



Army *Net Zero*

Progress and Barriers to Becoming Net Zero

Ms. Kristine Kingery
Director, Army Sustainability Policy

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	135,867,428
• Asia	42,549,120
• Other	3,204,439
• Leases	37,746,313
• Privatized	120,507,597
• WWII Wood	16,524,530

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

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	257,735
• Civilian	255,566
• Retired	184,674

Aviation

- Multi-use 60
- Heliport 28

Family Housing Units

• Owned	16,009
• Leased	6,432
• Privatized	86,277

Adequate Barracks

- Permanent Party 127.2K
- Training 148.4K

Plant Replacement Value

- \$304.4B

1 Billion Square Feet

152 Small Cities

2.2 Million People

108,000 Homes

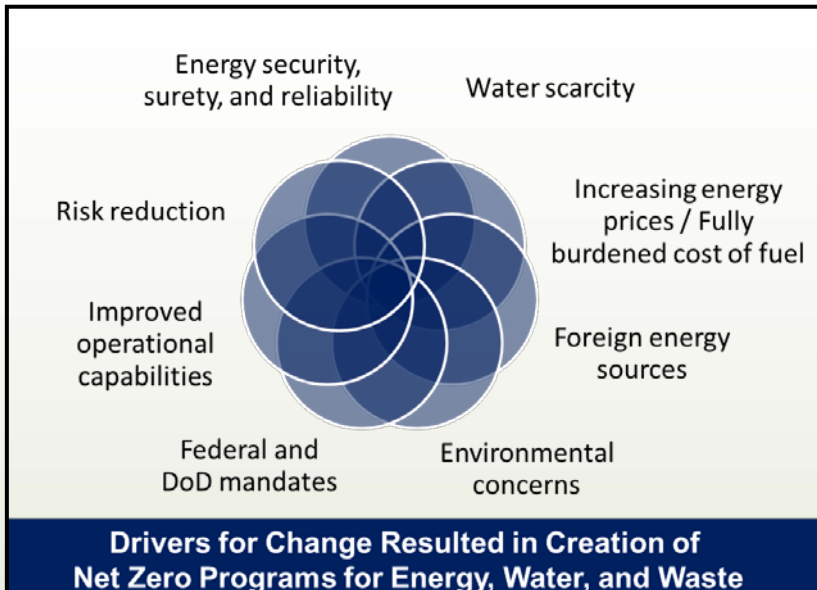
FY13 Installation Management Resources = \$18.9B



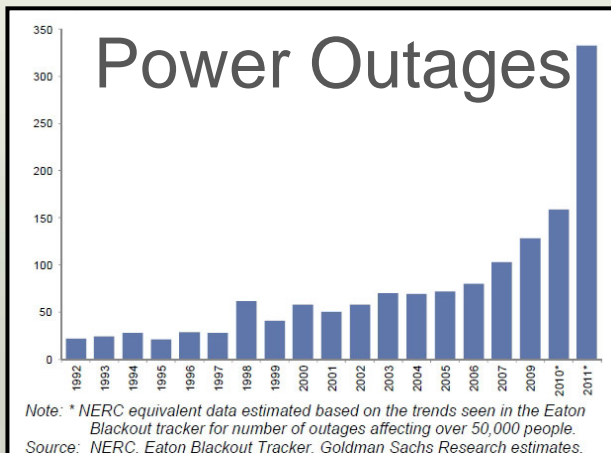
Drivers of Change



Risk factors and competing priorities include:



Federal Mandate	Focus Area	Performance Target
Energy Policy Act of 2005	Electricity use for federal government from renewable sources	<ul style="list-style-type: none"> At least 3% of total electricity consumption (FY07-09), 5% (FY10-12), 7.5% (FY13 +)
Executive Order 13423	Energy use in Federal buildings	<ul style="list-style-type: none"> Reduce 3% per year to total by 30% by FY2015 (FY2003 baseline)
	Total consumption from renewable sources	<ul style="list-style-type: none"> At least 50% of required annual renewable energy consumed from "new" renewable sources
Energy Independence & Security Act of 2007	Fleet vehicle alternative fuel use	Increase by 2% annually to reach 100% (FY2005 baseline)
	Total consumption from renewable sources	"Progress"
Executive Order 13514	Hot water in federal buildings	Reduce consumption by 2% annually for 26% total by FY2020 (FY2007 baseline)
	Fossil fuel use in Federal buildings	Reduce consumption by 2% annually for 26% total by FY2020 (FY2007 baseline)
	GHG emission reduction	Reduce GHGs by 34% by FY2020 (new buildings that enter design in FY2020 & after achieve net zero energy by FY2030)
National Defense Authorization Act, 2010	Net zero buildings	Reduce consumption by 2% annually for 26% total by FY2020 (FY2007 baseline)
	Water consumption	Reduce consumption by 2% annually for 26% total by FY2020 (FY2007 baseline)
National Defense Authorization Act, 2010	Waste minimization	<ul style="list-style-type: none"> Divert at least 50% of solid waste & 50% of C&D waste by FY2015
	Renewable fuels use	<ul style="list-style-type: none"> Directs the Secretary of Defense to consider renewable fuels in aviation, maritime, and ground transportation fleets.
National Defense Authorization Act, 2010	Facility renewable energy use	<ul style="list-style-type: none"> Produce or procure 25 % of the total quantity of facility energy needs, including thermal energy, from renewable sources starting in FY2025



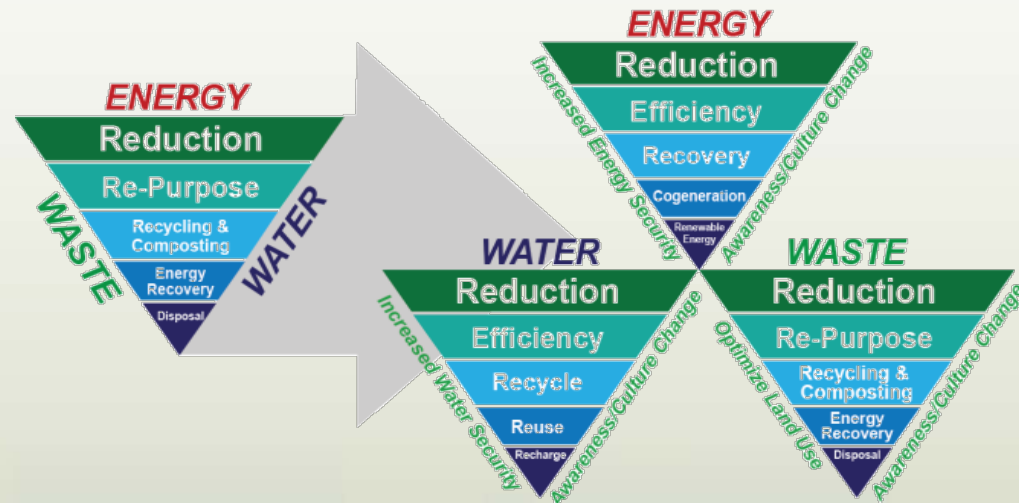
Evolution of Army Net Zero



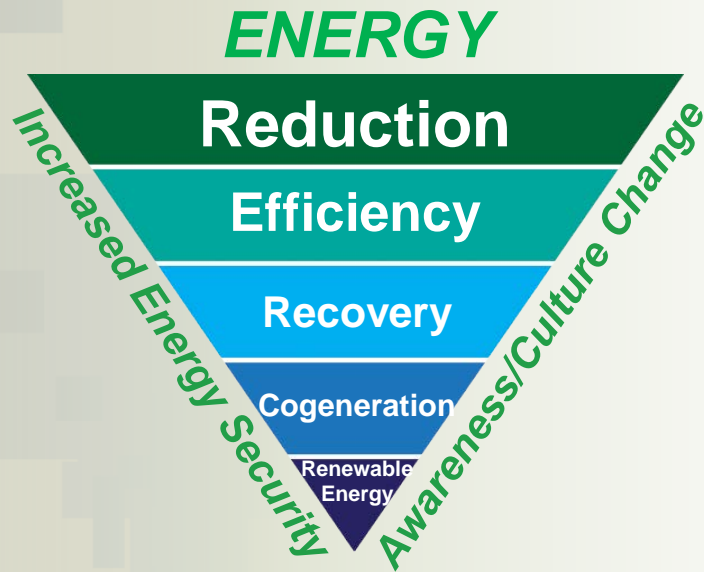
17 Net Zero Pilot Installations



Evolution of Net Zero Hierarchies



Net Zero Energy



Net Zero ENERGY:

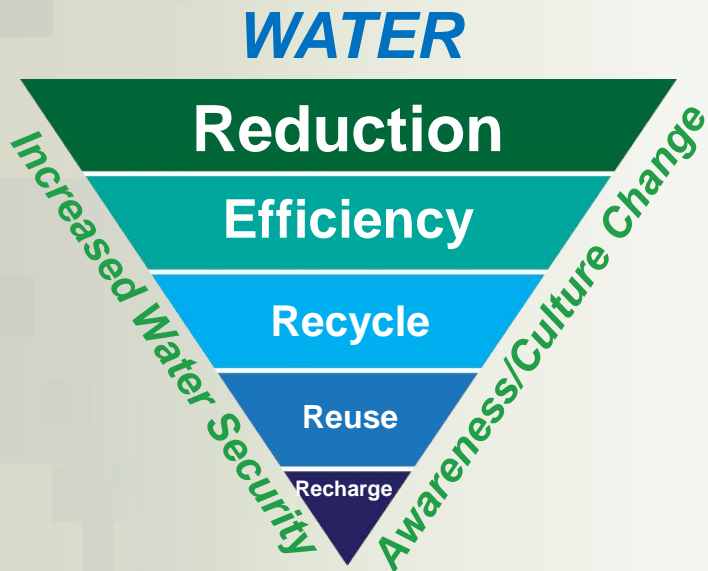
Reduce overall energy use, maximize efficiency, implement energy recovery and cogeneration opportunities, and then offset the remaining demand with the production of renewable energy from on-site sources

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:

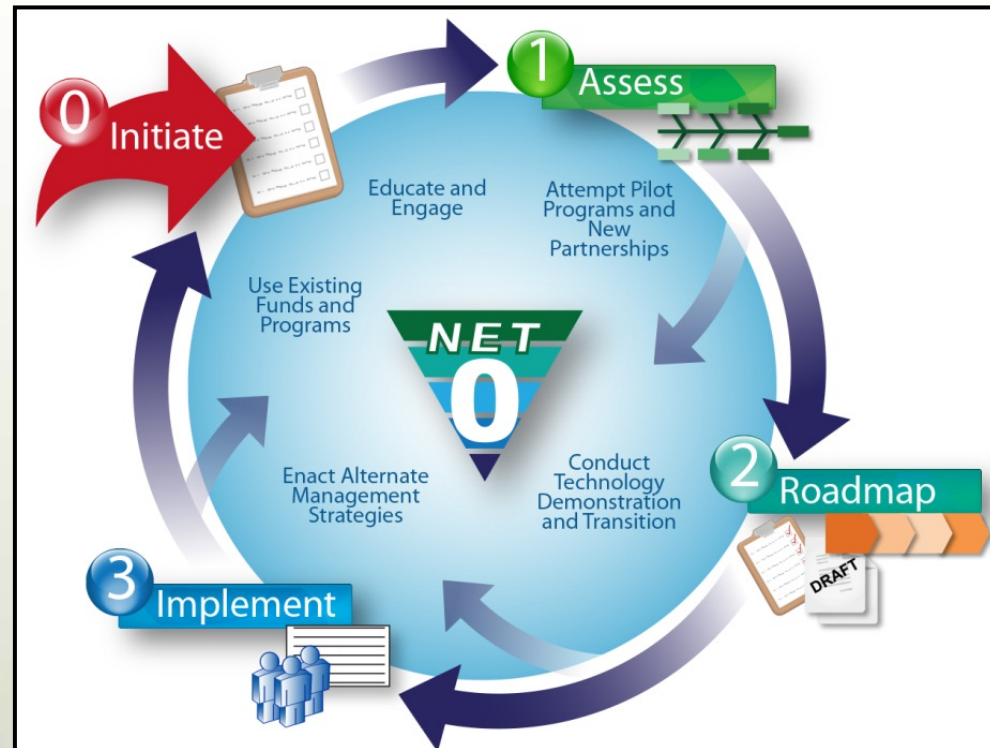
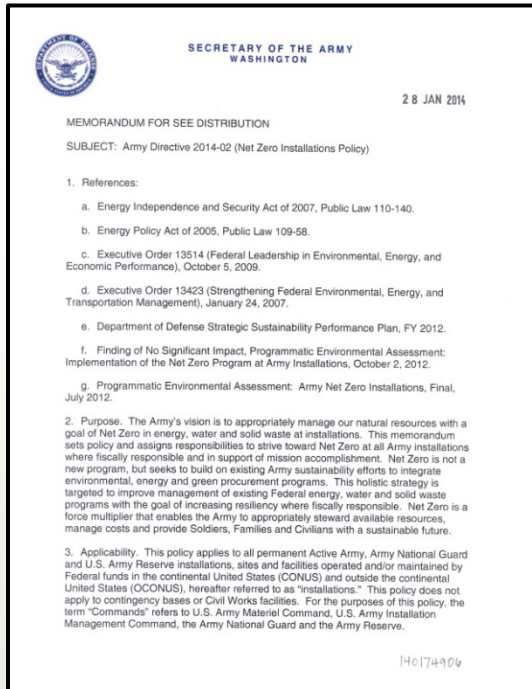
- Improved purchasing practices
- Recognition that waste is a resource
- Increased recycling and composting
- Energy recovery



Net Zero Army Wide



NZ Implementation Approach: Initiate, Assess, Roadmap and Implement



Net Zero Installations Policy: Army Directive 2014-02



Net Zero Implementation



Implementation Activities

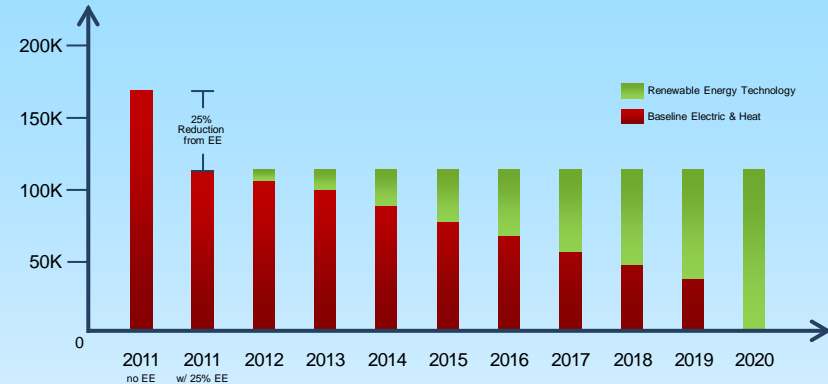
Initiate: Establish a baseline

Assess: Determine potential

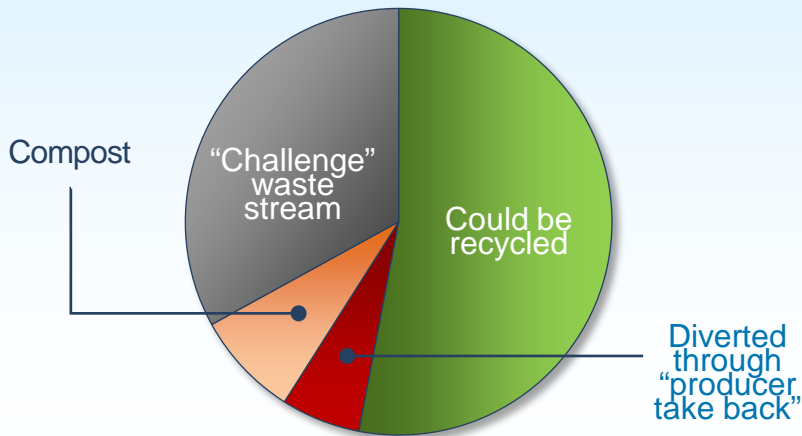
Roadmap: Plan and integrate the results into existing programs

Implement: Collaborate and act

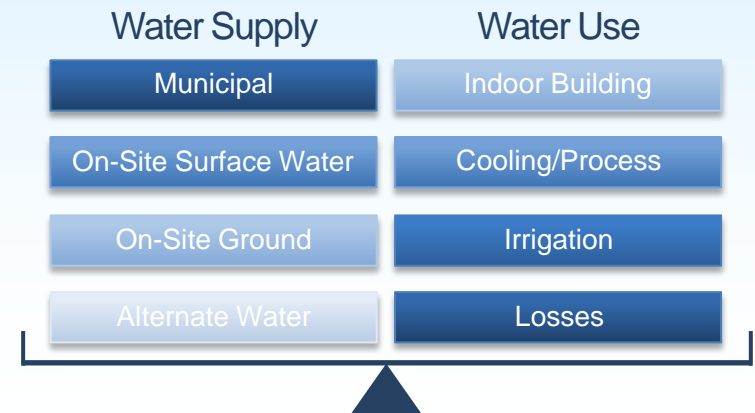
Load Reduction and Renewable Energy Integration Roadmap



Material Flow Analysis



Water Balance Framework

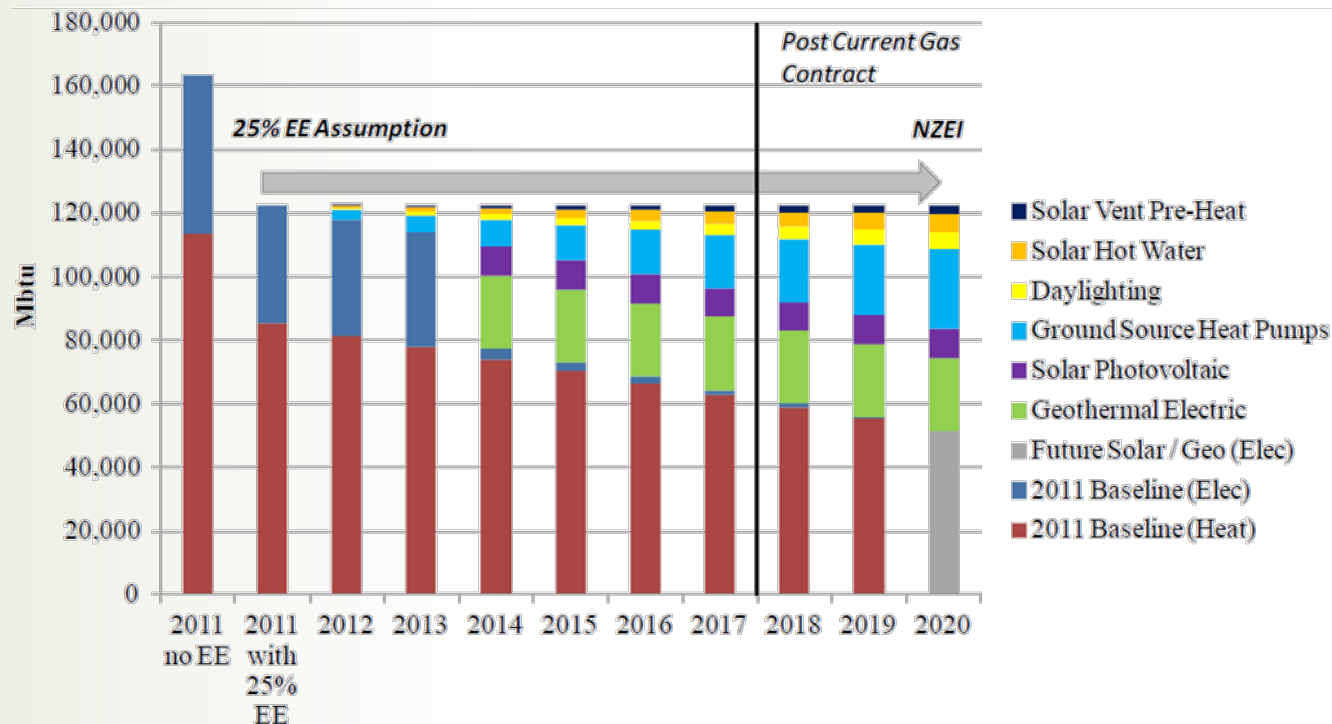


Energy Roadmaps



- 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

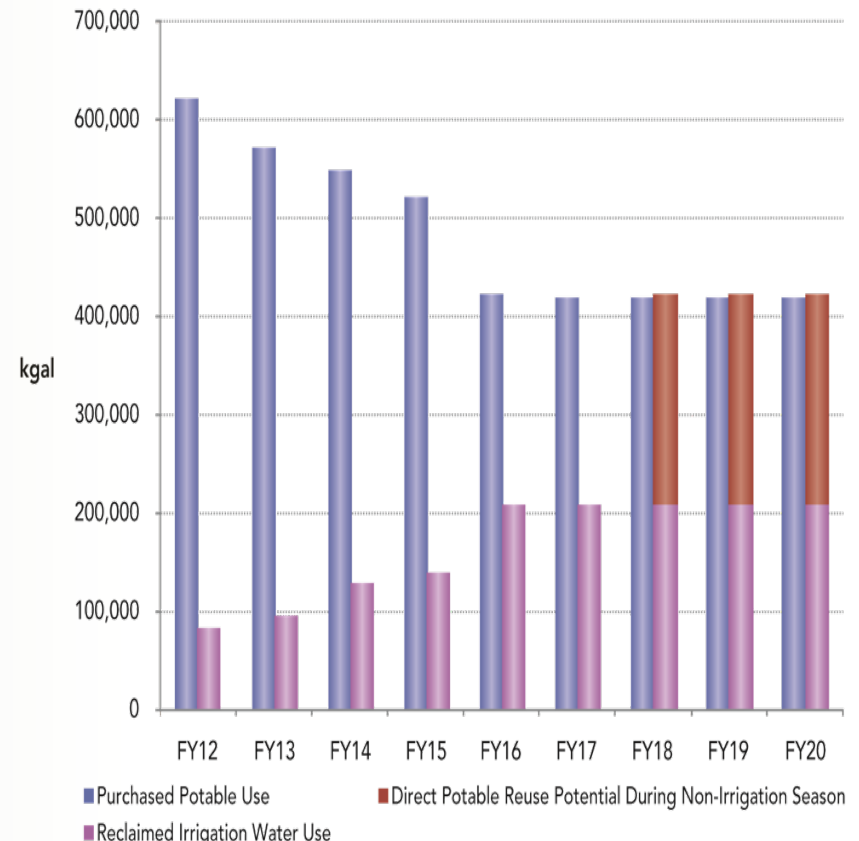
Roadmap Workshop

- Collaborate with site
- Set priorities
- Identify funding
- Determine acquisition strategy

Roadmap and Master Planning

- Finalize strategy
- Incorporate into master planning

Fort Carson Water Roadmap

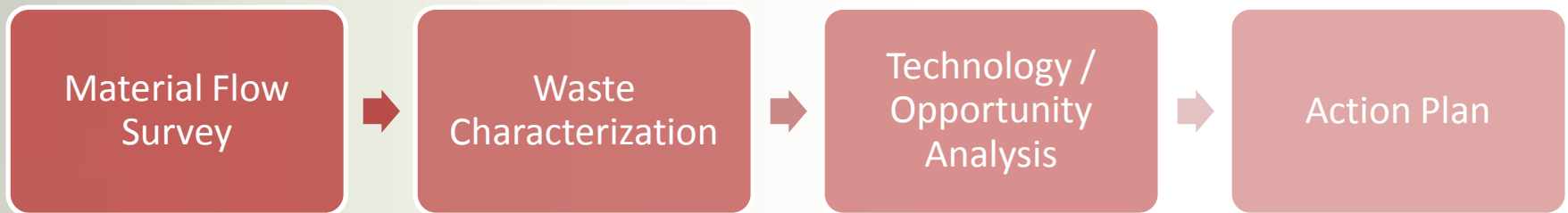
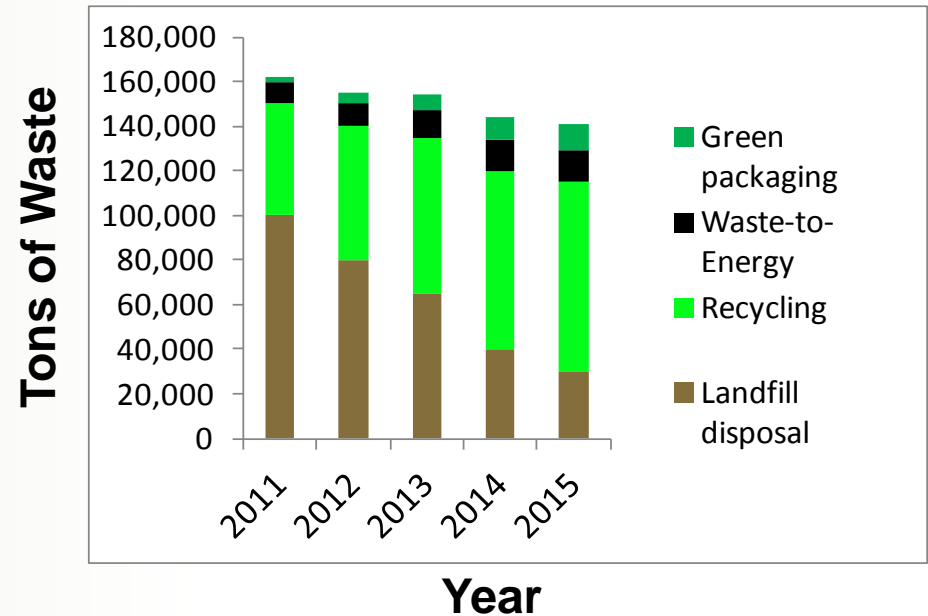


Waste Roadmaps



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

Example Installation Waste Profile



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

Net Zero Water – Tobyhanna AD

- Replaced potable water with process water for foam suppression at wastewater treatment plant
 - \$1,200 investment saves 300,000 gallons/month
 - Payback period: 1 month
- Installed a water chiller to replace single-pass cooling system
 - \$125,000 investment saves 2,000,000 gallons/month
 - Payback period: 8 months

Elements of Net Zero Water

Water conservation & efficiencies
Water reuse
Water security

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

Net Zero Energy – Fort Hunter Liggett

- Reduced energy intensity by 40% (FY2003-2010)
 - Behavioral changes
 - Implemented low-demand technologies
 - Energy-efficient new construction
- Constructing a 1 MW solar power system
 - Funded by Energy Conservation Investment Program
 - Will produce 1,500 MWh annually
 - Will provide 12% of the installation's energy
- 2nd 1 MW solar system in development

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

Net Zero

Joint Base Lewis-McChord (JBLM) Concrete and Asphalt Recycling

A Net Zero Waste installation reduces, reuses, and recovers waste streams, converting them to resource value with zero net waste disposal to landfill over the course of a year.

In support of its Net Zero Waste Installation goals, JBLM collects and recycles waste concrete and asphalt generated from in-house projects. This recycles the material to provide high-quality DCP specification aggregate for other on-post projects. This practice eliminates the need for off-site transportation and disposal, and reduces the need for new crushed rock aggregate. The need for using recycled material is dependent on the volume of material processed, but generally is DCP, less than the cost of virgin material.

The use of reclaimed aggregate qualifies for LEED credits, enabling JBLM to also meet the Army's sustainable design and development renovations.

Contribution to Net Zero

- Eliminates disposal of waste concrete and asphalt
- Reduces the need for new aggregate
- Reduces fuel use for transportation of new aggregate or disposal of waste aggregate

Earthworks Asphalt Recycling

A third order benefit of this best management practice is reduced carbon footprint. This on-post recirculation effort stimulates the aluminum and subsector from off-site disposal and virgin product quarries, significantly reducing greenhouse gases associated with aggregate transportation, as well as the volume of traffic through JBLM's access roads.



External Collaboration



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



NZ Water – Fort Riley



Membrane Bio-reactor
Waste Water Treatment Technology



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.)

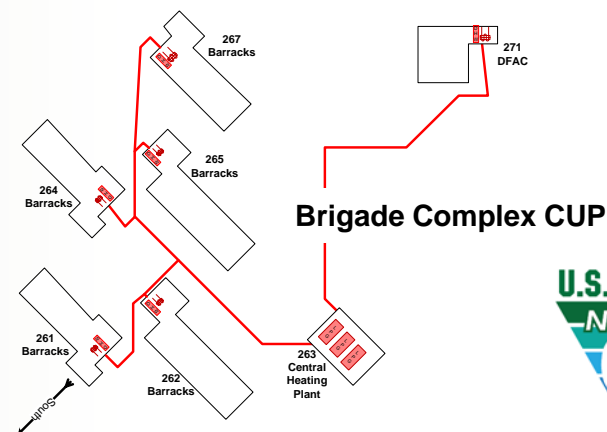


- **Pursue alternative financing mechanisms**

- 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



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



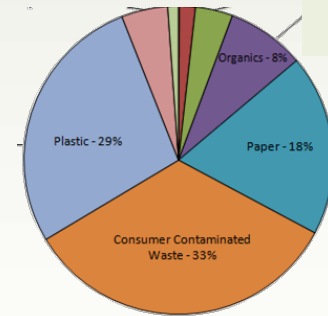
■ Establish a Qualified Recycling Program (QRP)

- 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



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



End-of-Life Furniture



▪ 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



Electronics Recycling
via UNICOR



Discussion



Journeying Towards Net Zero

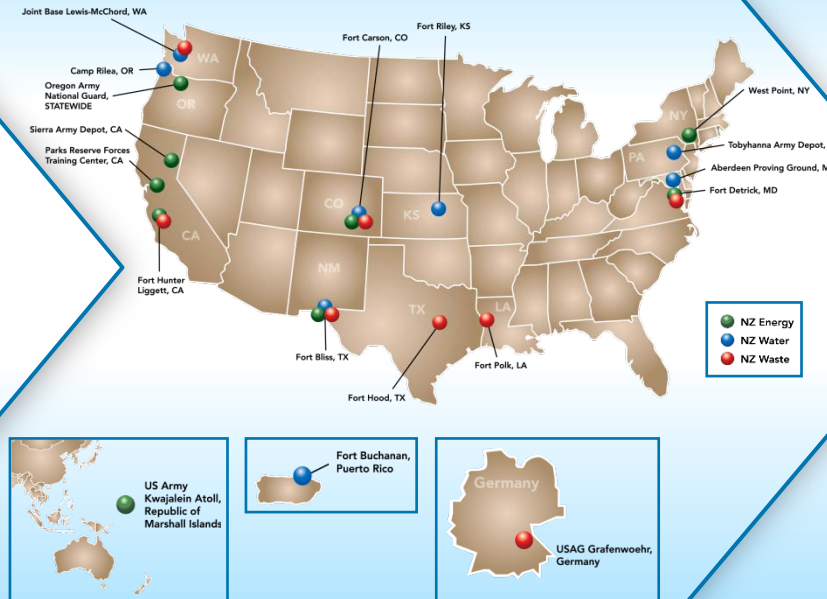


Drivers

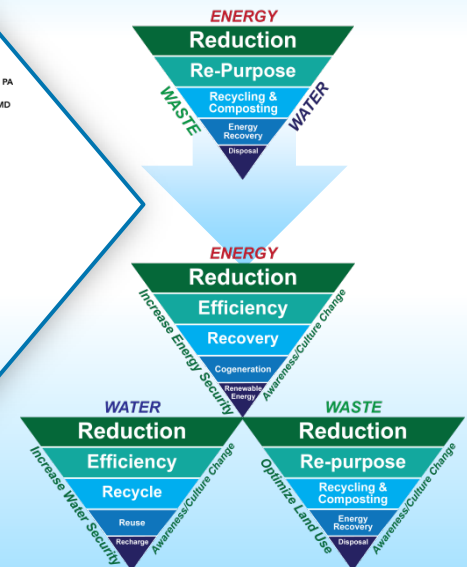
- Energy security, surety, and reliability
- Water scarcity
- Increasing energy prices/ Fully burdened costs of fuel
- Foreign energy sources
- Environmental concerns
- Federal and DoD mandates
- Improved operational capabilities
- Risk reduction

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

17 Pilot Installations



Evolution of the Hierarchy

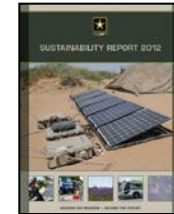


Questions?



Army Sustainability Report 2012

<http://usarmy.vo.llnwd.net/e2/c/downloads/269536.pdf>



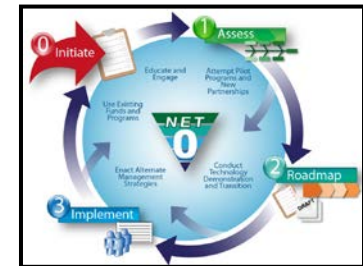
Office of the Assistant Secretary of the Army for Installations, Energy and Environment

<http://www.army.mil/asaiee>



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