

FORT CARSON SUSTAINABILITY GOAL PLAN ENERGY & WATER RESOURCES (EWR)

Goal Statement:

Sustain all facility systems from renewable sources and reduce potable water usage intensity by 75% by 2020

Vision

In support of the Sustainability and Net Zero Installation Initiatives the Post will sustain all facility systems from renewable sources by 2020 and reduce the potable water usage intensity by 75% from the 2001 baseline by 2020. The desired end-states are: secure sustainable energy sources; reduced dependence on fossil fuels and adverse air emissions; life cycle cost effectiveness; reduced reliance on petroleum imports and vulnerability; water conservation through efficient consumption, reduced wastewater effluent treatment requirements, increased water re-use and development of sustainable water source solutions. Achievement of this goal supports Installation and force security.

Ownership and Involvement (Resources, Roles and Authority)

Goal Proponent: DPW Director

Goal Lead & Fort Carson Partners: DPW - Operations Division Chief, Utility Manager, Energy Manager, Stormwater Program Manager, Wastewater Program Manager; PAIO Strategic Planner, Sustainability Planners, Balfour Beatty Communities (BBC), Fort Carson Support Services

Off-post Partners: Colorado Springs Utilities, Southern Colorado Renewable Energy Coalition, National Defense Center for Environmental Excellence (NDCEE), National Renewable Energy Laboratories, Pacific Northwest National Laboratory, Western Area Power Administration (WAPA), U.S. Department of Energy (Federal Energy Management Program), Governor's Office of Energy Conservation, U.S. Army Corp of Engineers National Energy Team, U.S. Army Construction Engineering Research Laboratory, Colorado Renewable Energy Society, City of Colorado Springs, Pikes Peak Area Council of Governments, Colorado Department of Public Health and Environment (CDPHE), El Paso County Health Department, Lower Fountain Water Quality Management Association (LFWQMA)

Fort Carson EMS – Significant Aspects and Impacts

Fort Carson's Installation Sustainability Plan and Environmental Management System (EMS) identifies eight aspects of activities on the Installation that have significant impacts on sustainability and the environment. Two of these aspects are consumption of water and energy use. Specifically, energy and water use as they relate to the following activities and operations:

- Water use for construction and dust control
- Water use in food service;
- Water use in landscape irrigation and maintenance;
- Water use in buildings and facility operations;
- Petroleum use and water use for vehicle and equipment maintenance
- Energy use in goods, services, storage and maintenance
- Energy use in buildings for vehicle and equipment maintenance and storage
- Energy use in business operations
- Energy use in construction operations
- Water quality in infrastructure: vehicle and equipment maintenance (repair/preventive maintenance & storage)
- Water quality in transportation and land use (tactical vehicles)
- Water quality in operations - business operation (waste water)

Legal and Other Requirements

- Army Regulation (AR) 420-1, Army Facilities Management, February 2008
- EO 13423, Strengthening Federal Environmental, Energy and Transportation Management, January 2007
- EO 13514, Federal Leadership in Environmental, Energy and Economic Performance, October 2009
- Energy Policy Act (EPACT) 2005
- Energy Independence and Security Act (EISA) 2007
- U.S. Army Energy and Water Campaign Plan for Installations, October 2007
- U.S. Army Strategy for the Environment 2004
- U.S. Army Sustainability Campaign Plan, May 2010
- Office of the Assistant Secretary of the Army for Installations and Environment Strategic Plan, 2009-2015
- Assistant Secretary of the Army for Installations, Energy and Environment Net Zero Initiative, April 2011
- DOD Strategic Sustainability Plan, October 2011
- ISP goal - Sustainable Transportation
- ISP goal - Air Quality
- ISP goal - Sustainable Development
- ISP goal - Sustainable Training Lands
- ISP goal - Sustainable Procurement
- ISP goal - Zero Waste

Background

This goal is the result of the combination of two goals and a portion of another goal from the Sep 2002 sustainability conference. The original goals were:

- **Sustain all facility and mobility systems from renewable sources with the capacity to generate all facility energy on post.**
- **Total water purchased from outside sources will be reduced by 75% from the 2001 baseline.**
- **Reduce the total volume of wastewater and storm water treated by 75%.**

The intent of these goals is to:

- Efficiently utilize energy and water resources.
- Reduce reliance on fossil fuels - especially petroleum imports.
- Reduce impact on the environment from fossil fuels.
- Reduce vulnerabilities and volatility of energy and water sources.
- Obtain reliable low cost utility and water services.
- Not automatically turn to distributed energy sources.
- Not burden existing energy and water systems.
- Enhance well being.
- Achieve closer alignment with The Natural Step system conditions.

This goal is the result of the combination of two goals in addition to the transfer of the wastewater and storm water treatment goal from the Zero Waste Goal. The primary method to reduce the volume of treated wastewater is to reduce the volume of water used at the Installation. Thus, the wastewater treatment goal is a measure of the reduction of water purchased from outside sources.

The three objectives that make up this goal support sustainable utilities use. Reducing water usage will reduce the amount that is treated by the sewage treatment plant, thus supporting Zero Waste Goal 10. In fact, the only way to truly reduce the amount of water treated on the Installation is to reduce the amount used by the Installation. Reducing energy and water use will allow the Installation to continue its training mission even if the cost of fuel, energy, and water increase dramatically or if current common sources of energy become scarce. In addition to saving money, reducing reliance on non-renewable and polluting sources of energy also improves the quality of air in which Soldiers live and train.

Achievement of this goal supports Installation and force security. Distributed sources of energy are one way to enhance Installation security. With sources or backup sources of energy readily available and unlimited on Fort Carson, any problems with the centralized source will not affect training and readiness.

In April 2011 Fort Carson self-nominated and was selected as a Net Zero Pilot Installation for Energy, Water and Waste. The strategy aims for Fort Carson to achieve Net Zero by 2020, thus accelerating the original sustainability goal targets (2027) by seven years. 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 the region in quantity or quality over the course of a year.

Challenges & Barriers

Special Challenges to achieving energy efficiency, on-site and off-site renewable energy and reduced water consumption:

Energy efficiency, which is measured in thousands of British Thermal Units per square foot, or KBTU/SF, was improved by 30% in FY85 compared to FY75. The Net Zero goal is to reduce by 30% in FY20 from a FY11 baseline. The Installation is now operating at 13.4% efficiency improvement from the old FY03 baseline. Additional efficiencies and cost reductions are limited by metering, funding constraints and technology limitations.

We are challenged to achieve 100% renewable energy, especially renewable energy produced on-site, because of current low utility rates and the expense of renewable technologies. Wind energy opportunities are limited by location – the best source of wind energy is not on Fort Carson, but occurs on the eastern plains. The community vision for use of renewable sources does not match Fort Carson's goals, which hinders our ability to acquire or purchase off-site.

The first priority for reduced water consumption is efficiency coupled with conservation. We are challenged to meet a 75% drinking water use reduction by our current turfgrass irrigation needs, system inefficiencies and the inability to collect, store and use rainwater because of current State water law. The very definition of Net Zero Water is complicated for Fort Carson since the major sources of water we use comes from outside our watershed. Maximizing the reuse of treated wastewater for irrigation or drinking water may be limited by funding constraints, technology and/or societal ("yuck factor") limitations.

Training

- Building Energy Monitor (BEM) Training
- Environmental Protection Officer (EPO) Training
- EMS Awareness

Communication

Internal communication of energy and water program through Mountaineer articles, policy letters, education, training and awareness, other publications and announcements

External Communication of the program with the Headquarters Department of the Army, IMCOM Region, the Front Range Renewable Energy Consortium, the Governor's Energy Office, Colorado Springs Utilities and regional energy planners

Controlled Documents

Comprehensive Energy and Water Management Plan (CEWMP) – Energy Manager computer and shared network

Net Zero energy and water project tracking spreadsheets – Energy Manager computer and shared network

Energy Policy Letters – Energy Manager computer, shared network and Sharepoint

Energy Program Continuity Book - Energy Manager computer and shared network

Water Policy Letters – Energy Manager computer, shared network and Sharepoint

Operational Controls

DPW Energy SOP – Sharepoint

Hydrant Permits – Utility Manager Office

Installation Design Guide

Monitoring & Measurement

Energy/water usage data - Army Energy and Water Reporting System (AEWRS) website; Data entered by Energy Manager at <https://aewrs.hqda.pentagon.mil/aewrs/>

Manual meter data - Utility Manager office

Meter data collected from meters - Utility Control System (UCS) at Bldg 1225

Meter data from the UCS - Meter Data Management System (MDMS)

Evaluation of Compliance

Inspections from Environmental Compliance Assessment Team

Evaluation of Fort Carson Support Service contract actions from Tech Monitors

Energy Audits

Nonconformity

Tech monitor daily reports are completed for several facility maintenance program areas reviewed by DPW Operations for the Fort Carson Support Service contract; nonconformity actions handled by COR of contract

Control of Records

Tech Monitor reports - DPW shared network

Hydrant Permits - DPW Utility Manager office

Utility Agreements - DPW Utility Manager office

Customer utility bills electronically and Utility Manager office

CSU utility bills electronically and Utility Manager office

Annual Review

CEWMP is reviewed annually by Energy Manager

Annual Sustainability review for Energy Program (each September)

Annual Sustainability review for Water Program (each May)

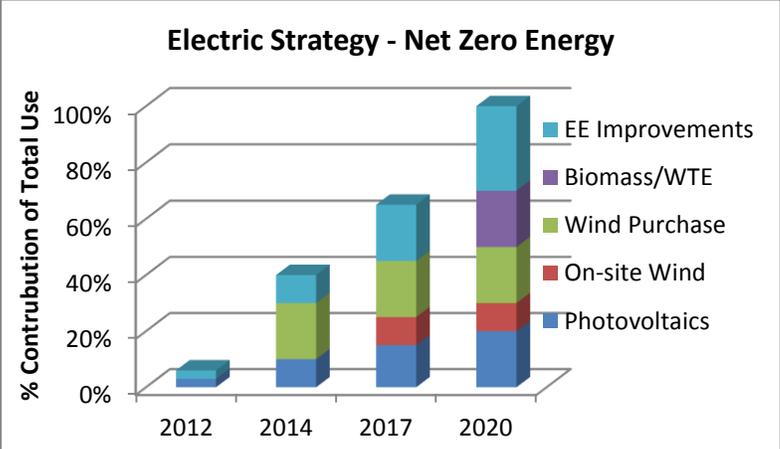
EMS annual management review

Goal Objectives and Targets

Objective EWR1: Increase renewable energy use

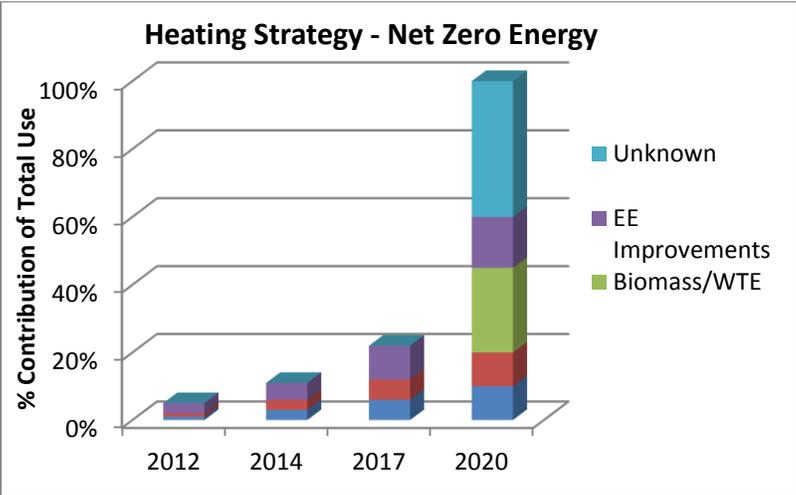
Target by FY14:
10% of facility electricity from renewable sources with the focus towards on-site systems

Target by FY17:
30% of facility electricity from on-site renewable sources with the focus towards on-site systems



Target by FY14:
10% of facility heat from on-site renewable sources

Target by FY17:
30% of facility heat from on-site renewable sources



Details on Objective EWR1 Target Graphs

Measures: Percentage of renewable electrical energy consumed by Fort Carson compared to the total electrical energy consumed. Percentage of renewable heating energy consumed by Fort Carson compared to the total heating energy consumed

Scope: Renewable Energy is defined as energy from non-petroleum sources such as wind, geothermal, hydro and solar.

Source: Fort Carson renewable systems

Baseline: The FY11 base is 3.5% of Fort Carson electric use is from on-site renewable energy and about 1.5% of the heating energy is from renewable sources. The largest percentage of on-site renewable energy comes from several photovoltaic systems including a 2MW array. On-site renewable heating energy comes from several solar hot water systems, ground source heat pump systems and a few transpired solar collector walls. In addition, Fort Carson buys hydropower from WAPA. This power is approximately 12% of Fort Carson’s total electric use and helps toward Federal goals but it is not produced on site in alignment with the Net Zero Energy goal.

Limitations: Colorado Springs Utilities provides the majority of Fort Carson's energy and is a publicly owned utility. While Fort Carson can influence the utility company by being such a large customer, Fort Carson does not control the energy portfolio of Colorado Springs Utilities. In addition, the life cycle cost for on-site renewable energy projects is a challenge for a site with low utility rates.

Verification & Validation: The DPW Utility Sales Officer is in frequent contact with the Fort Carson account manager from Colorado Springs Utilities.

Comment: In general, renewable energy is typically more expensive than traditional energy sources such as coal and natural gas. However, prices continue to fall and renewable energy is becoming a good decision in broadening an energy portfolio.

Initiatives in support of Objective EWR1 (FY12/13)

1.1 MW of Photovoltaics Installed – 5 large photovoltaic energy systems were installed in FY11 using MILCON money in new construction. This included a 235kW carport and a 481kW ground mounted system at a Battalion HQ

Microgrid Initiative – Partnering with NREL to potentially create a microgrid on Fort Carson with potential renewable projects to support the grid such as photovoltaics or electric vehicles (FY13, Approx \$4M)

Net Zero Environmental Assessment – The Army Environmental Center is completing the EA for over a dozen sites on Fort Carson for potential renewable energy implementation (FY12)

ESTCP Demonstrations – Using the ESTCP grant program to demonstrate a combined heat and power solar dish Infinia Corporation makes and a Biomax biomass system (FY12)

Wind Power Purchase – Working with Colorado Springs Utilities and wind providers to potentially purchase 7.5% to 30% of electrical energy from a wind power purchase (FY13)

Biomass Feasibility – Working with National Renewable Energy Laboratories (NREL) to research feasibility of biomass plant connected to the main heat plant (FY12)

Partner with AEC, CERL, NREL and others to identify potential renewable energy opportunities (FY12-FY20)

Involve the ASA Energy Initiatives Task Force (EITF) to coordinate potential projects (FY12-FY20)

Obtain approval of an on-site wind project (8-12% of electrical use) (FY15)

Investigate a Waste to Energy plant at Gate 19 (FY13)

Install additional photovoltaic installations subject to availability of funds (FY13-FY20)

Implement on-site projects funded/pursued through private partner partnerships such as Power Purchase Agreements (PPA) (FY13-FY20)

Determine the feasibility of an 8.5 MMBTU biomass boiler ECIP project at the main heat plant (FY13)

Install ground source heat pump retrofits, solar hot water systems and transpired solar collectors for renewable heat energy (FY13-FY20)

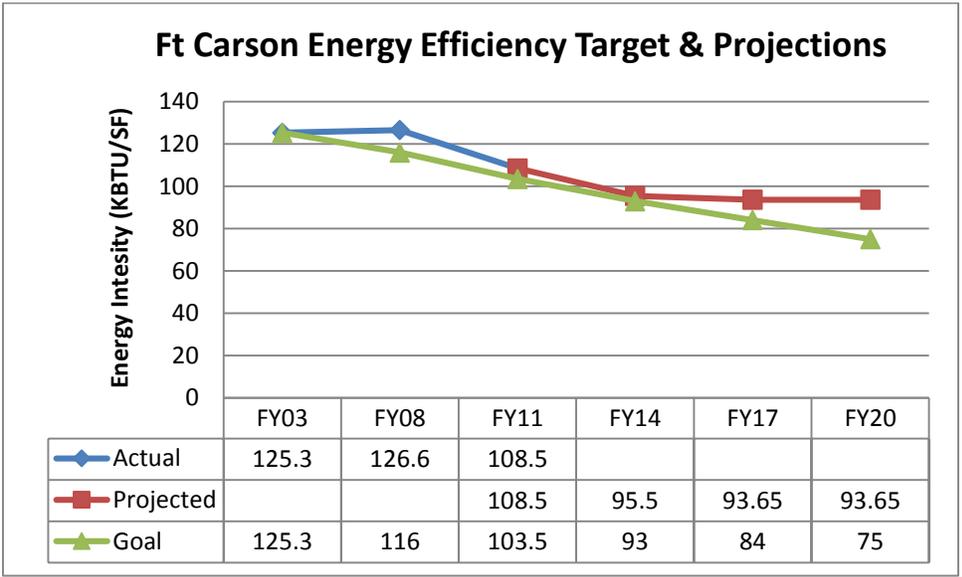
Pursue a community energy plant in support of a Net Zero ready Combat Aviation Brigade (CAB) major military construction project (FY13)

Participants involved: DPW, NREL, CERL, IMCOM, WAPA, AEC, CSU, COE and others

Objective EWR2: Reduce energy use per square foot (energy intensity) by 40% from an FY03 baseline

Target by FY14:
20% energy use per square foot reduction

Target by FY17:
30% energy use per square foot reduction



Details on Objective EWR2 Target Graph

Measure: Energy use per square foot of floor space.

Scope: Energy Efficiency is defined as the combined energy use of natural gas and electricity per square foot of floor space (real property) not including housing (which is privatized), Commissary, trailers and other exempt facilities.

Source: The DPW utility usage spreadsheets are based on Colorado Springs Utilities bills and real property floor space.

Baseline: The FY03 base is 125.3 KBTU/SF.

Limitations: Effects of weather on energy demand are not considered in the calculation. A severe winter will impact natural gas usage or a hot summer will impact electrical demand. New construction projects with year round climate control will also impact energy use. Demolition projects can have significant impacts on square footage and energy use calculations.

Verification & Validation: The DPW Utility Sales Officer validates utility bills. Bills are based on meter readings.

Comment: Energy Savings Performance Contract helps identify high payback energy conservation opportunities and implements them through alternative financing strategies. Projects and studies that identify and replace inefficient systems and equipment such as motors, fans, furnaces, air conditioners, lights, and heating systems can dramatically affect energy numbers. Command emphasis on elimination of waste has been documented to reduce consumption and costs.

Initiatives in support of Objective EWR2 (FY12/13)

Energy Savings Performance Contract – JCI was selected in December 2011 to assist Fort Carson in drastically reducing energy intensity through execution of an ESPC project. Initial proposal process would likely mean on-site project would not start construction until 2013.

High Bay Lighting Retrofits – Contracted Ameresco through the COE Huntsville to replace inefficient lighting in 40 facilities on Fort Carson

Boiler and Air Conditioner Replacements –Several projects funded to replace inefficient boilers and air conditioner systems in multiple facilities on Fort Carson

Meter Data Management System (MDMS) Pilot Site – Working with COE, Calibre and the Fort Carson NEC to field a system that will allow manipulation of smart meter data via the internet to use for energy trending and opportunity analysis

Energy Audits – Perform audits of multiple facilities to identify opportunities. The COE Huntsville is performing an Energy Engineering Analysis Program (EEAP) survey in FY12. Results will be used to identify and program additional energy projects. Night time audits have also been completed to identify wasted exterior lighting use.

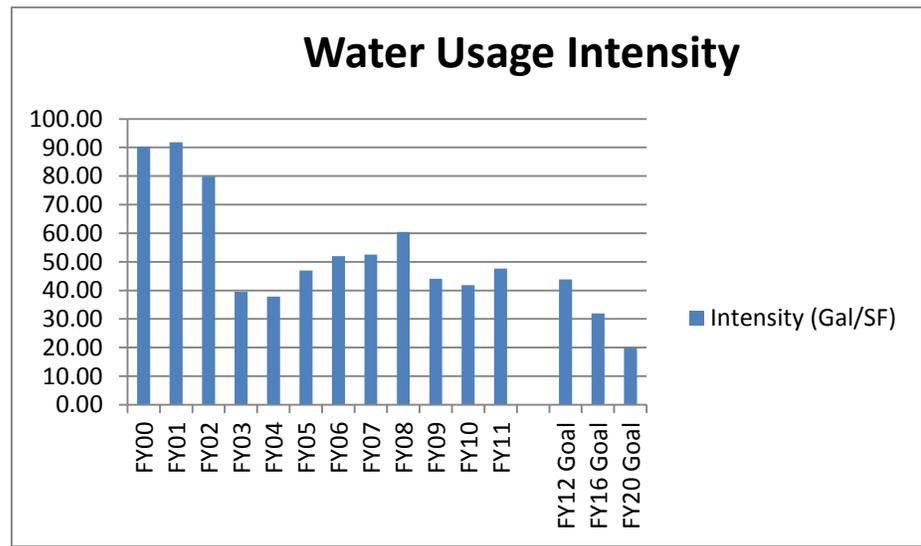
ECIP Participation – Continue to submit projects for consideration to include Energy Management Control System (EMCS) expansion, pursuit of energy opportunities identified under the Energy Engineering Analysis Program (EEAP) and re-commissioning opportunities

Participants involved: DPW, COE Huntsville, Ameresco, Johnson Controls, NEC and others

Objective EWR3: Reduce potable water use per square foot (water intensity) by 75% based on FY02 baseline

Target by FY14:
Reduce potable water use intensity by 45%

Target by FY17:
Reduce potable water use intensity by 60%



Details on Objective EWR3 Target Graph

Measure: Water usage per square foot of floor space.

Scope: Water usage is defined as potable water purchased divided by Fort Carson square footage (real property) not including housing (which is privatized), Commissary, trailers and other exempt facilities.

Source: The DPW utility usage spreadsheets are based on Colorado Springs Utilities bills.

Baseline: The FY02 baseline water usage intensity is 79.8 Gal/SF

Limitations: Water usage is very dependent on spring and summer watering conditions. A dry summer typically means higher water consumption

Verification & Validation: The DPW Utility Sales Officer validates utility bills. Bills are based on meter readings.

Comment: None.

Initiatives in support of Objective EWR3 (FY12/13)

Water Balancing Evaluation – Pacific Northwest National Laboratories (PNNL) is performing a water balancing survey on Fort Carson in FY12. Results will be used to identify and program projects

Leak Detection – Complete water surveys for multiple locations on Fort Carson. Will determine course of action, to include funding stream, if cost effective solutions

Research Expansion of Wastewater Effluent System – COE providing study and an FY13 ECIP project is programmed to expand the system to use this resource for irrigating the Sports Complex and Iron horse Park thus reducing potable water consumption

Xeriscaping – Minimize landscape watering requirements for new construction

Participants involved: DPW, BBC, Tenant Activities, Kira, COE Omaha

Alignment with IMCP and Installation Plans

IMCOM Campaign Plan: LOE 6, Energy and Water Efficiency and Security

Fort Carson Campaign Plan: Family LOE 3.2, Quality and Predictable Facilities and Services and 3.3, Quality of Life.