



ARMY NET ZERO PROVE OUT

Final Net Zero Water Best Practices

November 18, 2014

Distribution A

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Concurrent Technologies Corporation

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13. ABSTRACT (Maximum 200 words) In support of Task No. 0818, "Army Net Zero Prove-Out," the National Defense Center for Energy and Environment (NDCEE), operated by Concurrent Technologies Corporation (CTC), was tasked to provide the Office of the Deputy Assistant Secretary of the Army for Energy & Sustainability (ODASA[E&S]) outreach material consisting of Net Zero Water Best Practices. Information required to develop these Best Practices was collected over the course of this Task 818 and the NDCEE leveraged previous work with the NZ Pilot Installations under Task 0755. During the Period of Performance (POP) of T-0755 and since the commencement of this Task, monthly collaboration calls have been held between the Army Net Zero Team leaders, external resources, NDCEE and the Army Net Zero Water Pilot Installations (recently, participation has expanded beyond the pilot installations). These monthly calls accounted for the majority of Best Practices collected and were also included in the NZ Implementation Guide. The enclosed brochure found at Appendix A is intended to facilitate a comprehensive perspective for the institutionalization of NZ across the Army and aid in the transition of the NZ Pilot Installation Initiative concepts to a wider Army audience. Appendix B is a text version of the brochure to facilitate review.				
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LIST OF ACRONYMS AND ABBREVIATIONS

ACOM	Army Command
CTC	Concurrent Technologies Corporation
Dem/Val	Demonstration and validation
DFAC	Dining Facility
DoD	Department of Defense
DRU	Direct Reporting Unit
ECIP	Energy Conservation Investment Program
EO	Executive Order
ESCO	Energy Services Company
ESPC	Energy Savings Performance Contract
LEED	Leadership in Energy & Environmental Design
MBR	Membrane Bioreactor
MDMS	Meter Data Management System
MILCON	Military Construction
NDCEE	National Defense Center for Energy and Environment
NZ	Net Zero
ODASA(E&S)	Office of the Deputy Assistant Secretary of the Army for Energy & Sustainability
OSD	Office of the Deputy Under Secretary of Defense
PBSC	Performance-Based Service Contracting
POP	Period of Performance
RCI	Residential Communities Initiative
SIR	Savings to Investment Ratio
SRM	Sustainment, Restoration and Modernization
WWTP	Waste Water Treatment Plant

EXECUTIVE SUMMARY

In support of Task No. 0818, “Army Net Zero Prove-Out,” the National Defense Center for Energy and Environment (NDCEE), operated by Concurrent Technologies Corporation (CTC), was tasked to provide the Office of the Deputy Assistant Secretary of the Army for Energy & Sustainability (ODASA[E&S]) written summaries of significant, demonstrated best practices of Net Zero Water that can be used to guide Army installations in their pursuit of Net Zero Water and facilitate the institutionalization of Net Zero across the Army enterprise.

On April 19, 2011, the Assistant Secretary of the Army for Installations, Energy and Environment, the Honorable Katherine Hammack announced the sites for the Army Net Zero Pilot Installation Initiative – eight (8) of which were selected for Net Zero Water:

- Aberdeen Proving Ground, Maryland
- Fort Riley, Kansas
- JB Lewis-McChord, Washington
- Tobyhanna Army Depot, Pennsylvania
- Camp Rilea, Oregon
- Fort Buchanan, Puerto Rico
- Fort Carson, Colorado
- Fort Bliss, Texas

These sites served as test beds for the Army’s Net Zero Initiative, specifically, Net Zero Water, and the Army provided technical support to the Pilots, by way of developing baselines, water balance and efficiency assessments, water security and water conservation project potential and developing Net Zero plans (or Roadmaps). The intent was to transition and institutionalize Net Zero concepts, responsibility, methods, and implementation activities from the pilot installations to the appropriate Army Commands (ACOMs)/Direct Reporting Units (DRUs) and all Army installations. The purpose of this task was to support that transition by documenting Net Zero Water best practices identified that can be shared with other Army installations and advance the Net Zero concept across the Army.

Net Zero builds on longstanding sustainable practices and incorporates emerging best practices in building and community management of energy, water and solid waste at Army installations. With the 28 January 2014 issuance of the Army Net Zero Installation Directive, it became Army policy that all installations will implement Net Zero Water to the maximum extent practical and fiscally prudent by reducing overall water use, regardless of the source; increasing use of technology that uses water more efficiently; recycling and reusing water, shifting from the use of potable water to non-potable sources as much as possible; and minimizing interbasin transfers of any type of water, potable or non-potable, so that a Net Zero water installation recharges as much water back into the aquifer as it withdraws.

The Net Zero Water Best Practices brochure (Appendix A) and text version of the brochure (Appendix B) developed for this task captures significant, demonstrated best practices at the Net Zero Water pilot installations. Previous experience from NDCEE Task 0755, ongoing collaboration calls, and Net Zero meeting support was leveraged to capture achievements of the pilot installations, identify those projects that can be replicated at other installations and help the transition of the Net Zero Pilot Installation Initiative concepts to a wider Army audience.

APPENDIX A

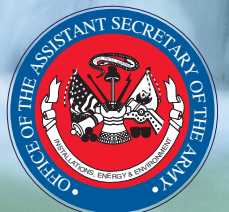
Net Zero Water Best Practices Brochure



water_Net Zero
Brochure_13NOV2014



Water





Joint Base Lewis-McCord Waste Water Treatment



Water

Net Zero Water involves reducing overall water use, regardless of the source; increasing use of technology that uses water more efficiently; recycling and reusing water, shifting from the use of potable water to non-potable sources as much as possible; and minimizing interbasin transfers of any type of water, potable or non-potable, so that a Net Zero water installation recharges as much water back into the aquifer as it withdraws.

THE ARMY'S NET ZERO INITIATIVE:

Net Zero is a strategy for sustainably managing energy, water, and solid waste programs on Army installations in a way that ensures the Army of tomorrow has the same access to energy, water, land and natural resources as today's Army. Net Zero installations will reduce energy and water usage and solid waste generation, exceeding goals set by Executive Orders, Department of Defense (DoD) Directives and Army Policies, where fiscally responsible. The journey towards Net Zero will provide greater energy and water security and increase operational flexibility.

Introduction

To date, the Army has made substantial progress in the areas of Net Zero Energy, Water, and Waste. A number of federal mandates, rising fuel costs, over-reliance on fragile commercial power grids, aging water and wastewater distribution systems coupled with the risk of compliance penalties have challenged the Army to step up and lead by example with its Net Zero Initiative. The Army rose to this challenge with the Net Zero Pilot Installation Initiative, which has allowed the Army to identify best practices that can be used to guide all installations in achieving Net Zero goals mandated through presidential orders, Department of Defense (DoD) and Army Directives. Capturing lessons learned and incorporating best practices in installation operations and management is a crucial step in institutionalizing Net Zero across the Army enterprise. This document summarizes best practices for implementing Net Zero Water which can decrease costs, improve water security and increase operational capability and resiliency. Best practices are organized into four main areas: **1)** Management Tools and Strategies; **2)** Outreach, Education and Awareness; **3)** Pilot Programs and New Technologies; and, **4)** Existing Programs and Funds. While this document is specific to water, some of the listed best practices are programs, policies, and strategies that can also be applied to Net Zero Energy and Waste, as well as integrated efforts to align Energy, Water and Waste efforts.

Management Tools and Strategies

Management tools include software and data systems that enable improved management of water use in facilities. The tools allow water use to be determined, monitored, and analyzed to facilitate the identification of reduction and efficiency opportunities. Management strategies are available that focus on commissioning, retrofits and ongoing activities within buildings to enable more efficient use of water. The following lists management tools first and then strategies that have been tried and proven as a best practice in the pursuit of Net Zero Water (in alphabetical order):

Tools

Garrison Installation Water Council or Water Steering Committee – Creating a council to identify methods of reducing water use can be an effective method for achieving Net Zero goals. This group of water stakeholders can work together to share information, identify strategies and establish priorities. They can affect a shift in installation operations and management that results in engaging everyone in the pursuit of Net Zero Water.

Leadership in Energy & Environmental Design (LEED) – The United States Green Building Council's LEED is an evaluation criteria program that helps to drive sustainable design and development, of which reduced water use is one of the focus areas. Installations can pursue water use reduction credits through implementation of this program for new construction and major renovations. Designing buildings using LEED helps to reduce water use throughout the life cycle of the building by installing more efficient equipment from the onset. Part of reducing water use through improved design would include changing construction standards for irrigation systems such that these systems use less water.

Meter Data Management System (MDMS) – Collecting and analyzing water use through automated systems such as the Army MDMS provides an understanding of the baseline and allows progress to be measured. Data from these systems allow installations to determine facility water use intensity and identify areas on which to focus solutions. Remotely monitoring buildings systems allow staff to identify service issues prior to emergency situations and lower water use for buildings that are not continuously occupied. However, installation personnel should proceed with caution because if sufficient water use is not continued in a facility's distribution system – it could result in adverse health implications.



Army Net Zero Best Practices



Fort Riley Central Vehicle Wash Facility (closed-loop water recycling)

Water Master Planning – The purpose of water management planning is to ensure water of sufficient quantity and quality is available to meet the installation's mission now and in the future. It is a critical component of installation utility planning and should be closely linked with the installation's Net Zero Water goals. The plan should provide detailed information on the assessment and implementation of water efficiency improvements at the installation, to meet the water conservation goals. It will also include best management practices such as water re-use, leak detection, use of green infrastructure and landscape management.

Strategies

Advanced Irrigation Systems – Irrigation systems are available that detect weather and adjust watering frequency accordingly to save considerably on irrigation requirements. While these systems are very effective in meeting water conservation objectives, they must be adjusted in drought scenarios when the system will water more frequently and increase water use.

Equipment Upgrades – Whenever water-using equipment is scheduled for upgrade, installations should ensure more efficient equipment is specified/obtained – especially in hospitals and Dining Facilities (DFACs); but also general plumbing fixtures. Low flow shower heads, aerators for sinks, and low flow urinals are examples of water-saving equipment. This can be also accomplished when buildings are empty due to deployments; this as an opportunity to replace water-using fixtures with more efficient fixtures across barracks and unit headquarter buildings.

Leak Survey and Leak Repair – Water loss through leaks in the distribution system is a normal part of operations, but often the leaks exceed normal ranges and addressing these can reduce water use significantly. Installations should incorporate leak detection and repair into existing water infrastructure and system maintenance. There are new approaches to detecting leaks that can impact existing management of water lines – one is to use a performance-based contract; another involves prioritizing leak detection in response to drought conditions. Replacement of aging distribution systems on older areas of the post may also address significant water loss. Pipe lining techniques exist to reduce leaks and reduce infiltration.

Non-potable Water Use – Installations should investigate and apply non-potable water sources to those end uses for which potable water is not needed. This includes use of non-potable groundwater for irrigation. Often golf course, parade ground, parks or other green space can be irrigated with untreated groundwater and reservoirs to disconnect this water use from the potable system. Storm water can be captured and used for irrigation. Rain water can be harvested for non-potable uses such as toilet flushing in buildings, cooling towers and irrigation. Implementation of these solutions should not increase overall water use; rather it should provide for a decrease in potable water use and return more water to the water source aquifer. Often these non-potable systems will require alternate piping to ensure the water is not confused for potable.

Pump and Pressure Management – Efficiencies can be gained through replacement of pumps and management of pressure within the system. An advanced water pressure meter may help track major water users – such as hydrants.

Recycling of Treated Wastewater – Onsite reuse of treated water from the wastewater treatment plants (otherwise referred to as reclaimed water) can be used for non-potable water end uses, such as irrigation and make-up water in industrial cooling towers. This reduces the amount of water used overall by recycling and reusing water multiple times before it is discharged. The use of non-potable water will require the construction of “purple pipe” distribution systems, signs and other measures to prevent water from being used for potable purposes.

Separation from Municipal Supply – It may be feasible for the installation to construct its own Water Treatment Plant (WTP) and/or Waste Water Treatment

Plant (WWTP) to be free of the municipal system. In some cases, this may significantly enhance the installation's ability to reduce water use and achieve Net Zero.

WWTP Design – Installations should include Net Zero considerations in the design and operation of WWTPs. There are many opportunities to reduce water use through more effective treatment and reclamation of wastewater. If the capability to generate Class A water from new WWTP is specified it is easier to reclaimed the treated water, even if this is going beyond strict regulatory requirements as it will produce a new water source.

Xeriscaping – Xeriscaping is landscaping and gardening that reduces or eliminates the need for supplemental water from irrigation. There are many techniques that produce water-conserving landscapes or drought-tolerant landscaping. Plants whose natural requirements are appropriate to the local climate are emphasized, and care is taken to avoid losing water to evaporation and run-off. One example is to convert turf to native meadows, or to reduce the number of acres at an installation considered “High Visibility” – thus requiring more water and fertilizer – to “Low Visibility.” This not only reduces the irrigation burden, but other labor associated with maintaining the landscaping. Those installations with golf courses can adjust management practices to reduce water used in irrigation such as replacing turf grass with water efficient varieties; this can be done slowly, over time as part of ongoing maintenance.

Outreach, Education and Awareness

Successful implementation of Net Zero actions requires both top-down command support and bottom-up community support. Members of the installation community will need to make different choices about the water they consume. Tenant organizations must be aware of the installation goals and support Net Zero actions. To accomplish this, a significant amount of outreach, education and awareness of Net Zero will be needed. Outreach, education and awareness are often low cost Net Zero actions that may be overlooked, but these can often have significant impact or may be essential to support the success of other Net Zero actions. Additionally, developing new partnerships can help installations achieve their Net Zero goals. Examples of outreach, education and awareness strategies that can be leveraged to achieve Net Zero Water are as follows (in alphabetical order):

Participation in Design Charrettes – Net Zero or sustainability staff participation in design or planning

charrettes helps to raise awareness of what the installation desires for its new buildings or new infrastructure. Cross-functional teams can help share expertise in support of a common goal, at the same time building positive support networks within the installation.

Residential Billing Program – Water conservation is often achieved by providing financial incentives. Army Residential Communities Initiative (RCI) contractors can implement mock and live billing to increase resident awareness of and subsequently reduce utility use.

Water Conservation Public Awareness – Public awareness programs aimed at changing behaviors have been shown to have productive results. Awareness campaigns seek to instill water conservation as a fundamental value. People tend to take water for granted, and many are unaware of the opportunities they have to reduce water use. A public awareness campaign involves developing messages and then communicating these through many different sources of media, such as newspaper articles, Facebook pages, or videos. Messages are statements that provide the basis for action. The target audience should relate to, believe, and be motivated by the messages. Campaigns can also include workshops, conferences, contests, awards and other types of events or engagement with local communities. Installations have engaged with their local communities through local or regional conferences on Net Zero and sustainability. For water, it is particularly important to focus educational efforts on maintenance departments to ensure that new fixtures are kept operating properly and the correct repair parts are kept on hand. Without this education, the personnel may go back to the old styles which use more water.

Pilot Programs and New Technologies

Pilot programs and demonstration projects are a potential venue to support efforts toward Net Zero Water. Before new technologies are deployed widely across an installation they are often demonstrated on a smaller scale through pilot programs and demonstration and validation (Dem/Val) projects. Pilot programs may involve new technologies or working with new partners. The focus is on temporarily implementing a new approach or technology, or leveraging external stakeholders with similar interests, to provide an opportunity to document the full effects of the actions on Net Zero goals before it is more



Army Net Zero Best Practices

permanently adopted. Examples of technologies that can be leveraged to achieve Net Zero Water goals are as follows (in alphabetical order):

Aircraft and Vehicle Wash Racks – Aircraft and vehicle wash racks are available that recycle 100% of wastewater for re-use in the system. There are also new covers for storage ponds to reduce evaporation from settling ponds and enable more of this water to be reused.

Hospital Sterilizer Retrofit – Water is used in steam sterilizers to provide jacket and chamber trap cooling and to create a vacuum in the ejector. Commercial retrofit kits that save water can be added to the existing equipment.

Membrane Bioreactors (MBR)/Decentralized wastewater treatment – There are wastewater treatment technologies available that can treat wastewater in smaller quantities closer to the source and/or end user. This will often reduce the costs and infrastructure challenges of installing purple pipe for a central WWTP to the non-potable end use, therefore enhancing the ability to reclaim treated wastewater and reuse it, reducing potable water use overall.

Existing Programs and Funds

Many installations have sustainability, energy efficiency, water conservation, recycling, pollution prevention, and green procurement programs in place that they can leverage to advance new Net Zero actions. Although available resources may be limited in existing programs, installations have direct control over these resources. Installations increase their chances to access existing programs and funds when they can show that Net Zero actions and projects can lead to cost savings, energy efficiencies and positive mission impact. Examples of existing programs and funding sources that can be leveraged to achieve Net Zero Water are (in alphabetical order):

Energy Conservation Investment Program (ECIP) – ECIP is part of the Military Construction (MILCON) program and is designated for projects that save energy or reduce energy costs. Funding is awarded by the Office of the Deputy Under Secretary of Defense (OSD) on a by-project basis and awards are allocated based on the highest savings to investment ratio (SIR), but also considers priorities emphasized by the Energy Policy Act of 2005, Executive Order (EO) 13423, and the Energy Independence and Security Act of 2007. This funding is an important existing program that can be leveraged in support of Net Zero Water as saving water also saves energy. An installation has leveraged ECIP funds to reuse non-potable water for irrigation.

Energy Savings Performance Contracts – Through the ESPC, installations can partner with an Energy Services Company (ESCO) wherein the ESCO conducts an energy audit and then identifies and implements energy savings improvements with no up-front costs required by the installations. Payment to the ESCO is based on the energy savings over time. Existing ESPCs may be used for water conservation projects, as saving water also saves energy. It may be beneficial to the installation to bundle water projects with energy projects to make more economical. Installations have used ESPCs for water fixture replacements to water conserving fixtures; aerators, showers, and kitchen prep sink.

Engage with Building Design Teams – Participation in design meetings for new buildings is an effective way to ensure Net Zero Water concerns are incorporated and considered.

Environmental Officer Training – Expand unit Environmental Officer Training to include Net Zero Water concerns.

Performance Contract for Leak Detection and Repair – Using a performance contract for leak detection and repairs is a technique that can leverage existing contracting capabilities. The contract is set up that payment is made only for those leaks detected and fixed, not just the service of detecting leaks. This incentivizes the contractor for repair projects, not just leak detection, improving the overall efficiency of the leak detection and repair. Other Performance-Based Service Contracting (PBSC) may be leveraged to improve contractor performance toward Net Zero goals. However, not all improvements are economical – especially with the cost of water usually so low; other incentives may need to be negotiated.

Sustainment, Restoration and Modernization (SRM) – SRM funds are applied annually to update and improve existing infrastructure through projects developed and prioritized by the installation DPW. These funds should be leveraged for water conservation and efficiency improvements.

Utilities Privatization – Many of the Army water systems have been privatized. It is critical to include water conservation and efficiency outcomes in the privatization contract, properly motivating the contractor to enable Net Zero water progress. If the contract is just written to cover quality and quantity of water delivered, then the contractor does not have responsibility to reduce overall water use – in fact the incentives may be to do the opposite.

Energy · Water · Waste

Fort Riley Membrane Bio Reactor (MBR) Site





The Net Zero Water strategy strives to balance water availability and use to ensure a sustainable water supply for years to come. This concept is of increasing importance because water scarcity is a serious and growing issue in many parts of the United States and around the world.

– Honorable Katherine Hammack

Resources

ASA (IE&E) home page:
www.army.mil/asaiee

Energy and Sustainability Webpage:
www.asaie.army.mil/Public/ES

Army Energy Program Net Zero Vision:
<http://www.asaie.army.mil/Public/ES/netzero/index.html>



APPENDIX B

Text Version of the Net Zero Water Best Practices Brochure



Water Text.docx

Army Net Zero Best Practices

Net Zero Water

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Tools

- Garrison Installation Water Council or Water Steering Committee – Creating a council to identify methods of reducing water use can be an effective method for achieving Net Zero goals. This group of water stakeholders can work together to share information, identify strategies and establish priorities. They can affect a shift in installation operations and management that results in engaging everyone in the pursuit of Net Zero Water.
- Leadership in Energy & Environmental Design (LEED) – The United States Green Building Council’s LEED is an evaluation criteria program that helps to drive sustainable design and development, of which reduced water use is one of the focus areas. Installations can pursue water use reduction credits through implementation of this program for new construction and major renovations. Designing buildings using LEED helps to reduce water use throughout the life cycle of the building by installing more efficient equipment from the onset. Part of reducing water use through improved design would include changing construction standards for irrigation systems such that these systems use less water.
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- Water Master Planning – The purpose of water management planning is to ensure water of sufficient quantity and quality is available to meet the installation’s mission now and in the future. It is a critical component of installation utility planning and should be closely linked with the installation’s Net Zero Water goals. The plan should provide detailed information on the assessment and implementation of water efficiency improvements at the installation, to meet the water conservation goals. It will also include best management practices such as water re-use, leak detection, use of green infrastructure and landscape management.

Strategies

- **Advanced Irrigation Systems** – Irrigation systems are available that detect weather and adjust watering frequency accordingly to save considerably on irrigation requirements. While these systems are very effective in meeting water conservation objectives, they must be adjusted in drought scenarios when the system will water more frequently and increase water use.
- **Equipment Upgrades** – Whenever water-using equipment is scheduled for upgrade, installations should ensure more efficient equipment is specified/obtained – especially in hospitals and Dining Facilities (DFACs); but also general plumbing fixtures. Low flow shower heads, aerators for sinks, and low flow urinals are examples of water-saving equipment. This can be also accomplished when buildings are empty due to deployments; this as an opportunity to replace water-using fixtures with more efficient fixtures across barracks and unit headquarter buildings.
- **Leak Survey and Leak Repair** – Water loss through leaks in the distribution system is a normal part of operations, but often the leaks exceed normal ranges and addressing these can reduce water use significantly. Installations should incorporate leak detection and repair into existing water infrastructure and system maintenance. There are new approaches to detecting leaks that can impact existing management of water lines – one is to use a performance-based contract; another involves prioritizing leak detection in response to drought conditions. Replacement of aging distribution systems on older areas of the post may also address significant water loss. Pipe lining techniques exist to reduce leaks and reduce infiltration.
- **Non-potable Water Use** – Installations should investigate and apply non-potable water sources to those end uses for which potable water is not needed. This includes use of non-potable groundwater for irrigation. Often golf course, parade ground, parks or other green space can be irrigated with untreated groundwater and reservoirs to disconnect this water use from the potable system. Storm water can be captured and used for irrigation. Rain water can be harvested for non-potable uses such as toilet flushing in buildings, cooling towers and irrigation. Implementation of these solutions should not increase overall water use; rather it should provide for a decrease in potable water use and return more water to the water source aquifer. Often these non-potable systems will require alternate piping to ensure the water is not confused for potable.
- **Pump and Pressure Management** – Efficiencies can be gained through replacement of pumps and management of pressure within the system. An advanced water pressure meter may help track major water users – such as hydrants.
- **Recycling of Treated Wastewater** – Onsite reuse of treated water from the wastewater treatment plants (otherwise referred to as reclaimed water) can be used for non-potable water end uses, such as irrigation and make-up water in industrial cooling towers. This reduces the amount of water used overall by recycling and reusing water multiple times before it is discharged. The use of non-potable water will require the construction of

“purple pipe” distribution systems, signs and other measures to prevent water from being used for potable purposes.

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- WWTP Design – Installations should include Net Zero considerations in the design and operation of WWTPs. There are many opportunities to reduce water use through more effective treatment and reclamation of wastewater. If the capability to generate Class A water from new WWTP is specified it is easier to reclaimed the treated water, even if this is going beyond strict regulatory requirements as it will produces a new water source.
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Outreach, Education and Awareness

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Additionally, developing new partnerships can help installations achieve their Net Zero goals. Examples of outreach, education and awareness strategies that can be leveraged to achieve Net Zero Water are as follows (in alphabetical order):

- Participation in Design Charrettes – Net Zero or sustainability staff participation in design or planning charrettes helps to raise awareness of what the installation desires for its new buildings or new infrastructure. Cross-functional teams can help share expertise in support of a common goal, at the same time building positive support networks within the installation.

- Residential Billing Program – Water conservation is often achieved by providing financial incentives. Army Residential Communities Initiative (RCI) contractors can implement mock and live billing to increase resident awareness of and subsequently reduce utility use.
- Water Conservation Public Awareness – Public awareness programs aimed at changing behaviors have been shown to have productive results. Awareness campaigns seek to instill water conservation as a fundamental value. People tend to take water for granted, and many are unaware of the opportunities they have to reduce water use. A public awareness campaign involves developing messages and then communicating these through many different sources of media, such as newspaper articles, Facebook pages, or videos. Messages are statements that provide the basis for action. The target audience should relate to, believe, and be motivated by the messages. Campaigns can also include workshops, conferences, contests, awards and other types of events or engagement with local communities. Installations have engaged with their local communities through local or regional conferences on Net Zero and sustainability. For water, it is particularly important to focus educational efforts on maintenance departments to ensure that new fixtures are kept operating properly and the correct repair parts are kept on hand. Without this education, the personnel may go back to the old styles which use more water.

Pilot Programs and New Technologies

Pilot programs and demonstration projects are a potential venue to support efforts toward Net Zero Water. Before new technologies are deployed widely across an installation they are often demonstrated on a smaller scale through pilot programs and demonstration and validation (Dem/Val) projects. Pilot programs may involve new technologies or working with new partners. The focus is on temporarily implementing a new approach or technology, or leveraging external stakeholders with similar interests, to provide an opportunity to document the full effects of the actions on Net Zero goals before it is more permanently adopted. Examples of technologies that can be leveraged to achieve Net Zero Water goals are as follows (in alphabetical order):

- Aircraft and Vehicle Wash Racks – Aircraft and vehicle wash racks are available that recycle 100% of wastewater for re-use in the system. There are also new covers for storage ponds to reduce evaporation from settling ponds and enable more of this water to be reused.
- Hospital Sterilizer Retrofit – Water is used in steam sterilizers to provide jacket and chamber trap cooling and to create a vacuum in the ejector. Commercial retrofit kits that save water can be added to the existing equipment.
- Membrane Bioreactors (MBR)/Decentralized wastewater treatment – There are wastewater treatment technologies available that can treat wastewater in smaller

quantities closer to the source and/or end user. This will often reduce the costs and infrastructure challenges of installing purple pipe for a central WWTP to the non-potable end use, therefore enhancing the ability to reclaim treated wastewater and reuse it, reducing potable water use overall.

Existing Programs and Funds

Many installations have sustainability, energy efficiency, water conservation, recycling, pollution prevention, and green procurement programs in place that they can leverage to advance new Net Zero actions. Although available resources may be limited in existing programs, installations have direct control over these resources. Installations increase their chances to access existing programs and funds when they can show that Net Zero actions and projects can lead to cost savings, energy efficiencies and positive mission impact. Examples of existing programs and funding sources that can be leveraged to achieve Net Zero Water are (in alphabetical order):

- **Energy Conservation Investment Program (ECIP)** – ECIP is part of the Military Construction (MILCON) program and is designated for projects that save energy or reduce energy costs. Funding is awarded by the Office of the Deputy Under Secretary of Defense (OSD) on a by-project basis and awards are allocated based on the highest savings to investment ratio (SIR), but also considers priorities emphasized by the Energy Policy Act of 2005, Executive Order (EO) 13423, and the Energy Independence and Security Act of 2007. This funding is an important existing program that can be leveraged in support of Net Zero Water as saving water also saves energy. An installation has leveraged ECIP funds to reuse non-potable water for irrigation.
- **Energy Savings Performance Contracts** – Through the ESPC, installations can partner with an Energy Services Company (ESCO) wherein the ESCO conducts an energy audit and then identifies and implements energy savings improvements with no up-front costs required by the installations. Payment to the ESCO is based on the energy savings over time. Existing ESPCs may be used for water conservation projects, as saving water also saves energy. It may be beneficial to the installation to bundle water projects with energy projects to make more economical. Installations have used ESPCs for water fixture replacements to water conserving fixtures; aerators, showers, and kitchen prep sink.
- **Engage with Building Design Teams** - Participation in design meetings for new buildings is an effective way to ensure Net Zero Water concerns are incorporated and considered.
- **Environmental Officer Training** - Expand unit Environmental Officer Training to include Net Zero Water concerns.
- **Performance Contract for Leak Detection and Repair** – Using a performance contract for leak detection and repairs is a technique that can leverage existing contracting capabilities. The contract is set up that payment is made only for those leaks detected and fixed, not just the service of detecting leaks. This incentivizes the contractor for

repair projects, not just leak detection, improving the overall efficiency of the leak detection and repair. Other Performance-Based Service Contracting (PBSC) may be leveraged to improve contractor performance toward Net Zero goals. However, not all improvements are economical – especially with the cost of water usually so low; other incentives may need to be negotiated.

- Sustainment, Restoration and Modernization (SRM) – SRM funds are applied annually to update and improve existing infrastructure through projects developed and prioritized by the installation DPW. These funds should be leveraged for water conservation and efficiency improvements.
- Utilities Privatization – Many of the Army water systems have been privatized. It is critical to include water conservation and efficiency outcomes in the privatization contract, properly motivating the contractor to enable Net Zero water progress. If the contract is just written to cover quality and quantity of water delivered, then the contractor does not have responsibility to reduce overall water use – in fact the incentives may be to do the opposite.

Back cover quote:

The Net Zero Water strategy strives to balance water availability and use to ensure a sustainable water supply for years to come. This concept is of increasing importance because water scarcity is a serious and growing issue in many parts of the United States and around the world.

Honorable Katherine Hammack