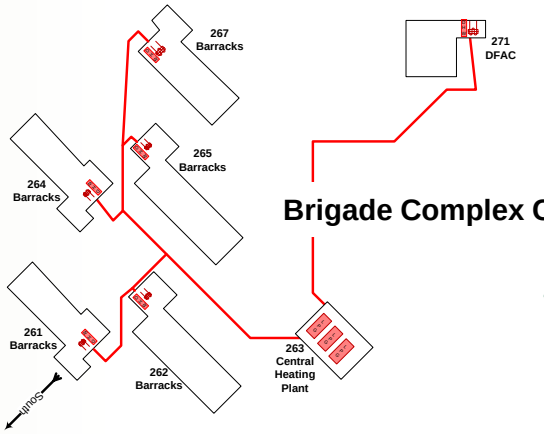
Best Practices - Energy

- **Conduct thermal building envelope analysis**
  - IR thermography identifies heat loss & enables targeted repairs
- **Reduce energy use through energy management control systems (EMCS)**
  - Provides ability to control energy-consuming devices (e.g., fans, compressors, boilers, chillers, pumps, lights)
  - Can also be used for demand reduction
- **Hire resource efficiency managers (REMs)**
  - REM's goal is to reduce consumption & cost of energy
  - Work with existing staff to enhance conservation efforts

Best Practices – Energy (cont.)

- **Pursue alternative financing mechanisms**
  - Energy Savings Performance Contracts (ESPCs) & Utility Energy Service Contracts (UESCs)
- **Conduct energy master planning**
  - Integrates energy efficiency & renewable energy goals & planning into the Real Property Master Plan
  - Enables renewable energy options that aren't feasible at a single building (e.g., central utility plants (CUP) to serve a Brigade complex)



Best Practices – Water

- **Maximize the use of xeriscaping**
  - Turf irrigation is one of the most common water demands at Army installations
  - Camp Rilea converted turf to native meadows and rain gardens to reduce irrigation needs
- **Implement leak detection on the potable water distribution system**
  - Tobyhanna implemented an aggressive metering and leak detection program resulting in 38% reduction in water use intensity


Synthetic Turf Conversion


Xeriscape Conversion

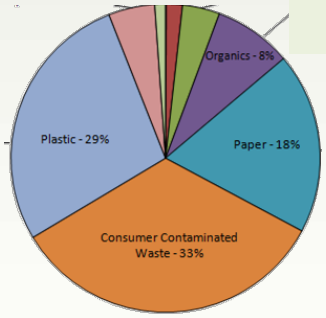
Best Practices – Water (cont.)

- **Maximize water recycling**
  - Matching water quality to intended use
- **Install purple pipe**
  - Separating reclaimed water via installation of purple pipe system
  - Several pilot developing projects to design, plan, and install
- **Maximize use of alternate water sources**
  - Collect and use rain water for industrial cooling tower make up
  - Capturing stormwater for use in irrigation

Best Practices – Waste

- **Establish a Qualified Recycling Program (QRP)**
  - Installations can receive proceeds from sales
  - Proceeds can be invested in other recycling efforts and Morale, Welfare and Recreation activities

- **Characterize and quantify waste flows**
  - Quantify waste types and volumes
  - Identify waste streams for elimination, minimization, or diversion



- **Improve purchasing practices to reduce waste at the source**
  - Eliminate excess packaging
  - Require take-back policies
  - Require recyclable content

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Best Practices – Waste (cont.)

- **Repurpose and reuse waste/material through free and low-cost opportunities**
  - Establish re-use centers for furnishings, equipment, etc.
  - Donate excess used furniture to non-profits
  - Work with non-profits to recover usable building components prior to demolition
  - Reuse textiles for other uses
- **Recycle and compost waste through free and low-cost opportunities**
  - Partner with non-profits to collect and dispose of personal electronics
  - Look for city / regional collection efforts


End-of-Life Furniture

Goodwill Industries International, Inc.

Habitat for Humanity

unicor


Electronics Recycling via UNICOR

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Discussion

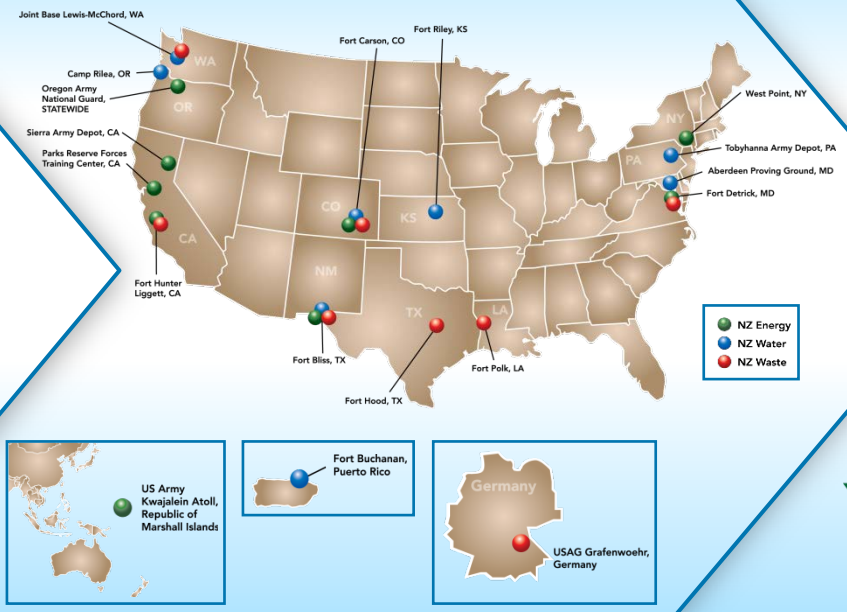
Journeying Towards Net Zero

Drivers

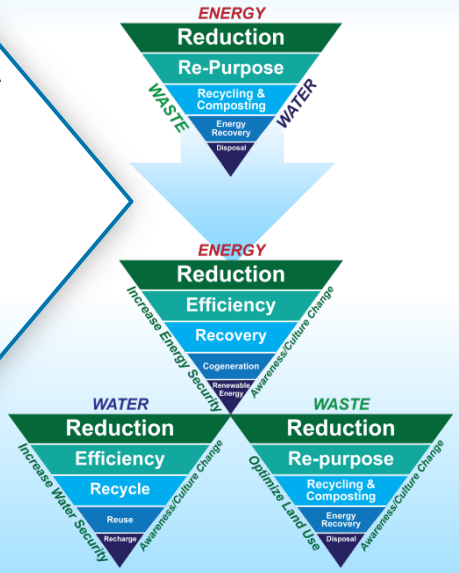
- Energy security, surety, and reliability
- Water scarcity
- Increasing energy prices/ Fully burdened costs of fuel
- Foreign energy sources
- Environmental concerns
- Federal and DoD mandates
- Improved operational capabilities
- Risk reduction

Drivers for Change Resulted in Creation of Net Zero Programs for Energy, Water, and Waste

17 Pilot Installations

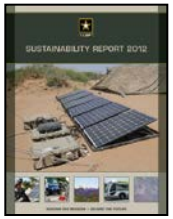


Evolution of the Hierarchy



Questions?

Army Sustainability Report 2012
http://usarmy.vo.llnwd.net/e2/c/downloads/269536.pdf



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