



Army Net Zero Installation Initiative

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18 January 2012



Perfect Storm





U.S. ARMY

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"> 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
	Fleet vehicle alternative fuel use	<ul style="list-style-type: none"> Increase by 10% annually to reach 100% (Base line FY2005)
Energy Independence and Security Act of 2007	Total consumption from renewable sources	<ul style="list-style-type: none"> 25% by FY2025 - "Sense of Congress"
	Hot water in new / renovated federal buildings from solar power	<ul style="list-style-type: none"> 30% by FY2015 if life cycle cost-effective
	Fossil fuel use in new / renovated Federal buildings	<ul style="list-style-type: none"> Reduce 55% by FY2010; 100% by 2030
Executive Order 13514	GHG emission reduction	<ul style="list-style-type: none"> DoD Goal: reduce Scope 1 & 2 GHGs by 34% by FY2020 DoD Goal: reduce Scope 3 GHGs by 13.5% by FY2020
	Net zero buildings	<ul style="list-style-type: none"> All new buildings that enter design in FY2020 and after achieve net zero energy by 2030
	Water consumption	<ul style="list-style-type: none"> Reduce consumption by 2% annually for 26% total by FY 2020 (FY2007 baseline)
	Waste minimization	<ul style="list-style-type: none"> Divert at least 50% of solid waste & 50% of C&D waste by FY2015
National Defense Authorization Act, 2010	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.
	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



Net Zero Hierarchy



—The primary goal is a focus toward net zero and when we talk about net zero, it's not only net zero energy, but it's net zero energy, water, and waste. When you look at the term "net zero" or a hierarchy of net zero you must start with reduction, then progress through repurposing, recycling, energy recovery, disposal being the last.—

— HON Katherine Hammack, DoD Bloggers Roundtable, 10 October 2010

- **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.



Pilot Installations





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.

Goals:

- Contribute to the Army Campaign Plan's objective of energy security for the Army
- Address energy efficiency and conservation first
- Preference for use of renewable energy for on-site power; enables operation if grid goes down
- Must address redundant energy supply sources
 - Can the installation function for long periods of time during supply disruptions affecting the electric grid, natural gas pipeline, propane & fuel oil deliveries, etc.
- Applies to both electrical and thermal energy
- Behavioral change are necessary to change culture
- Must be fiscally responsible

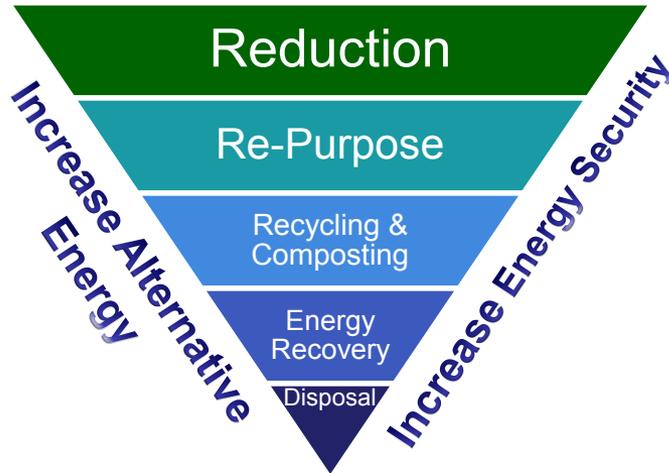




Net Zero Energy Strategy



ENERGY



Requires holistic approach and includes

- Dramatic demand-side energy use reduction
- Right mix of energy generation technologies and strategies that contribute to energy security
- Areas/building clusters served by small Central Utility Plants
- Clear and flexible implementation strategies based on potential technology innovations and mission changes

We must build and retrofit our building stock today with life cycle cost in mind



Elements of Net Zero Energy



<i>Army Campaign Plan and energy security</i>	Support the installation energy Major Objective
<i>Integrate energy considerations into Master Planning</i>	Develop an energy component as part of the Installation's master planning process
<i>Increase energy efficiency in new construction</i>	Increase the use of energy technologies in construction and major renovation projects that provide the greatest cost-effectiveness, energy efficiency, and support the Army's sustainability objectives
<i>Reduce energy consumption in existing facilities</i>	Eliminate energy inefficiencies that waste natural & financial resources, and do so in a manner that does not adversely impact mission or the comfort & quality of the facilities in which Soldiers, Civilians, Families, & contractors work & live
<i>Reduce dependence on fossil fuels</i>	Reduce dependency on fossil fuels by increasing use of clean, renewable energy, reducing waste, increasing efficiencies, and improving environmental benefits
<i>Improve energy security</i>	Improve the security and reliability of our energy systems to provide dependable utility service, while decreasing dependence on a fragile electric grid

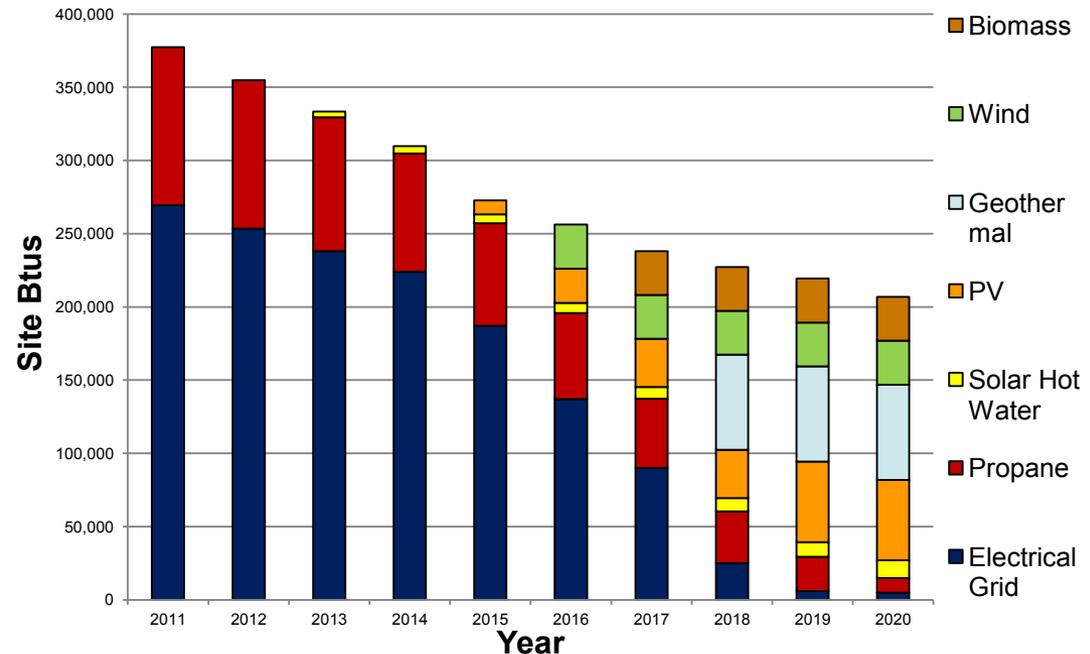


Energy Roadmaps



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

Example Installation Energy Profile





Renewable Energy Assessments



■ Process

- Start with screening tools
- Conduct further analysis of promising technologies
- Make recommendations

■ Analysis tools

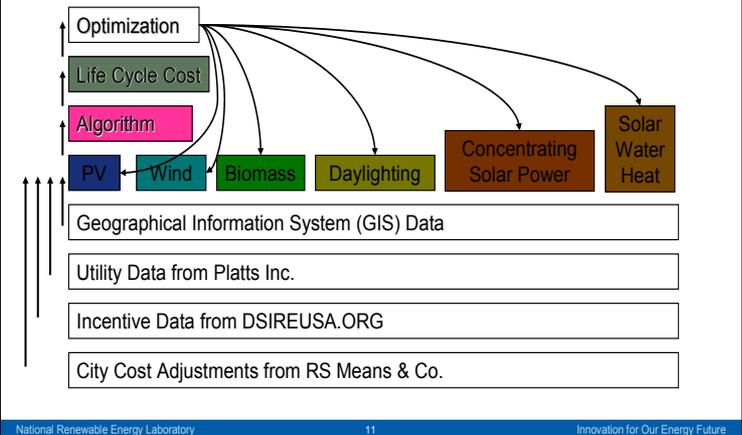
- GIS resource screening tools
- Renewable Energy Optimization (REO), PV Watts, IMBY, RET Screen, Solar Analysis Model (SAM), etc.

■ Considerations

- Think outside the “standard tool” box
→ fuel cells, microturbines, solar pools, etc.

Renewable Energy Optimization (REO)

- REO finds the least-cost combination of renewable energy technologies to meet net zero goal

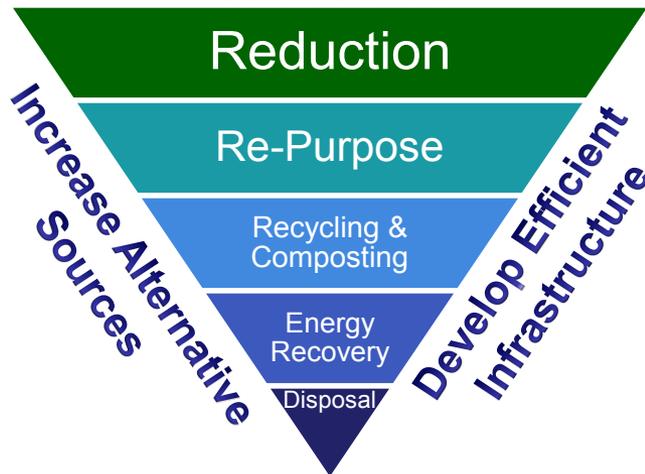




Net Zero Water Strategy



WATER



A Net Zero **WATER** Installation limits the consumption of freshwater resources & returns water back to the same watershed so not to deplete the groundwater and surface water resources of that region in quantity and quality over the course of a year

Goals:

- Contribute to the Army Campaign Plan's water security Major Objective
- Reduce freshwater demand through water efficiency and conservation
- Access/develop alternate water sources to offset freshwater demand
- Develop water-efficient green infrastructure
- Implement low-impact development to manage storm water



Elements of Net Zero Water



<i>Army Campaign Plan and water security</i>	<ul style="list-style-type: none">▪ Support the water security Major Objective
<i>Water conservation and efficiencies</i>	<ul style="list-style-type: none">▪ Identify and eliminate water inefficiencies (e.g., distribution system losses, evaporation losses)▪ Implement low-impact development strategies that retain storm water runoff▪ Implement a water conservation awareness campaign to change employee behavior
<i>Water reuse</i>	<ul style="list-style-type: none">▪ Implement water reuse strategies▪ Include gray-water systems in new building designs where cost effective
<i>Water security</i>	<ul style="list-style-type: none">▪ Improve the security & reliability of our water systems to provide dependable water service to critical infrastructure during external service disruptions▪ If served by public water systems, establish alternate water supplies



Current/Future Water Supply and Demand Studies



- **Assess 30-year water supply and demand for Army installations across the US**

- Method developed in FY09 at two pilot studies
- Applied to 10 US installations and three overseas installations

Pilot sites

Fort Bliss, TX
Fort Bragg, NC

US sites

Camp Shelby, MS
McAlester AAP, OK
Fort Benning, GA
West Point, NY
Fort Hood, TX
Fort Carson, CO
Fort Campbell, TN/KY
Fort Riley, KS
Joint Base Lewis-McChord, WA
Fort Irwin, CA

Overseas sites

USAG Humphreys, Korea
USAG Grafenwoehr, Germany
USAG Vicenza, Italy



Water Roadmaps



Water Balance

- Identify largest end-users
- Set priorities

Water Efficiency Opportunities

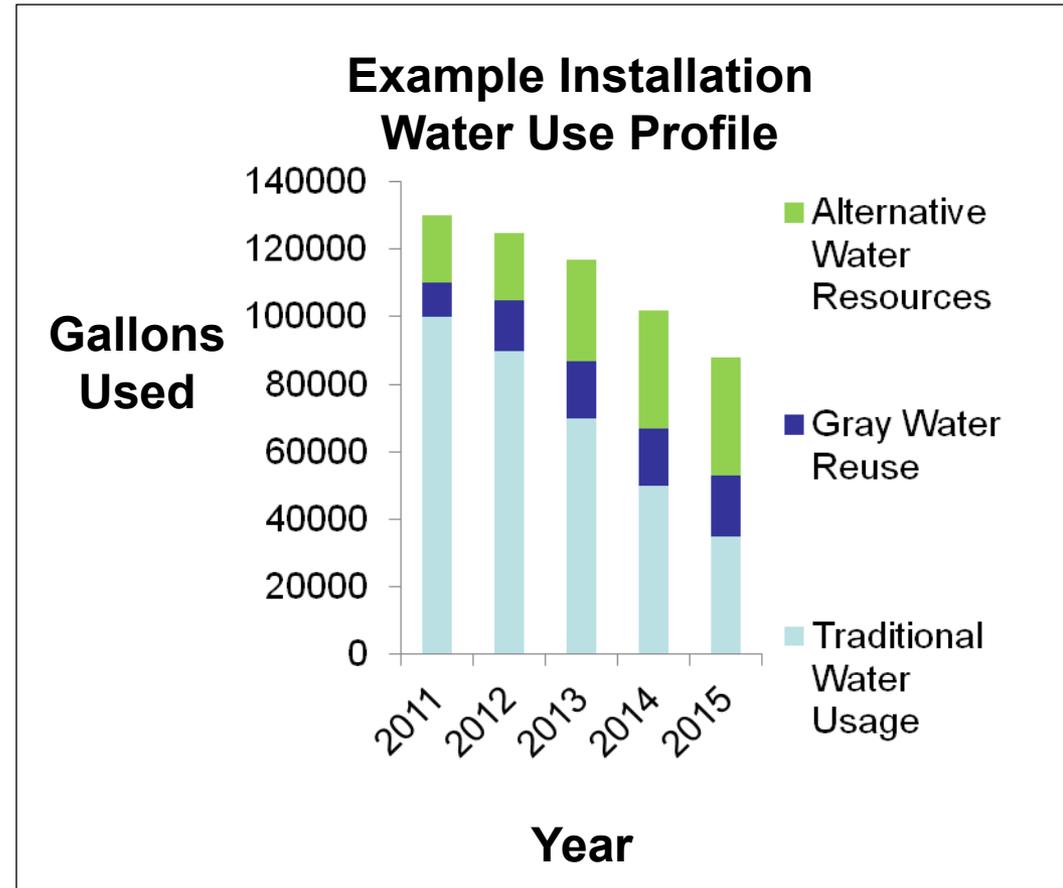
- Perform LCC analysis on measures
- Rank order projects
- Include technology and behavioral changes needed

Roadmap Workshop

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

Roadmap and Master Planning

- Finalize strategy
- Incorporate into master planning





Net Zero – Water Balance



Water Supply

Water Use

Water Balance = comparison of water supplied to water used.

Municipal

Indoor building

On-site surface water

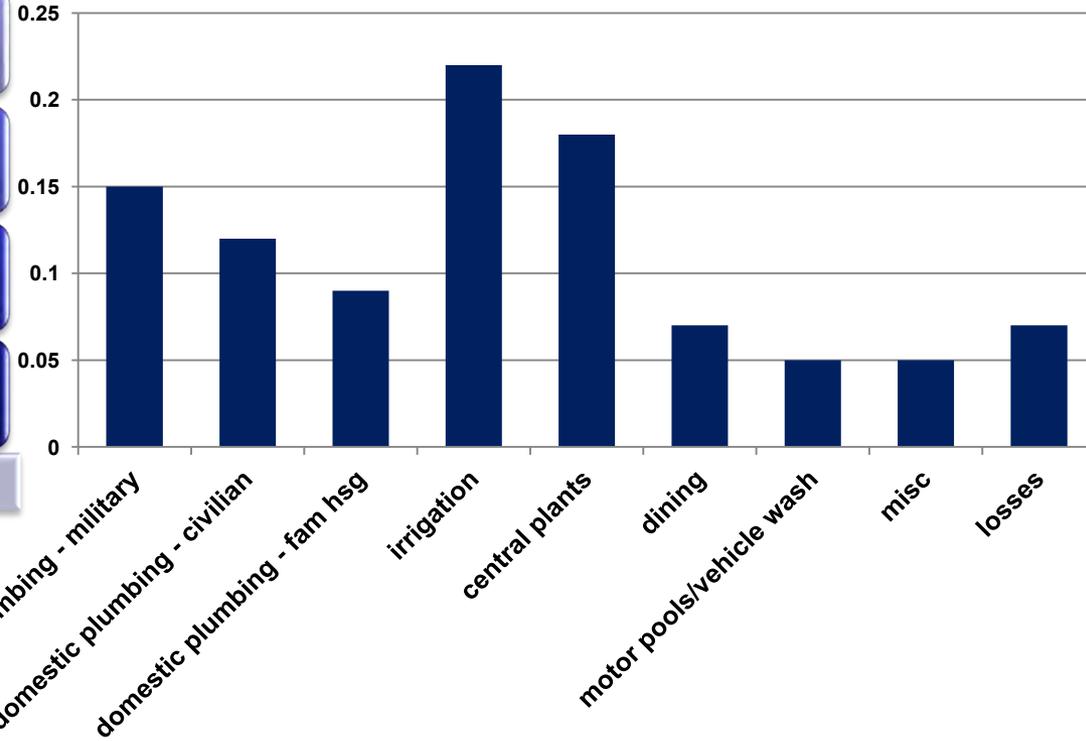
Cooling/ Process

On-site ground

Irrigation

Alternate water

Losses





Net Zero Waste



A Net Zero **WASTE** Installation

reduces, reuses, and recovers waste streams, converting them to resource values with zero solid waste to landfill over the course of a year

Goals:

- Eliminate unnecessary purchase of materials
- Minimize amount waste generated wherever feasible
- Expand efforts to re-purpose & recycle/divert used materials
- Use Waste-to-Energy technologies for waste that cannot be avoided, re-purposed, recycled, or composted
- Eliminate landfill disposal to the maximum extent feasible



Net Zero Waste Strategy

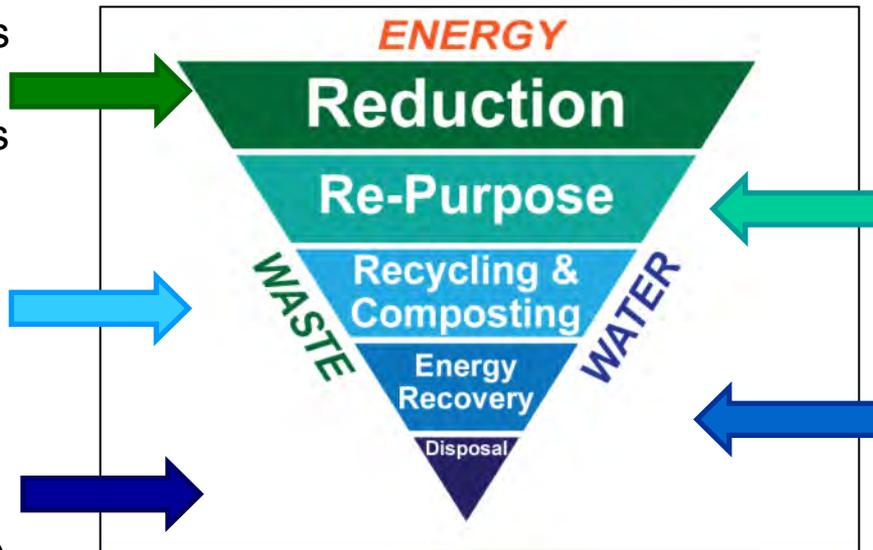


Pilot Installations should have a comprehensive program that starts at the top of the hierarchy

Waste avoidance via procurement practices & other pollution prevention (P2) efforts

All recyclable or compostable waste collected & diverted (to on- or off-post facilities)

Waste-to-Energy ash (if not further diverted) & any limited special wastes



Installation re-use centers & efforts to match waste stream products with potential users (e.g., crushed drywall used for soil amendment; construction & demolition (C&D) debris reuse)

Waste that can't be re-used, recycled, or composted is sent to a WTE plant (on- or off-post)

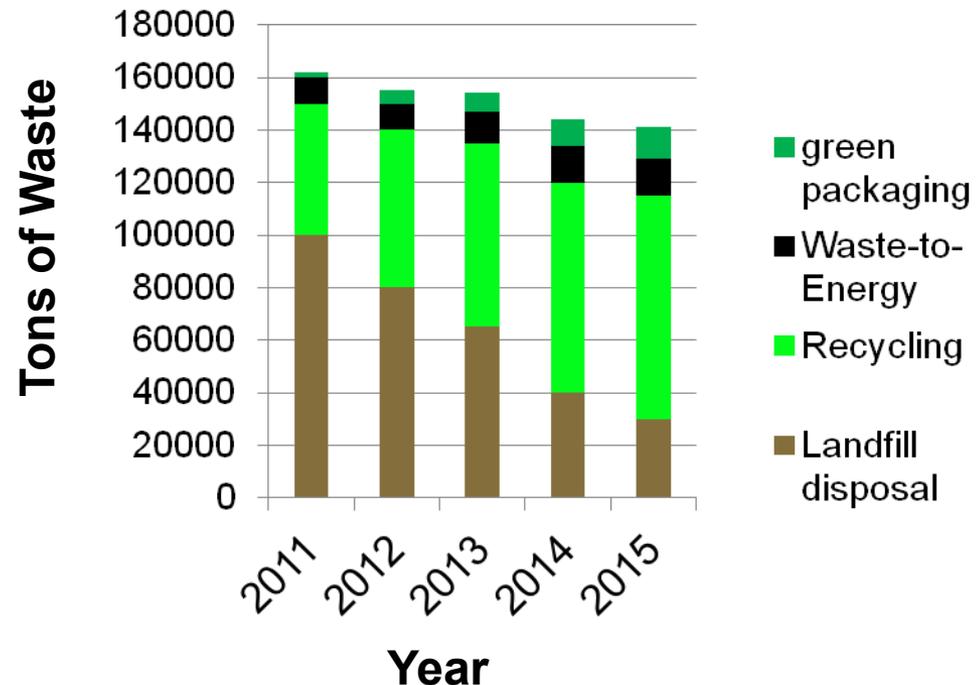


Waste Roadmaps



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

Example Installation Waste Produced Profile





Material Flow Analysis Surveys

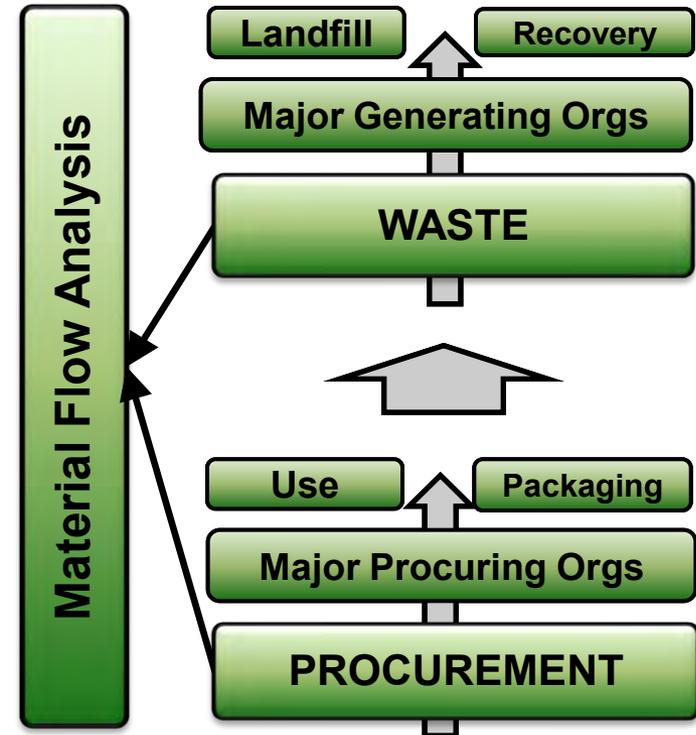


■ Objective:

- Analyze waste streams (outputs) and procurement (inputs) to support NZ Waste strategies

■ Approach:

- Use readily available data
- Organize analysis by activity type
 - Dining facilities / food sales
 - Construction
 - Vehicle maintenance
- Identify priority waste streams for reduction / elimination





A Systems-of-Systems Approach



- **Interconnections**
 - Energy and Water
 - Water and Waste
 - Waste and Energy
- **Net zero must be addressed holistically across energy, water, and waste**



Leveraging Private Investments



Potential Financing Mechanisms

- **Energy Savings Performance Contracts (ESPC)**
 - Utilize private capital to make infrastructure improvements on military installations
 - Payment is derived from the savings generated by the improvements – Savings are verified through Measurement & Verification (M&V)
- **Utility Energy Service Contracts (UESC)**
 - Procurement method using utility expertise & capital to meet Federal conservation mandates
 - Utility's costs repaid directly from installation's avoided costs resulting from project implementation
- **Enhanced Use Lease (EUL)**
 - Funding method for construction on installations by allowing a private developer to lease underutilized property
 - Payment usually in the form of power back to the installation
- **Power Purchase Agreement (PPA)**
 - Allow federal agencies to fund on-site renewable energy projects with no upfront capital costs incurred



ARMY STRONG