

Department of Defense Sustainability Performance Report FY 2013





AUG 14 2013

The mission of the Department of Defense (DoD) is to provide the military forces needed to deter war and protect the security of our country. To successfully execute the DoD mission, our Military Departments must have the energy, land, air, and water resources necessary to train and operate, today and in the future, in a world where there is increasing competition for resources. Sustainability provides the framework necessary to ensure the longevity of these resources by addressing energy, environmental, safety, and occupational health considerations. Incorporating sustainability into DoD planning and decision-making enables us to address current and emerging mission needs, minimize long-term costs, and consider future challenges.

This annual update of the DoD Strategic Sustainability Performance Plan (SSPP) lays out our goals and sustainability performance expectations through FY 2020, establishing the path by which DoD will improve our mission, lower life cycle costs, and advance technologies and practices that further the sustainability goals of the Nation. In FY 2012, the Department continued to drive progress on sustainability by integrating it into the everyday course of DoD business. We did this by embedding sustainability concepts and requirements into our high-level strategies, training, policies, and guidance documents across the Military Departments.

We are committed to integrated risk management practices that advance our mission while protecting our people and the environment, reducing costs, and promoting a culture of sustainability. The Department is addressing sustainability concepts in our acquisition and procurement processes, as well as in the planning and management of our installations. For every DoD program, the Department actively seeks opportunities to improve our full range of operations through enhanced analysis, informed decision-making, and appropriate budgets necessary to integrate sustainability DoD-wide.

DoD sustainability goals are aggressive, especially for energy, water, and greenhouse gas emissions. In FY 2013 and FY 2014, our primary sustainability focus is to maintain mission capability by reducing energy costs and improve the energy security of our fixed installations through energy efficiency and renewable energy. To support this, the Department plans to award \$363 million in performance-based, third-party contracts in FY 2013 and at least \$581 million in FY 2014.

The Department will meet or exceed the FY 2013 targets of many of its SSPP goals. We will leverage sustainable technology development with other agencies and industry and jump-start commercial adoption to achieve payoffs that extend beyond the defense sector. We will continue to engage employees, stakeholders, and the public in our commitment to sustainability. Although we still have much to do, the Department is committed to making the transformation necessary to integrate sustainability into our culture of excellence and fiscal stewardship while also improving national security. We are steadfast in achieving the transition needed to be ready for the challenges of tomorrow.

A handwritten signature in black ink, appearing to read "Frank Kendall", written over a horizontal line.

Frank Kendall
DoD Senior Sustainability Officer
Under Secretary of Defense for Acquisition,
Technology, and Logistics

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Executive Summary

Vision

“The Department’s vision of sustainability is to maintain the ability to operate into the future without decline—either in the mission or in the natural and man-made systems that support it.”

– Policy Statement from Dr. Ashton B. Carter, Under Secretary of Defense (Acquisition, Technology and Logistics), 14 June 2010

It is evident throughout the Department of Defense (DoD) FY 2013 Strategic Sustainability Performance Plan (SSPP) that sustainability has become part of the day-to-day execution of DoD’s mission, and is increasingly becoming more thoroughly woven into the Department’s policies, procedures, and practices. At the heart of sustainability is the need to preserve Earth’s natural resource base for use in the future. DoD depends on these resources – energy, air, land, water – to conduct its mission. Just as sustainability directly affects the ability of DoD to perform its mission in the future, so does the Department’s ability to be resilient to the impacts of climate change. Sustainability and climate change adaptation go hand in hand in DoD’s efforts at continual improvement to ensure our resilience and success.

Although the SSPP does not expressly address combat operations or the direct support of combat operations – such as contingency basing, ships, aircraft, and tactical vehicles – the linkages between sustainability and the DoD mission are strong and direct for combat as well as non-combat activities.

Leadership

The DoD Senior Sustainability Officer (SSO) is the Under Secretary of Defense for Acquisition, Technology and Logistics. This senior official is responsible for ensuring the effective and successful implementation of the SSPP across the Department. Reporting directly to the SSO is the Senior Sustainability Council (SSC), co-chaired by the Deputy Under Secretary of Defense for Installations and Environment and the Assistant Secretary of Defense for Operational Energy Plans and Programs. The SSC consists of approximately 20 senior officials from the Military Departments and key DoD Directorates, who collectively span all functions of the Department, in keeping with the cross-cutting, integrated nature of sustainability. Chartered in November 2010, the purpose of the SSC is to integrate sustainability into DoD policies, plans, budgets, and decisions, and make recommendations pertaining to sustainability, including on the adequacy of policies and resources in meeting the Department’s sustainability goals. In addition to the SSC, each Military Department and the Defense Logistics Agency (DLA) have designated a sustainability officer to ensure accountability in implementing the SSPP across their Department.

Performance Review

Greenhouse Gas Reduction

DoD reduced its FY 2012 greenhouse gas (GHG) emissions by 9.2% from the FY 2008 baseline (Figure ES-1), as determined by the inventories the Department conducts annually of its GHG emissions. The continued decline in emissions was possible due to significant reductions in most of the main categories contributing to the Department’s inventory. For example, the combined emissions from purchased electricity and on-site fossil fuel combustion by facilities fell by 8.5%, and non-tactical mobile emissions fell by 16%, from FY 2008.

In the near-term, the greatest impact on the Department’s GHG emissions will come from a continued focus on reducing the use of fossil fuels. One of the main paths DoD will use to achieve this is through performance-based contracting, where the cost to implement projects is paid entirely or largely through the savings generated from improvements in energy and water efficiency. In FY 2012, DoD awarded contracts for 37 performance-based projects with a total value of \$343 million. For FY 2013, performance-based contracts either already awarded or in the pipeline total \$363 million, and for FY 2014 there are currently \$581 million worth of projects in the pipeline.

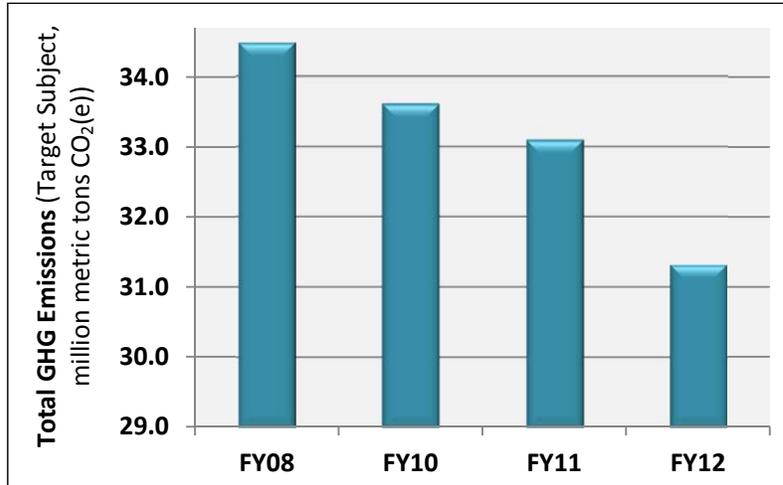


Figure ES-1. Steady Decline in DoD GHG Emissions Since the FY 2008 Base Year

Teleworking is one of the strategies the Department is employing to reduce Scope 3 GHG emissions. DLA is a leader not just within DoD, but across the entire federal family. Approximately one-third of all eligible DLA employees telework on a regular basis. DLA is not only increasing the portion of eligible employees who are teleworking, it has also been steadily increasing the number of employees determined to be eligible. It has done this through a multi-pronged approach of identifying and addressing barriers, engaging senior leadership, helping supervisors determine eligibility, using “hoteling” office space, providing training, and raising awareness.

Sustainable Buildings

One of the greatest sustainability challenges the Department faces is retrofitting a sizeable portion of its large inventory of existing buildings to the point where they meet the criteria of the *Guiding Principles of Federal Leadership in High Performance and Sustainable Buildings*. Out of 51,953 owned and leased buildings subject to this requirement, only 316 of them met the Guiding Principles criteria in FY 2012. However, DoD has been developing and issuing a number of seminal policy and guidance documents to accelerate the Department’s progress in improving its buildings. In May 2012, DoD issued Unified Facilities Criteria (UFC) 2-100-01, [Installation Master Planning](#), which provides direction and guidance on the sustainable planning and siting of military facilities. In March 2013, the Department issued more strict building standards in the form of DoD UFC 1-200-02, [High Performance and Sustainable Building Requirements](#). This latest UFC provides military construction project managers – for both new construction and major renovation – with a contract-enforceable standard that complies with all federal sustainability mandates, including the Guiding Principles.

DoD has been learning valuable lessons on approaches for improving the sustainability and performance of new



construction. One example is the Community Emergency Services Station at Fort Bragg, NC (see inset photo), which received a Platinum rating from the U.S. Green Building Council Leadership in Energy and Environmental Design (LEED) certification system. This was accomplished without increasing the cost of construction above that needed for LEED Silver certification, which DoD requires of all new construction. The 8,250-square-foot building uses 35% less energy than a typical building of its size, and 83% less potable water. Recycling and reuse succeeded in diverting 90% of the construction debris from the waste stream. The Army is incorporating the knowledge gained through the project design and construction process into the Army’s standard design guidance for military construction. Similarly, the New Campus East facility of the National Geospatial-Intelligence Agency achieved LEED Gold certification, at no more cost than would have been needed to achieve Silver. The building is projected to reduce energy consumption by 44% and water by 40%. The building is also better for employee health since it was constructed using materials low in volatile organic compounds.

By way of future strategies, the Army is updating its sustainable design and development policy to align with the new DoD UFC and to require enhanced commissioning, which will be used to benchmark high-performance milestones from capital investments. The Air Force continues to conduct combined Sustainable Infrastructure Assessments on its buildings to determine their high-performance sustainability status and provide investment-grade technical and financial analysis. As the Navy continues its rollout of advanced metering infrastructure, it will use the additional data to update future guidance, and help identify and prioritize renovation and repairs based on returns on investment. The Marine Corps is revising its Order for Energy to incorporate the Guiding Principles requirement and facilitate tracking of performance. On the Pentagon reservation, the Washington Headquarters Service will have building-level energy and water meters in place by the end of FY 2014, along with software to analyze the data.

Fleet Management

Petroleum consumption by the Department’s non-tactical vehicles was 19.5% lower in FY 2012 than the base year of FY 2005 (Figure ES-2), far exceeding the 14% target in Executive Order (EO) [13423](#), Strengthening Federal Environmental, Energy, and Transportation Management. This was accomplished in part by an increased reliance on alternative fuels, with FY 2012 consumption 128% higher than the FY 2005 baseline – well in excess of the 95% target for federal agencies.

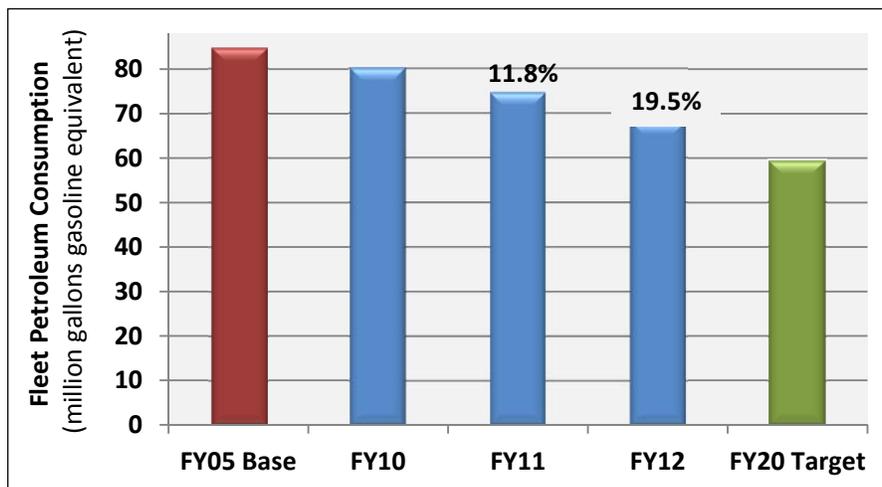


Figure ES-2. DoD Non-Tactical Vehicle Petroleum Use Progressively Declining

The Military Services and other DoD Components have identified a comprehensive suite of approaches they will use to reduce the environmental impacts of the Department's vehicle fleets. The most common among them are to:

- install more alternative fueling infrastructure and position alternative fuel vehicles where the fuel and fueling infrastructure are available, where practical;
- downsize vehicles, including replacing those vehicles that do not leave the base with low-speed neighborhood electric vehicles (EVs);
- downsize the vehicle fleet by eliminating all unjustified vehicles;
- make use of the replacement cycle for vehicles procured through the General Services Administration to replace higher mileage vehicles with those that emit fewer GHGs; and
- increase the number of EVs and electric hybrids that are full size and for heavy duty applications.

Water Use Efficiency and Management

Like energy, water is a limited natural resource that is vital to the DoD mission. In keeping with this reality, the Department has been ahead of the curve in driving down the potable water intensity of its facilities, with FY 2012 consumption 18.6% lower than the FY 2007 baseline. This performance easily surpasses the target of 10% in EO [13514](#) (Federal Leadership in Environmental, Energy, and Economic Performance), and has DoD poised to achieve the FY 2020 goal of a 26% reduction well ahead of schedule.

Water and energy are inexorably linked, and it is not uncommon for DoD to implement measures that improve the efficiencies of both. Perhaps the strongest connection between water and energy is in water treatment and distribution systems, since a significant amount of energy is required to treat water and then pump it to its destination. Every year, DoD installations repair leaking water pipes in their internal distribution systems, generating impressive savings in water and in the significant amount of energy embedded in that water. For example, the recent leak detection and repair program at Tobyhanna Army Depot in Pennsylvania reduced water consumption by 34%, saving an estimated 17 million gallons per year. The DLA Defense Supply Center in Richmond, VA, reduced water consumption by 42% by replacing (and recycling) leaking cast iron water mains.

Another valuable lesson DoD has learned in water resources management is to partner with local authorities to acquire untreated or reclaimed water for irrigation. Altus Air Force Base in Oklahoma partnered with the City of Altus to bring untreated water from a local reservoir to irrigate the base golf course. Not only is the installation saving \$48,000 a year, but the city is also benefiting; not having to treat the water delivered directly from the reservoir, the city is saving \$12,000 a year and 12 million gallons of water. Naval Air Station (NAS) Corpus Christi in Texas partnered with the City of Corpus Christi to build the infrastructure that delivers reclaimed water from the city's wastewater plant – treated but not potable – to the installation's golf course. The city paid for the infrastructure from the plant to the installation fence line, and the installation handled the remaining infrastructure. NAS Corpus Christi is saving an estimated \$384,000 every year as a result.

Moving forward, the Military Services continue conducting water assessments of all appropriate buildings on a four-year cycle (i.e., 25% of inventory per year). The Department of the Navy realizes significant efficiencies by following the Water Efficiency Best Management Practices of the Department of Energy Federal Energy Management Program, and will continue to employ them in the future. The Navy is also in the process of testing and evaluating a set of commercial smart

irrigation technologies. The Army is increasing its emphasis on water efficiency in its core operations, adding new water objectives to the FY 2013 Army Campaign Plan, and issuing a new [Water Goal Attainment Responsibility Policy for Installations](#) in December 2012. The Army will continue with its Net Zero Water Initiative, following up on the roadmaps it is developing for eight pilot installations. The Air Force plans to issue a Net Zero Strategy and Guidance in FY 2013 to focus installation efforts on reducing consumption of potable water to an amount no more than can be practicably captured and reused, repurposed, or aquifer-recharged.

Pollution Prevention and Waste Reduction

In the area of pollution prevention and waste reduction, the Department has six sub-goals: three to reduce solid waste (one pertaining specifically to printing paper), and three to reduce the use and release of chemicals – one on toxic chemicals and two addressing pest management practices. To reduce the use of paper, the Navy and five of the Defense Agencies have each issued a policy establishing a program to drive an agency-wide transition to a culture of reduced paper, and they are actively implementing those programs. On solid waste management, DoD diverted 49% of its non-hazardous solid waste away from landfill disposal in FY 2012, exceeding the 46% target for FY 2012 and falling just shy of the 50% target for FY 2015. DoD diversion of construction and demolition (C&D) debris reached 74% in FY 2012, well in excess of the 60% target. Of DoD personnel and contractors who apply pesticides, 99% are properly certified, and 97% of all DoD installations have integrated pest management plans prepared, reviewed, and updated annually by pest management professionals. The Department did not decrease the amount of toxic chemicals it released into the environment or transferred off-site for disposal and treatment, with calendar year 2011 chemicals 6.6% higher than the 2006 baseline. DoD chemical releases have been falling in recent years, but there can be year-to-year variability depending on the needs of direct mission support, and due to events such as accidental releases and increased loads on wastewater treatment plants when forces return from overseas.

A lesson demonstrated repeatedly across DoD is that recycling and reusing solid waste is a less costly waste management approach than disposal. DLA Land and

Maritime in Columbus, OH, found that landfilling C&D debris cost about 60% more than turning in the materials to a C&D processing facility, even if the materials are not separated. Separating the materials first reduces the handling costs even more. Marine Corps Logistics Base Albany in Georgia added a recycling statement of work to all maintenance and construction contracts, giving the base exclusive recycling rights to C&D debris. The change generated over \$502,000 for the base in FY 2012, and \$300,000 in FY 2011. Joint Base Elmendorf Richardson in Alaska was able to launch a paper and cardboard recycling program using the proceeds from recycling expended small arms

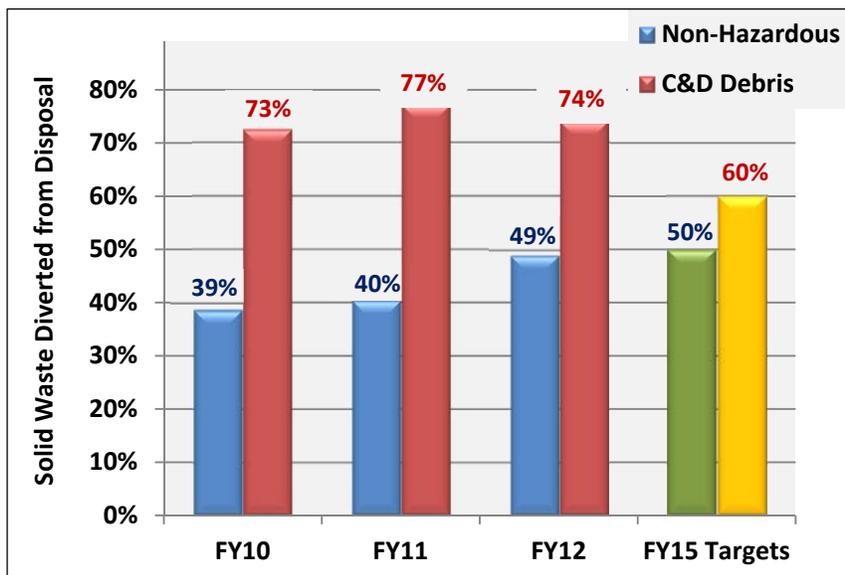


Figure ES-3. DoD Progress Diverting Solid Waste from Disposal (non-hazardous and construction & demolition debris)

cartridge casings. The program recycled 208,000 pounds of paper and cardboard in FY 2012. Grissom Air Reserve Base in Indiana recently converted 49,420 tons of asphalt millings and concrete from the installation's airfield projects into materials used as backfill to cover airfield drainage ditches.

The Department is constantly searching for ways to replace harmful chemicals with more benign alternatives. The impetus for this goes beyond environmental and health concerns, given the high cost and sometimes limited availability of specialty chemicals, as well as the costs for their safe treatment and disposal. A case in point is the Army's replacement of the extremely potent GHG sulfur hexafluoride (SF₆) with a helium-based system for detecting leaks in helicopter blades. The switch helps mitigate global warming, but the savings to the Army are significant as well, since the cost of SF₆ is substantially higher than the cost of helium. Another recent development is the successful demonstration by the Army of a system for converting used motor oil into a fuel that is mixed with diesel or jet fuel. The system saves in two ways: by lowering cost expenditures for new fuel, and reducing the amount and therefore the cost of disposing of used oil. Apart from research and development, some progress made by the Department in reducing chemicals comes simply from improved administration and training. Navy installations in the Hampton Roads area of Virginia cut the amount of toxic chemicals they issued between 2006 and 2012 in half, by changing the procedure for processing requests, increasing audits and inspections, and training personnel.

Each of the Military Services is planning to make enterprise-wide improvements to solid waste policy and guidance in FY 2013. The Air Force expects to issue a Net Zero Strategy and Guidance document by the end of FY 2013 addressing waste reduction and diversion. The Army is planning to develop updated solid waste management guidance in FY 2013 to improve its solid waste diversion performance, and it will integrate several new solid waste diversion goals into the planned FY 2103 update to its sustainable design and development policy. The Navy is incorporating revised solid waste management policy into the updated *Environmental Readiness Program Manual* (Chief of Naval Operations Instruction 5090.1D), scheduled for release in FY 2013, and it plans to revise its Qualified Recycling Program guide. In FY 2013, the Marine Corps plans to identify areas where new or updated policy and guidance can help improve diversion from disposal.

Sustainable Procurement

In FY 2012, DoD manually reviewed 1,995 contract actions having a value greater than \$3,000, and found 95% to be in compliance. In its quest to further improve the extent to which procurement is conducted sustainably, the Department is developing a Sustainable Procurement DoD Instruction to establish policy, assign responsibility, and provide direction for sustainable procurement across the DoD. In addition, the Department is executing regional sustainable product pilot programs at military installations across the United States. The pilot programs engage Military installations from all Services to identify specific procurement requirements, understand their level of knowledge of sustainable procurement policy and programs, and demonstrate the performance of sustainable products in the operational environment. The concept of the pilot programs is to more rapidly gain acceptance of sustainable products, share lessons learned across the Services, and target areas where sustainable products will support the DoD mission. Finally, the Department is launching the DoD Sustainable Products Center in 2013 to act as an independent center for the integration of sustainable products. The Center will provide the Military Departments, DLA, and other DoD Components with a single focal point for sustainable products, a repository of performance information, and access to demonstrations conducted at DoD installations of alternative green products and services.

At the level of the Military Services, each has plans for improving sustainable procurement in FY

2013. The Navy will update its training and awareness catalog, [Buy It Green 2012: How to Buy Green for a Sustainable Navy](#), for release in late FY 2013 or early FY 2014. The Army is developing Quick Guides to improve purchasing practices for common installation activities, such as food service, grounds maintenance, and vehicle maintenance. The Marine Corps will analyze the results of a survey conducted in 2012 to determine the level of understanding by installation staff of sustainable procurement, and use the analysis to improve outreach to installations. The Air Force plans to collaborate with DLA and the General Services Administration on ways to make environmentally preferable products more visible and accessible in their procurement tools.

Electronic Stewardship and Data Centers

Of all covered electronics acquisitions in FY 2012, 99% of them were registered with the Electronic Product Environmental Assessment Tool. For those DoD Components that tracked the data in FY 2012, 53% of all eligible computers and monitors had power management actively implemented and in use. The Department handles the disposition of all of its excess or surplus electronic products in an environmentally sound manner. The vast majority of DoD electronics equipment at the end of its useful life passes through DLA's Disposition Services, which has long had a rigorous system in place to ensure the environmentally sound disposition of electronics.

Renewable Energy

One of the Department's main paths to ensure resiliency and mission assurance is through renewable energy. Of the total amount of electricity consumed by DoD facilities in FY 2012, 4.0% was supplied by electric forms of renewable energy. When non-electric forms are counted as well, the portion of renewable energy produced or procured by the Department rises to 9.6%. DoD uses the latter definition in tracking its progress on renewable energy, because by FY 2025 DoD is required by [Title 10, United States Code §2911\(e\)\(2\)](#) to have one-quarter of its energy supplied by renewable energy – of all types – measured as a percentage of electricity consumed by DoD facilities. The Department's steady rise in reportable renewable energy has slowed recently due to a DoD decision to place less emphasis on *procuring* renewable energy and more on *installing* renewable energy capacity on DoD installations. Increasing on-site renewable energy is a mission assurance strategy, to make installation missions more resilient to the vulnerabilities of the commercial electric grid.

The Department is increasingly financing its large-scale renewable energy projects through power purchase agreements with the private sector. An example is 3.0 megawatts (MW) of solar energy completed on Edwards Air Force Base, CA, in April 2012. A developer designed and built the system and will own it over a ten-year period, during which time the base buys the power from the developer at a fixed long-term rate. The Services are also using performance-based contracts to finance renewable energy. In December 2012, construction was completed on a 4.1 MW solar system at White Sands Missile Range, NM, installed under a \$16.8 million performance contract. The energy service provider will maintain and operate the system, and sell the electricity to the base at the same rate it was paying the local utility company at the time the contract was signed. Moving forward, the Services will continue using alternative financing to



Photo: U.S. Navy

accelerate the large-scale development of renewable energy on their lands. Each of the three Military Departments set a goal to install one gigawatt of renewable energy on their installations: the Air Force by 2016, the Navy by 2020, and the Army by 2025.

Progress on Administration Priorities

Performance-based contracting is an essential element of the Department's strategy for achieving the first Objective of its SSPP: to ensure the availability of resources critical to the DoD mission. The Department's commitment to this strategy is reflected in the growing value of contracts awarded or planned to be awarded in FY 2012, FY 2013, and FY 2014: \$343 million were awarded in FY 2012, \$363 million were either already awarded or are in the pipeline for FY 2013, and FY 2014 already has projects worth \$581 million in the pipeline. Regarding fleets, the management plans for non-tactical vehicle fleets are handled at the DoD Component level, with the Military Services, DLA, and other DoD Components each preparing their own Fleet Management Plan.

To promote biobased purchasing, DoD is in the process of conducting a review of specifications for biobased applicability. As of May 2013, the Department reviewed 2,115 military and federal specifications, standards, handbooks, and commercial item descriptions, identifying documents that have potential for biobased applicability. By the end of the calendar year 2013, the Department will have reviewed 20% of all DoD specifications for biobased applicability. Additionally, the Department identified specifications that directly relate to the U.S. Department of Agriculture Biobased Product Categories by round. To date, DoD has identified 94 military specifications and 10 commercial item descriptions associated with the 20 U.S. Department of Agriculture product categories, as delineated in product category rounds 1 through 7. The Department has compared commercially-available technical data on biobased products against military specification requirements to promote the use of biobased products. DoD has demonstrated success and commitment in revising standardization documents to promote biobased products. Last year, for example, DoD conducted a biobased penetrating lubricant demonstration that resulted in Revision C of the Commercial Item Description A-A-50493 Oil, Penetrating (for Loosening Frozen Metallic Parts).

Maintaining readiness in the face of climate change is one of four key priority areas for the Department. Including climate change considerations in DoD planning processes will enhance operational and infrastructure resilience. The Department submitted the 2012 Climate Change Adaptation Roadmap as an appendix to the 2012 SSPP. Although an updated Roadmap is not required for FY 2013, DoD has provided the 2012 Roadmap and a 2013 Addendum to it as appendices.

Another indication of the Department's commitment to Administration priorities is the fact that DoD has eight specific sub-goals addressing the five following elements of EO 13514 that are not captured by the set of metrics required for reporting to the White House Council on Environmental Quality and the Office of Management and Budget:

- 1) teleworking and lower-carbon business travel by DoD employees (sub-goals 3.3 and 3.4);
- 2) reductions in toxic and hazardous chemicals and materials (sub-goals 6.1, 6.2 and 6.3);
- 3) continued implementation of formal environmental management systems (sub-goal 7.4);
- 4) reduced use of printing paper (sub-goal 5.1); and
- 5) stormwater management (sub-goal 2.3).

Part I: DoD Sustainability Policy and Governance

I.1 Sustainability and the DoD Mission

The Department of Defense's (DoD's) vision of sustainability is to maintain the ability to operate into the future without decline – either in the mission or in the natural and man-made systems that support it. The Department embraces sustainability as a critical enabler in the performance of the mission, recognizing that it must plan for and act in a sustainable manner now in order to build an enduring future. Sustainability is not an individual Departmental program; rather, it is an

“Sustainability’ and ‘sustainable’ mean to create and maintain conditions, under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic, and other requirements of present and future generations of Americans.

– Executive Orders 13423 and 13514

organizing paradigm that applies to all DoD mission and program areas. Applying a systematic framework for improving sustainability involves a wide range of practices that span much of the Department's day-to-day activities and military operations, and DoD personnel are learning to apply this mindset to improve mission performance and reduce life cycle costs. The Department recognizes that it can address many

key issues facing DoD through smart investments that improve sustainability as well as promote the mission, such as using energy and water more efficiently, acquiring more energy from renewable sources, designing buildings for high performance, reducing the use of toxic and hazardous chemicals, and optimally managing solid waste.

The DoD Strategic Sustainability Performance Plan (SSPP) provides a coherent approach both for complying with multiple federal requirements for sustainability and for ensuring the mission is accomplished. The SSPP goals do not directly address combat and support operations, such as contingency basing, ships, aircraft, and tactical vehicles. However, this section of the SSPP will repeatedly touch upon the Department's operational activities because the linkages between sustainability and the DoD mission are strong and direct across the board, including for combat operations. For this reason, the Department is working to improve the sustainability of contingency basing as a means of enhancing force effectiveness and mission outcomes. This involves applying the principles of sustainability in policy, doctrine, organizations, training, materiel, leadership, personnel, and facilities. The expected results are improvements in: planning; the efficiency, effectiveness, and interoperability of equipment; and the management and oversight of contingency basing. Improved contingency base sustainability will also enhance mission support by reducing resource consumption and the vulnerability of fuel and water supplies, preserving the health of warfighters, and improving environmental and safety performance. Lastly, to the extent DoD can share sustainable practices with partner nations, international resilience in the face of climate change is being built. This resilience can contribute to the Department's goal of conflict prevention as outlined in the [2010 Quadrennial Defense Review](#).

This section of the SSPP discusses the link between sustainability and the DoD mission in terms of four key priority areas for the Department:

- 1) Energy and Reliance on Energy
- 2) Chemicals of Environmental Concern
- 3) Water Resources Management
- 4) Maintaining Readiness in the Face of Climate Change

I.1.A Energy and Reliance on Energy

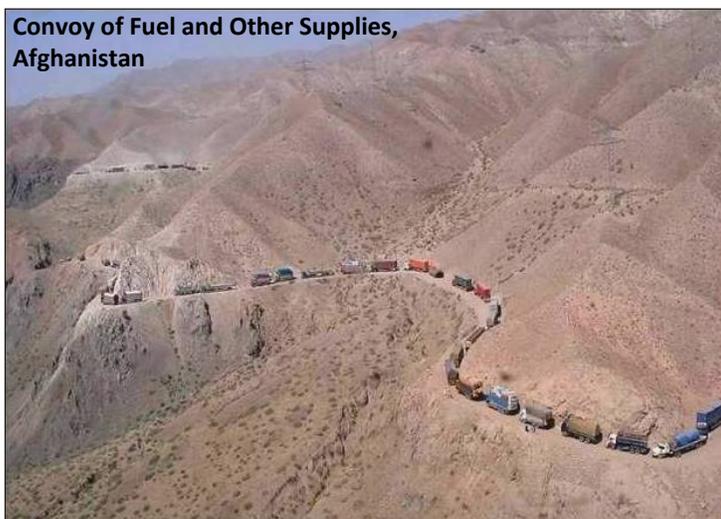
The Department's requirements for energy pose four broad security challenges. First is the growing operational risk to forces deployed around the globe. Attacks on fuel convoys and fixed energy supplies in Afghanistan and surrounding countries already demonstrate the vulnerability of our current supply networks, and future adversaries likely will possess additional capabilities to target global logistics and fuel infrastructure with even greater lethality. A second challenge is the security of petroleum distribution networks. Most petroleum products move by sea, and much of this trade passes through vulnerable chokepoints such as the Strait of Hormuz. Piracy, political instability, and military action can threaten the free flow of energy resources through these vital channels. Additionally, the operational and logistical benefits of purchasing energy closest to the point of use means that the Department is subject to physical attack, political unrest, and mismanagement associated with overseas refineries. A third challenge is the price volatility of a fungible, globally traded commodity such as petroleum. Regardless of the changing domestic energy context here in the U.S., political instability around the globe and fluctuating supply and demand can create significant price volatility, raising DoD's costs and complicating budget and acquisition decisions.

Use of Energy in Facilities

Relating specifically to the fixed installations under the purview of this SSPP, a final energy challenge is the vulnerability of the electric grid. DoD's reliance on the commercial grid to deliver electricity to hundreds of major installations places the continuity of critical missions at risk. In general, installations lack the ability to manage their supply of electrical power, making them potentially vulnerable to intermittent or prolonged power disruption caused

by natural disasters, attacks, or sheer overload of the grid. With the increasing reliance of U.S. combat forces on "reach back" support from installations in the United States, power failures at those installations could adversely affect power projection and homeland defense capability. This means that an energy threat to bases in the United States can be a threat to operations abroad. The Department is committed to renewable energy not only because it is dedicated to showing leadership in sustainability, but because on-site renewable energy and storage improves resilience and thus mission readiness. Military installations are generally well situated to support solar, wind, geothermal, and other forms of renewable energy, as long as the type of energy facility, its siting, and its physical and operational characteristics are carefully evaluated to avoid any impacts to the mission or readiness.

The Department continues to pursue an investment strategy designed to reduce energy demand in fixed installations, while increasing the supply of renewable energy sources. Efforts to curb demand for energy – through conservation and improved energy efficiency – are by far the most cost-effective ways to improve an installation's energy profile. A large fraction of DoD energy efficiency investments goes to retrofit existing buildings. Typical retrofit projects install high efficiency heating, ventilation and cooling systems, energy management control systems, and more efficient lighting.



Convoy of Fuel and Other Supplies,
Afghanistan

Photo: U.S. Army

The Department is taking advantage of the fact that DoD's fixed installations offer an ideal test bed for next-generation energy technologies developed by industry, the Department of Energy (DOE), and university laboratories, filling the gap between research and broad commercial deployment. Emerging energy technologies hold the promise for dramatic improvements in energy performance but face major impediments to commercialization and deployment. DoD's built infrastructure and lands encompass a diversity of building types and climates in the United States, affording an exceptional opportunity to assess the technical validity, operating costs, and environmental impact of advanced, pre-commercial technologies. As both a real and a virtual test bed, our facilities can serve as a sophisticated first user, evaluating the technical validity, cost, and environmental impact of advanced, pre-commercial technologies. The Department is applying the energy test bed concept to improve the energy efficiency of buildings, improve renewable energy technologies on or in proximity to installations, and develop smart microgrids. DoD can help create a market for those technologies that prove effective and reliable by serving as an early adopter, as it did with jet engines, computers, and the internet. The test bed approach is key to meeting the Department's needs, allowing DoD to leverage technology advances from the private sector while benefiting from the lower costs that occur once the private sector commercializes the technologies. In addition, the test bed is an essential element of the national strategy to develop and deploy the next generation of energy technologies needed to support the nation's infrastructure.

Use of Energy in Operations

Title 10 Section 138 defines "operational energy" as the energy required for training, moving, and sustaining military forces and weapons platforms for military operations. In other words, operational energy includes the liquid fuel consumed by aircraft, ships, tactical vehicles, and contingency bases. Given the risks and opportunities associated with the use of energy, the Department is pursuing a range of initiatives to institutionalize operational energy across the Defense Components, support current operations, and build energy into the future force.

"Our [energy] posture is imposing costs at all levels, strategic, operational, tactical and financial."

—*Sharon Burke, Assistant Secretary of Defense for Operational Energy Plans and Programs*

Building on the Operational Energy Strategy released in 2011, the Secretary of Defense released the supporting DoD Operational Energy Strategy Implementation Plan in March 2012. In particular, the Implementation Plan identified specific targets for action by the Defense Components as well as establishing the Defense Operational Energy Board as a mechanism for reviewing, synchronizing, and supporting operational energy initiatives. The Department also released the first comprehensive policy for alternative fuels in July 2012. Developed with the Services and relevant defense agencies, the policy states that the Department's primary alternative fuels goal is to ensure operational military readiness, improve battlespace effectiveness, and increase flexibility in military operations. Finally, the Department released the FY 2013 Operational Energy Budget Certification Report in August 2012, which certified that the Military Department's budgets support the DoD Operational Energy Strategy and the Implementation Plan.

In support of current operations, the Department pursued a broad array of materiel and non-materiel initiatives to improve operational capabilities and reduce the fuel sustainment burden on deployed forces. For example, successful initiatives in the past year have included an array of programs associated with more energy efficient shelters, improved power generation, base camp experimentation, and electrical microgrids. The Department also worked with the Combatant Commands to include operational energy in operational planning and organization. For example,

U.S. Pacific Command held its Operational Energy Summit in March 2012, where the Command's senior leaders agreed to a plan for implementing the DoD Operational Energy Strategy.

In addition to promoting institutional change and supporting current operations, the Department continued to integrate operational energy into future force development. In January 2012, DoD announced the release of \$18 million through the Operational Energy Capability Improvement Fund to fund programs that reduce the energy demand of future contingency bases. The Department also is pursuing projects initiated from the July 2010 Memorandum of Understanding with DOE, including modular hybrid energy storage, battery storage and lightweight materials for vehicles, the demonstration of an energy storage system to reduce generator fuel consumption, and the use of energy advisers at five geographic Combatant Command Headquarters.

To implement a long-term operational energy strategy, the Department continued efforts to enhance the requirements and acquisition processes. In particular, the DoD Operational Energy Plans and Programs (OEPP) teamed with Joint Staff Logistics (J4), the lead for overseeing the implementation of the Energy Key Performance Parameter under the Joint Capabilities Integration and Development System. J4 and OEPP collaborated to assess compliance with the guidance, and evaluate Service analyses of the energy supportability of new operational capabilities. In August 2012, OEPP also released a memorandum titled "Notification of Updated Guidance for the Calculation of Fully Burdened Cost of Energy in Analysis of Alternatives and Acquisition Programs." Released to the Service Acquisition Executives, in partnership with the OSD Cost Assessment and Program Evaluation office, this memorandum updated the methodology for calculating the fully burdened cost of energy to help inform cost, schedule, and performance trade decisions in alternatives and acquisition programs.



Together, these efforts to reduce demand and expand supply will enhance combat effectiveness and reduce risk and cost. While a contributor to the Department's sustainability effort, operational energy is necessarily exempt from the targets of this Plan and Executive Order (EO) [13514](#).

I.1.B Chemicals of Environmental Concern

Chemicals are essential to DoD operations, but the Department faces long-term risks from the use of hazardous and toxic chemicals and materials. Use of these chemicals and materials of environmental concern can result in compliance and cleanup costs, generate health claims, and increase the life cycle costs of weapon systems and facilities. The Department must protect people and readiness by reducing the use of such high-risk chemicals and hazards, both known and emerging. New restrictive laws and regulatory standards have implications for DoD's readiness, including training and supply chain effects. These restrictions can affect the availability of chemicals, which can impact the performance, cost, and schedule of acquiring new weapon systems and maintaining existing ones. Proper management of hazardous and toxic chemicals and materials protects the workers who handle them, as well as the range assets (land, air, and water) needed for training, and the ecosystems under DoD's care, ensuring continued military access. Reducing the release of chemicals of environmental concern can also remove reporting burdens and lessen DoD

costs associated with the use of these chemicals. The regulatory environment surrounding chemicals of environmental concern is highly complex and represents a significant resource burden on the Department in terms of labor and management of time, as well as direct costs. Through the use of safer and greener chemicals, even if they have a higher purchase price than the chemicals they replace, the Department can realize savings in avoided compliance and other costs, and protect itself from the risk that restricted chemicals will become difficult and expensive to acquire, if not unavailable altogether.

Figure 1 reflects the premise of the Department’s chemical management strategy. The Department’s [Toxic and Hazardous Chemicals Reduction Plan](#), released in 2008, describes DoD programs, initiatives, and actions necessary to reduce the procurement, use, release, and disposal of chemicals of environmental concern. The Department is moving toward a life cycle approach that considers the selection, management, use, and disposal of chemicals of environmental concern in all of its operations. Acquisition reform efforts include evaluating environmental, safety, and occupational health considerations earlier in the design phase, including chemical and material selections. Sustainment Plans, which address how a weapon system is maintained to ensure readiness, will also include life cycle risk assessments. For example, the Department must take into account future regulatory restrictions, because they can affect the availability of materials and the costs of maintaining weapon systems.

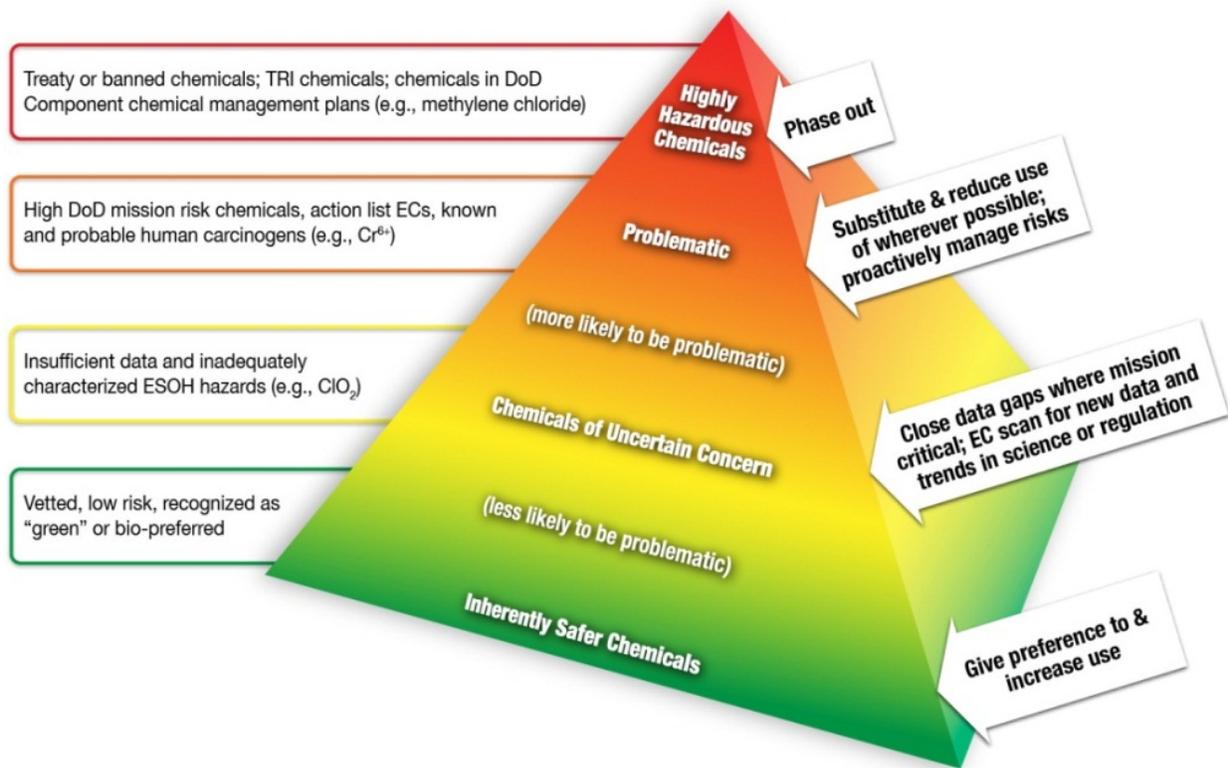


Figure 1. DoD Chemical Risk Management Strategy
(ECs are emerging contaminants)

The Department has an extensive array of protections against the risks posed by chemicals of environmental concern. One successful approach the Department employs to manage hazardous

materials is the [Consolidated Hazardous Material Reutilization and Inventory Management Program](#), also known as the Hazardous Material Pharmacy. The concept is based on a single point of control and accountability over requisitioning, distributing, and issuing hazardous materials, where the amount of material dispensed for a given purpose is specifically matched to the required quantity, drastically reducing hazardous waste. Another important approach is the use of Environmental Management Systems (EMSs). The EMS described in the DoD Toxic and Hazardous Chemicals Reduction Plan enables the Department to align and coordinate relevant programs for the purpose of reducing the procurement, use, and release or disposal of toxic and hazardous chemicals, at all organizational levels and across different functions. DoD also integrates an EMS-based hazardous material business process into key activities at military installations.

The enterprise-wide management of the selection, acquisition, distribution, use, and disposal of chemicals better prepares DoD for potential future regulatory initiatives. This life cycle approach of anticipating developments at the international, national, and state levels informs the chemical usage decisions made by DoD today and promotes military readiness for tomorrow. DoD's emerging contaminant program exists to minimize operational disruptions through proactive risk management of chemicals expected to be regulated more strictly in the near future. The program has scanned about 600 chemicals so far, and developed 56 risk management measures that have been or are being implemented by various programs across the Department.



While many of the proactive risk management measures focus on toxic chemicals, DoD is also managing substances that might not be toxic but impact global warming with a potency hundreds to many thousands times as much as carbon dioxide (CO₂). For example, sulfur hexafluoride (SF₆) is critical as a dielectric material used in DoD weapon systems and components, including the Airborne Warning and Control System radar, the MK-92 fire control system, and transducers in torpedoes, submarines, and submarine sonar systems. While it is non-toxic, it is an extremely potent greenhouse gas, remaining in the atmosphere for 3,200 years and

having 23,000 times the warming potential of CO₂ over a 100-year period. The State of California regulates SF₆ as part of its GHG emission reduction effort under California Assembly Bill 32 (AB 32), the Global Warming Solutions Act. DoD anticipates that SF₆ emissions will be regulated more in the future, which could threaten its availability over the long-term and will certainly increase its cost. In response, the Department issued a policy in October 2010, directing the Military Departments to develop and implement procedures to reduce, capture, and recycle SF₆ where operationally, technically, and economically feasible. DoD has been researching ways to reduce SF₆ leakage and searching for alternatives to replace it.

Some hydrofluorocarbons (HFCs) also have high global warming potentials (GWPs). The Department has dedicated significant effort to deploying alternatives to substances that deplete earth's protective stratospheric ozone layer, but for many applications the only alternatives identified so far are HFCs. While some HFCs have less impact on atmospheric warming than the ozone-depleting substances they replaced, the international community is concerned about their relatively high GWP and expanded use. Therefore, Canada, Mexico, the United States, and the

Federated States of Micronesia have made proposals via an amendment to the [Montreal Protocol on Substances That Deplete the Ozone Layer](#) to use a stepped phase-down of production and consumption of HFC to 15% of the baseline in 20 years. DoD has evaluated and favors this particular proposed phase-down approach. DoD uses HFCs for mission-critical applications in shipboard, aircraft, and ground tactical vehicle air conditioning, refrigeration, fire suppression, and explosion protection systems. For the majority of these applications, there are no known substitutes that meet DoD's unique performance and safety requirements. The commercial sector is working to develop low-GWP alternatives to HFCs, but in the meantime DoD continues to design and build weapon systems – which often have operational lifetimes of 30 to 50 years – using HFCs, and it is essential that HFCs continue to be available at a reasonable cost. Therefore, the Department continues to conduct research on low-GWP alternatives to HFCs, and coordinates with the Environmental Protection Agency and Department of State on issues of substitution and availability.

Finally, to ensure the availability of chemicals needed for the DoD mission, the Department is promoting the use of more benign chemicals. This will protect the Department from mission risks associated with the removal of substances from the market, or significant increases in their cost. DoD supports research and development on an ongoing basis, searching for safer and more environmentally-friendly products and processes that reduce the use and release of toxic and hazardous substances. The Department looks in particular for alternatives that deliver mission benefits in addition to environmental benefits, since mission benefits help drive the adoption of new products. Another essential approach for increasing the Department's use of safer chemicals and products is DoD's Green Procurement Program. To support its successful implementation, DoD developed a program framework that supports the testing and evaluation of environmentally preferable products, and provides green procurement metrics, a venue for sharing information and best practices, and green procurement education and training.

I.1.C Water Resources Management

Fresh water is a limited and mission critical resource essential for military operations, drinking, hygiene, sanitation, food preparation, and medical care. During military operations, water poses the same challenges as liquid fuel, requiring the protection of large, vulnerable convoys as it is transported to the troops. Also, the treatment and disposal of wastewater is a human health and environmental issue for soldiers and the civilian populations being protected during military operations. To address the issues of water and wastewater in contingency basing, the Services and the DoD Strategic Environmental Research and Development Program are supporting research and development of technologies suitable for contingency bases that can reclaim potable and non-potable water from graywater and blackwater. Reclaiming contingency base wastewater will greatly reduce the amount of water that needs to be delivered to troops, while reducing the volume of wastewater requiring treatment and disposal.

At fixed installations, water is also a mission imperative. Water scarcity has led a number of DoD installations in the United States to implement aggressive water conservation and reuse measures. So far, most of these installations have been located in arid portions of the West, but having assured supplies of water is becoming an issue in other parts of the country as well. DoD also faces potential water risks in its supply chain, should there be insufficient water for suppliers to produce the goods and services sold to DoD. Water supply and distribution, water use, wastewater treatment, and stormwater management are interrelated and influence energy and sustainability. For example, the extraction, treatment, and delivery of water to end users is a highly energy-intensive process. Measures that use and distribute potable water more efficiently and with less leakage also result in significant reductions in energy consumption and therefore emissions of CO₂. A low impact

development approach to stormwater management reduces runoff from impervious surfaces at facilities, which reduces the flow of pollutants into water bodies and reduces the volume of stormwater entering the wastewater treatment system. Reducing the volume of stormwater helps prevent system overload problems such as combined sewer overflows, while also reducing the consumption of energy required to operate the wastewater treatment system.

I.1.D Maintaining Readiness in the Face of Climate Change

The 2010 Quadrennial Defense Review highlighted the importance of managing the effects of climate change, citing energy security and climate change as significant challenges requiring a change in how the Department operates. Climate change is predicted to affect the Department in many ways, including direct effects on installations and less direct impacts such as the destabilization of regions of the world already prone to conflict. Climate change can directly impact military installations and operations by limiting the availability and quality of ranges and other lands needed for operations, and increasing flood and fire hazards and energy grid vulnerability.

Some of the Department's low-lying coastal installations are threatened by coastal erosion and inundation due to sea level rise, which can damage or destroy infrastructure, reduce availability of land for operational needs, and impact water supply due to seawater intrusion. Scientists project that climate change will bring an increased frequency of heavy precipitation events, raising the threat of flooding. The more frequent and extreme heat projected to occur with climate change may limit outdoor training, strain personnel efficiency, and strain electricity supply due to the increased demand on the grid for cooling. Human health could also be impacted due to the connection between heat and air quality: heat accelerates the photochemical process that forms ground-level ozone from vehicle exhaust, which is why the most dangerous levels of ozone in urban areas occur during summer. Ozone, one of the primary components of smog, irritates and inflames the lining of the respiratory system. Ozone formation and its attendant health problems will likely worsen with the warmer temperatures projected to result from climate change.

Climate Change and DoD

"Climate change will shape the operating environment, roles, and missions that we undertake. The Department must complete a comprehensive assessment of all installations to assess the potential impacts of climate change on its missions and adapt as required."

— *DoD Quadrennial Defense Review, 2010*

In many areas, warmer temperatures will reduce the amount of snow pack in the mountains, and it is common in the United States and elsewhere for areas to rely on mountain snowmelt for a significant amount of their water supply. Scientists project that higher temperatures will increase the risk of wildfire by reducing moisture in soil and plant material and, in some areas, by lengthening the fire season. Because a variety of

military range activities can start fires, an increased risk of uncontrolled wildfires can have direct mission consequences. Scientists also expect the changing temperature and precipitation regimes accompanying climate change to cause shifts in the composition or geographic range of some species.

Among the species shifts anticipated are movement of wildlife to more favorable habitats, expansion of vector-borne diseases into the United States, and expansion of invasive grasses and shrubs. Invasive plants contribute fuel load for wildfires, which in turn increases the likelihood, range, and intensity of wildfires. Threats to federally-protected species may increase and additional species may become endangered, adding to the obligation of species protection for some installations. Thawing permafrost and a reduction in the sea ice that protects the coast from erosion by storms will impact DoD installations in the Arctic.

These impacts can directly interfere with an installation's ability to carry out its mission. For example, training can be limited through the occurrence of more red and black flag days (high heat and humidity conditions); by the loss of land to either sea level rise or the need to set aside more land for endangered species; and by more frequent restrictions on live-fire training where heat and reduced rain increase the fire hazard. Another reason for DoD to prepare for a changing climate is that strategies to make the Department more resilient to climate change can also improve sustainability. For example, by increasing the generation and use of renewable energy, and institutionalizing energy and water efficiency into all DoD operations, the Department can decrease its vulnerability to fluctuations and shortages of these resources.

I.2 Plan Implementation

I.2.A Leadership and Accountability

The Department designated the Under Secretary of Defense for Acquisition, Technology and Logistics as DoD's Senior Sustainability Officer (SSO) responsible for ensuring the effective and successful implementation of the SSPP across the Department. Reporting directly to the SSO is the Senior Sustainability Council (SSC), led by the Deputy Under Secretary of Defense for Installations and Environment and the Assistant Secretary of Defense for Operational Energy Plans and Programs. The current SSC membership is shown in Table 1. As stipulated in its charter, the four key tasks of the SSC are to:

- 1) integrate sustainability into policies, plans, budgets, and decisions;
- 2) make recommendations on processes and procedures to implement the requirements of EO 13514 and other federal sustainability requirements;
- 3) continuously improve the Department's approach to the SSPP; and
- 4) review the adequacy of policies, resources, and performance in meeting goals, and make recommendations on changes required.

The SSC is responsible for ensuring integration of the SSPP into the Department's enterprise management structure, an ongoing way of conducting business DoD-wide that DoD continually maintains, evaluates, and refines for optimal performance in all aspects of the DoD mission, including sustainability. The SSC is working to ensure that sustainability is reflected in relevant policies, program plans, guidance, and budget development within the Department.

Each Military Department and the Defense Logistics Agency (DLA) has designated a sustainability officer to ensure accountability for the SSPP's implementation, and annually each develops a plan for how they will implement the DoD SSPP. Additionally, the leadership of the SSO, SSC, Sustainability Implementation Work Group, and a set of relevant committees and work groups help execute the goals of the SSPP. The committees and work groups cover a wide range of sustainability topics, including: GHGs, energy, transportation and fuels, solid waste and recycling, green procurement, electronic stewardship, and sustainable manufacturing.

The Sustainability Implementation Work Group reports to the SSC and is charged with drafting input to the SSPP and facilitating compliance and continual improvement in meeting the SSPP goals. The Department is using its existing structure of committees and work groups to address specific issues and engage subject matter experts where appropriate.

Table 1. Senior Sustainability Council Membership

Deputy Under Secretary of Defense (Installations and Environment) - Co-Chair
Assistant Secretary of Defense, Operational Energy Plans and Programs - Co-Chair
Under Secretary of Defense (Comptroller)
Under Secretary of Defense for Policy
Under Secretary of Defense for Personnel and Readiness
Assistant Secretary of the Army (Installations, Energy and Environment)
Assistant Secretary of the Navy (Energy, Installations and Environment)
Assistant Secretary of the Air Force (Installations, Environment and Logistics)
Deputy Department of Defense Chief Information Officer
Assistant Secretary of Defense for Research and Engineering
Director, Defense Procurement and Acquisition Policy
Assistant Secretary of Defense (Logistics and Materiel Readiness)
Director, Cost Assessment and Program Evaluation
Deputy Assistant Secretary of Defense for Manufacturing and Industrial Base Policy
Director for Logistics, Joint Staff
Director, Defense Logistics Agency Installation Support
Deputy General Counsel (Environment and Installations)
Assistant Secretary of the Army (Civil Works)

The Office of the Secretary of Defense employs a number of mechanisms to ensure that sustainability factors are adequately addressed. Departmental planning and programming guidance lays out requirements that DoD Components must use to build their budgets; environmental and sustainability requirements are a part of this guidance. Another key feature of DoD’s planning and budgeting process is the Future Year Defense Plan, which provides a six-year resource plan for achieving Department objectives, with major updates occurring every two years and the planning horizon rolling forward during each update cycle.

The SSC conducts annual Performance Management Reviews, and DoD Components are required to submit annual progress reports to OSD. The progress reports and Performance Management Reviews afford the Department the opportunity to alter strategies to better meet sustainability goals. Also, the EMSs used by the Military Service installations and DLA facilities provide a valuable framework to guide sustainability improvements and monitor and evaluate performance. The SSPP has a built-in performance monitoring system in the form of the 21 quantitative metrics for each of the sub-goals.

I.2.B Incorporating Sustainability into Facility Investment Decisions

The design of facilities, and the evaluation and prioritization of activities, should consider environmental and societal factors in addition to mission, financial, and regulatory considerations. For example, the mission benefits of having an off-grid source of electricity can outweigh the higher cost of renewable energy. The creation of walkable retail destinations on bases reduces automobile usage, saves military families money, and improves health. Sustainability is also closely tied to the well-being of personnel, DoD's most important asset. The ability to recruit, retain, train, educate, and equip the All-Volunteer Force, and to sustain its readiness and morale, is fundamental to the mission. Adopting greener chemicals and materials limits potential exposure and can avoid the need to use hot, uncomfortable hazardous material suits, expediting operations and maintenance activities. In areas where air quality is a concern, an Installation Commander might prioritize investment and design decisions that lower vehicle emissions and reduce the heat island effect on the installation (e.g., by planting shade trees). Therefore, investment decisions should consider all



the costs and benefits of incorporating sustainability. A cost-benefit analysis, including both monetary and non-monetary costs and benefits, should be performed on proposed projects so decision-makers can best evaluate their anticipated effectiveness.

The sustainability principles promulgated in the SSPP are the policy of the Department, and should be incorporated into all DoD decisions pertaining to design, investments, and prioritization of activities. The Department recognizes the

importance – and the challenge – of ensuring that sustainability is incorporated into decision-making across the organization. Individual Commands and installations – not a central DoD office – make many of the decisions on budgeting and executing DoD projects. In practice, decisions made at the facility level do not always take into consideration the larger objectives of the Department as a whole, including its sustainability objectives. The challenge of incorporating sustainability into investment decisions is exacerbated by the fact that many sustainability considerations are difficult to quantify, whether at the installation or Major Command level. The Department needs to find more ways to help Installation Commanders and other decision-makers form an objective basis for making decisions on projects in a way that advances DoD's sustainability objectives, beyond simple, traditional return on investment calculations. Beyond the project level, the Department has a bigger picture view of promoting sustainability: investing in new and emerging technologies. These investments represent a risk at the individual project level, but when viewed across the entire Department they can significantly increase the return on investment.

DoD owns over 200,000 buildings, a real property inventory that generates a significant maintenance and repair requirement. Recognizing the need to improve the performance of these assets, the Department issued a new Unified Facilities Criteria (UFC) in March 2013, titled [High Performance and Sustainable Building Requirements](#), defining how to improve the performance and sustainability of DoD facilities, both existing and new, owned and leased. Part of the challenge posed by DoD's existing buildings is that a large fraction of them are not metered, and return on investment calculations require accurate consumption data. To address this deficiency, DoD issued

a metering policy in April 2013 requiring all DoD Components to use advanced metering to capture a minimum of 60% of electricity and natural gas use by the end of FY 2020, with the goal of capturing 85% of consumption. Apart from straight return on investment considerations, DoD approaches real property asset management in a budget-constrained environment by focusing resources on the facilities with the greatest maintenance and repair needs, balanced by an evaluation of which assets are most crucial to the mission. For example, a storage facility may not need to be maintained to the same level of condition as a runway, based on the consequence of a failure of the asset.

DoD modified its approach to the Energy Conservation Investment Program (ECIP), making it part of a portfolio approach in which the Services pursue the most financially attractive energy projects, whether through third-party financing or their own budgets. As a result, projects having a major impact on energy efficiency and/or security can be funded even though they might not otherwise be justified under internal funding strategies. Another change in ECIP, to encourage long-term planning, is that Services are now required to build a five-year program of projects proposed for ECIP funding. Finally, DoD introduced inter-Service competition for ECIP funding. Although the Department will guarantee each Service a minimum level of funding, it will award funds based purely on competitive merit beginning in FY 2014.



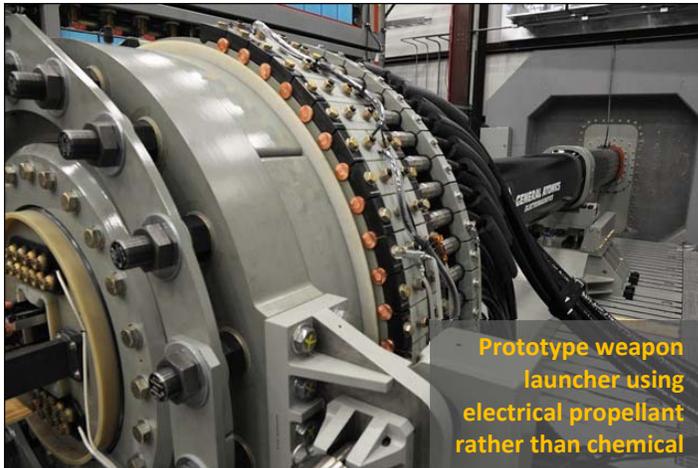
Photo: U.S. Air Force

Improving efficiency by cleaning an air filter, Kandahar Airfield, Afghanistan

Sustainable Acquisition

The Department continues to make progress in developing a methodology to better integrate sustainability thinking into the DoD weapons system acquisition process. DoD personnel have been investigating ways to adopt the life cycle impact assessment process into the DoD acquisition process and have been meeting with industry, academia, and other government agencies to benchmark best practices. DoD staff have developed a draft framework of inputs, outputs, and key impact categories. The overall objective is to develop a Military Standard for conducting life cycle impact assessments at the conceptual, developmental, and design stages of acquisitions. Use of the standard should result in lower total ownership costs and more sustainable systems – those that use less energy, water, and toxic chemicals, and that produce fewer emissions.

Photo: U.S. Navy



Prototype weapon launcher using electrical propellant rather than chemical

An essential component of sustainable weapons acquisition is sustainable manufacturing. Sustainable manufacturing is the creation of manufactured products with processes that are economically sound, non-polluting, energy efficient, conserving of natural resources, and safe for warfighters, users, employees, and communities. As a keystone concept that integrates multiple sustainability elements, sustainable manufacturing can make weapons acquisition more

affordable through cost avoidance of environmental, health, and safety liabilities. Every dollar spent on liabilities is one less for warfighter capabilities. Sustainable manufacturing has a place in both the acquisition of systems and in their logistics sustainment.

I.3.C Outreach and Communication

The Department is continually working to increase awareness of the SSPP among personnel, using normal internal channels of communication within the Department and within each individual DoD Component, such as websites, newsletters, and announcements. Annual updates of the SSPP will be used as opportunities to remind civilian, military, and contractor staff of the SSPP's goals and the Department's expectations. Every year the Deputy Undersecretary of Defense for Installations and Environment and the Assistant Secretary of Defense for Operational Energy Plans and Programs present the SSPP to senior managers within each DoD Component at the Deputy Assistant Secretary level and higher. Presentations stress the integration of sustainability activities within overall DoD strategic planning and budgeting.

The Department already has two platforms on the internet for communicating to both DoD employees and the public on sustainability performance:

- DENIX (DoD Environment, Safety and Occupational Health Network and Information Exchange, <http://www.denix.osd.mil/sustainability/>); and
- the "DoD Goes Green" website at http://www.defense.gov/home/features/2010/1010_energy/.

DENIX offers a wealth of information on sustainability, including DoD and federal policy and guidance, useful technical information, and examples of DoD's sustainability activities. Topics covered include: [alternative fuel vehicles](#), [environmental, safety, and occupational health in acquisition](#), the [Toxics Release Inventory](#), [Environmental Management Systems](#), [Green Procurement](#), [Solid Waste and Recycling](#), and [Sustainability](#). The DoD Goes Green site is focused entirely on energy: energy efficiency, renewable energy, and fuels from sources other than petroleum. In addition, the Whole Building Design Guide website, www.wbdg.org, hosts a significant number of DoD documents pertaining to green buildings, including facility and construction criteria.

Making DoD more sustainable requires the broad participation of personnel across the Department. While OSD can accomplish a certain amount of outreach and raise awareness, most employee engagement occurs at the Component level. In general, across DoD, Components engage and reach out to their personnel on sustainability issues through internal newsletters, websites, and social media. The Services participate in award programs such as the Secretary of Defense Environmental Awards and comparable federal agency programs such as the annual Federal Energy and Water Management Awards of the DOE Federal Energy Management Program (FEMP).

The Navy¹ makes extensive use of social media platforms, including Facebook and Twitter pages of the Task Force Energy and *Currents Magazine*, the *Currents* Flickr page, and the Navy Energy and Environment YouTube channel. These online tools have allowed the Navy to expand its reach to a diverse audience and to effectively communicate recent news and developments on sustainability. The interactive framework allows the Navy to embrace the conversational tone of the internet and provide real-time updates and responses to questions. In FY 2012, the Navy increased the number of Task Force Energy Facebook page "likes" by 37%, Navy *Currents* Facebook page "likes" by 52%,

¹In this document, the Navy is used to refer to the U.S. Navy, and DON is used to refer to the Department of the Navy (which includes the Marines Corps as well as the U.S. Navy).

Task Force Energy Twitter followers by 45%, and Navy *Currents* Twitter followers by 42%. The Navy Energy and Environment YouTube channel received 4,241 video views during FY 2012. The Department of Navy (DON) updated its environmental policy, *Environmental Readiness Program Manual* (Chief of Naval Operations Instruction 5090.1D), and will release it in 2013. The update specifically addresses sustainability and the SSPP.

The Army's Senior Energy and Sustainability Council continued to oversee and integrate sustainability and energy efforts across the Army enterprise, including establishment of a new major objective in the Army Campaign Plan. Campaign Objective 8.0, Energy and Sustainability, includes four major enterprise-level energy and sustainability objectives (with associated metrics): installation energy, operational energy, water security, and the Army's Civil Works program. The FY 2013 Army Campaign Plan includes a campaign-level objective "achieve energy security and sustainability objectives" and it embeds sustainability as a "foundation" concept across the Plan's strategy map. In July 2012, the Army issued its Power and Energy Strategic Communications Plan, designed to increase awareness and support of the Army's energy and sustainability efforts and successes. Another form of outreach for the Army is its *Army Sustainability Report*, which is distributed internally and externally. The Army published the latest version in October 2012, restructured to better align with the DoD SSPP. The Army's public website includes pages on energy, sustainability, and environment (<http://www.army.mil/news/energy/> and <http://www.army.mil/news/environment/>). Headquarters Army and Army installations also are utilizing social media to expand sustainability outreach. The Army further engages personnel through three sustainability award programs of the Secretary of the Army: Sustainability Awards, Environmental Awards, and Energy and Water Management Awards.

The Air Force uses a variety of media to emphasize and communicate its continued commitment to minimize environment, safety and occupational health risks. In addition to the traditional Air Force Civil Engineer magazine, the new Air Force Civil Engineer Center shares information on energy, environmental and sustainability initiatives across the Air Force by making extensive use of its website, its new document management and communications electronic dashboard (eDASH), and social media platforms including Facebook, Flickr, YouTube and Twitter. In support of the new Energy Strategic Plan and its fundamental element "Foster an Energy Aware Culture", the Air Force leveraged the federal government-wide Energy Action Month in October to increase energy awareness and encourage more energy-efficient behavior. Eighty bases participated in the campaign, estimated to have reached hundreds of thousands of people through multiple avenues. The Air Force Energy Facebook page saw a four-fold increase in activity in October and sustained about half that over the following months. This annual campaign continues to expand with additional collaboration across Services and more specific messaging and training that gives Airmen the tools to implement more energy efficient behaviors in their daily routines.

Much of the internal outreach and communication in the Washington Headquarters Service (WHS) takes the form of a Sustainability and Energy Management Task Force led by the WHS Environmental, Sustainability and Energy Branch. The purpose of the task force, which was established in 2010, is to communicate energy management goals and develop, implement, and maintain energy management strategies at the Pentagon. Since then the mandate of the group has been broadened to include all sustainability topics, but the focus remains on energy as the greatest opportunity for improvement at this time. Task force membership consists of representatives from other divisions within WHS pertaining to sustainability, including building management, engineering, and construction management, security, and acquisitions. In FY 2013, the Environmental, Sustainability and Energy Branch will update the existing environmental website to

include DoD's SSPP goals and WHS' progress in meeting the goals, as well as descriptions of other sustainability efforts at the Pentagon. It is also considering expanding outreach in FY 2014 by conducting sustainability assessments of office spaces in the Pentagon. The assessments would include a waste audit resulting in recommendations to improve office recycling, an energy audit resulting in recommendations to reduce office energy consumption, and a materials audit resulting in guidance on purchasing sustainable office products.

In the National Security Agency (NSA), engaging and communicating with employees in sustainability is handled by the agency's Sustainability Team. The Team maintains both an internal and external webpage where it posts information on NSA sustainability actions, and staffs kiosks at various NSA events to communicate the agency's sustainability efforts. In cases where broad-based employee participation is required, such as when the agency moved to single stream recycling, the agency also uses signs, posters, and emails for outreach. Quarterly, the Sustainability Team holds Green Team meetings with representatives from across the agency, providing the opportunity to offer suggestions on sustainability projects and policy. The agency routinely offers training to NSA employees on a wide variety of topics such as the U.S. Green Building Council Leadership in Energy and Environmental Design (LEED) rating system, energy management, and green procurement.

The Defense Intelligence Agency (DIA) has an active program to communicate sustainability. The effort begins during the one-week orientation class for new employees, in which all incoming DIA employees are educated on DIA sustainability initiatives and ways they should help improve sustainability through measures such as reducing energy use, recycling, and double-sided copying. Once employees enter the DIA work force, the primary means to communicate sustainability (better known as "greening" in DIA culture) is through DIA's internal website, featuring daily articles, photos, announcements, and other items of interest on topics ranging from energy saving tips to buying green products. The site also has an internal Greening webpage on its classified website that serves as the unofficial repository for many DIA sustainability documents, products, and services, including the DoD SSPP. It further provides details to employees on the DIA recycling program and serves as the bulletin board of the DIA Greening Council. The Greening Council is a group of volunteer representatives from each directorate across the agency dedicated to improving DIA's sustainability outreach efforts. Since its first meeting in January 2010, the Council has been promoting sustainability activities and preparing articles for publication in DIA's quarterly magazine and on the internal website. In 2013, DIA will directly communicate the specific goals and requirements of the DoD SSPP to all employees, and is considering a mandatory online training class on the SSPP.

The Missile Defense Agency (MDA) promotes the participation of its employees in sustainability by requiring all of them (military, civilian, and contractors) to complete an environmental awareness training course that explains the importance of MDA's environmental compliance and sustainability program. MDA's Environmental Directorate maintains a website accessible to all employees, containing current information to ensure that all employees in each organizational element are aware and have a working knowledge of the goals and requirements of the SSPP. The agency also publishes articles on current MDA sustainability issues, events, and success stories at least quarterly.

DoD welcomes input on its SSPP. Please submit comments and questions through DENIX at <https://www.denix.osd.mil/cmrmnd/> by clicking on the "Contact Chemical Material Risks Management Program" link at left.

Part II: DoD Sustainability Objectives, Goals, and Sub-Goals

Objective 1: Ensure the Continued Availability of Resources Critical to the DoD Mission

GOAL 1 The Use of Fossil Fuels Reduced

Goal 1 Responsible OSD Office

AT&L/I&E

Goal 1 Sub-Goals

SUB-GOAL 1.1 Energy Intensity of Facilities Reduced 30% from FY 2003 Levels by FY 2015 and 37.5% by FY 2020

Metric

The percent reduction relative to FY 2003 in the total energy consumed by DoD facilities per gross square foot of total DoD building space. A facility is defined by the Energy Independence and Security Act of 2007 (EISA) §432(1)(C) as any building, installation, structure, or other property (including any applicable fixtures) owned or operated by, or constructed or manufactured and leased to, DoD. The term facility includes a group of facilities at a single location, or multiple locations managed as an integrated operation, and contractor-operated facilities owned by DoD. It does not include any land or site for which the cost of utilities is not paid by the federal government.

Annual Planning Targets and Results

FY	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Targets	15%	18%	21%	24%	27%	30%	31.5%	33%	34.5%	36%	37.5%
RESULTS	11.4%	13.3%	17.7%	<i>including source credits</i>							
Btu/GSF	102,929	100,268	96,593								
billion Btu	210,691	197,212	183,157								
000 GSF	1,949,734	1,896,352	1,896,110								
FY 2003 Baseline for each FY											
Btu/GSF	116,134	115,647	117,344								

SUB-GOAL 1.2 By FY 2020, Produce or Procure Energy from Renewable Sources in an Amount that Represents at Least 18% of Electricity Consumed by Facilities

Metric

The numerator is the sum of renewable energy that DoD produced, a DoD controlled location produced, or a DoD component procured from another source. The denominator is the total electric consumption of facilities as published in the DoD annual energy management report. Renewable energy is defined in 10 United States Code (U.S.C.) §2924(7) as either thermal or electrical energy that is produced from renewable sources, including solar, wind, biomass, landfill gas, ocean (including tidal, wave, current, and thermal), geothermal (including electricity and heat pumps), municipal solid waste, and new hydroelectric generation capacity if achieved from increased efficiency or additions of new capacity at existing hydroelectric projects.

Annual Planning Targets and Results

Fiscal year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Targets	10%	11%	12%*	10%	11%	12%	13%	14%	15%	16%	18%
RESULTS	9.6%	8.5%	9.6%								

**Title 10, U.S.C. §2911(e) (2) requires DoD to establish an interim renewable energy goal in FY 2018, adjusting future DoD renewable energy planning factors.*

SUB-GOAL 1.3 Use of Petroleum Products by Vehicle Fleets Reduced 30% from FY 2005 Levels by FY 2020

Metric

The percent reduction in petroleum product consumption by DoD non-tactical motor vehicle fleets relative to FY 2005.

Annual Planning Targets and Results

Fiscal year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Targets	10%	12%	14%	16%	18%	20%	22%	24%	26%	28%	30%
RESULTS	5.3%	11.8%	19.5%								
million GGE	80.3066	74.8129	68.3000								
FY 2005 Baseline	84.8318	million GGE (gallons of gasoline equivalent)									

GOAL 2 Water Resources Management Improved

Goal 2 Responsible OSD Office
AT&L/I&E

Goal 2 Sub-Goals

SUB-GOAL 2.1 Potable Water Consumption Intensity by Facilities Reduced 26% from FY 2007 Levels by FY 2020

Metric

The percent reduction relative to FY 2007 in potable water consumed by DoD facilities per gross square foot of total building space. Consumption includes the loss of water after it is delivered (e.g., through leaking or malfunctioning fixtures, such as toilets). A facility is defined as per EISA §432(1)(C).

Annual Planning Targets and Results

Fiscal year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Targets	6%	8%	10%	12%	14%	16%	18%	20%	22%	24%	26%
RESULTS	12.9%	10.8%	18.6%								

SUB-GOAL 2.2 Industrial and Irrigation Water Consumption Reduced 20% from FY 2010 Levels by FY 2020

Metric

The percent reduction relative to FY 2010 in total water consumed by DoD for irrigation (agricultural and/or landscaping) and industrial purposes (for industrial processes that do not require potable water).

Annual Planning Targets and Results

Fiscal year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Targets	n/a	2%	4%	6%	8%	10%	12%	14%	16%	18%	20%
RESULTS	n/a	n/a	n/a								
million gal	4,483	10,722	13,821								

SUB-GOAL 2.3 All Development and Redevelopment Projects of 5,000 Square Feet or Greater Maintain Pre-Development Hydrology to the Maximum Extent Technically Feasible

Metric

The percent of covered projects (those development and redevelopment projects of 5,000 square feet or greater) that can demonstrate with documentation that stormwater design objectives were met through practices that infiltrate, evapotranspire, and/or harvest and use the rainfall to the maximum extent technically feasible. The criterion for maximum extent technically feasible is the full employment of accepted and reasonable stormwater infiltration and reuse technologies subject to site and applicable regulatory constraints.

Annual Planning Targets and Results

Fiscal year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Targets	-	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
RESULTS	n/a	n/a	98%								

Objective 2: DoD Readiness Maintained in the Face of Climate Change

GOAL 3 Greenhouse Gas Emissions Associated with DoD Operations Reduced

Goal 3 Responsible OSD Offices

Sub-Goals 3.1 and 3.2: AT&L/I&E

Sub-Goals 3.3 and 3.4: AT&L/Personnel and Readiness

Goal 3 Sub-Goals

SUB-GOAL 3.1 Greenhouse Gas Emissions from Scope 1 and 2 Sources Reduced 34% from FY 2008 Levels by FY 2020

Metric

The percent reduction of GHG emissions (subject to DoD emissions reduction target) from combined Scopes 1 and 2 sources from the FY 2008 baseline.

Annual Planning Targets and Results

Fiscal year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Targets	3%	5%	7%	10%	13%	16%	19%	22%	28%	30%	34%
Results	3.6%	4.4%	9.2%	<i>All GHG emissions are in units of million metric tons of carbon dioxide equivalent, MMT CO₂(e)</i>							
MMT CO ₂ (e)	27.0123	25.6808	24.3870								

Baseline for FY11 and 12	26.8551
Baseline for FY10	28.0209

Procedural improvements affecting the FY 2011 inventory required a revision to the FY 2008 baseline used for FY 2011. The FY 2010 inventory was not revised, so it retains its original FY 2008 baseline.

SUB-GOAL 3.2 Greenhouse Gas Emissions from Scope 3 Sources Reduced from FY 2008 Levels by FY 2020

Metric

The percent reduction of GHG emissions (subject to DoD emissions reduction target) from Scope 3 sources from the FY 2008 baseline.

Annual Planning Targets and Results

Fiscal year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Targets	0%	0%	1%	2%	3%	4%	5%	7%	9%	11%	13.5%
Results w/Hosted RE*	4.8%	(0.1%)	9.1%								
Results without Hosted RE**	(6.0%)	(9.0%)	0.4%								
MMT CO ₂ (e)*	6.6072	7.4236	6.9390								
MMT CO ₂ (e)**	7.3549	8.0820	7.6045								

Baseline for FY12	7.6341
Baseline for FY11	7.4130
Baseline for FY10	6.9399

without Hosted RE

*Including credit for renewable energy (RE) generation operated by third-parties.

** Without including the renewable energy credits.

SUB-GOAL 3.3 30% of Eligible Employees Teleworking at Least Once Per Bi-Weekly Pay Period, on a Regular, Recurring Basis by FY 2020

Metric

The percent of DoD employees eligible to telework who are doing so at least once per bi-weekly pay period on a regular, recurring basis. Telework can be at any approved location: home, a telework center, and/or a secure telework site meeting the additional requirements for facility construction, network security, and access control for employees needing access to classified networks. An employee’s day off during a compressed work schedule cycle does not count as a telework day.

Annual Planning Targets and Results

Fiscal year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Targets	-	-	10%	15%	17%	20%	23%	25%	27%	29%	30%
RESULTS	n/a	n/a	8%								

SUB-GOAL 3.4 Greenhouse Gas Emissions from Employee Air Travel Reduced 7% from FY 2011 Levels by FY 2020

Metric

The percent reduction of GHG emissions from air travel by DoD employees on DoD business, relative to FY 2011, as calculated from travel data captured by the Defense Travel Management Office.

Annual Planning Targets and Results

Fiscal year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Targets	-	0%	0%	1%	2%	2%	3%	4%	5%	6%	7%
RESULTS	n/a	n/a	9.0%								
MMT CO ₂ (e)	n/a	2.30*	2.09								

**The Air Travel number in the FY 2011 data submission will not match this value, as this is an improved estimate developed after the FY 2011 data were submitted.*

GOAL 4 DoD Climate Change Vulnerability Assessed and Resiliency Improved

Goal 4 Responsible OSD Office

AT&L/I&E

Goal 4 Sub-Goals

There are no sub-goals for Goal 4 at this time

Objective 3: The Ongoing Performance of DoD Assets Ensured by Minimizing Waste and Pollution

GOAL 5 Solid Waste Minimized and Optimally Managed

Goal 5 Responsible OSD Offices

Sub-Goal 5.1: OSD Director of Administration

Sub-Goals 5.2 and 5.3: AT&L/I&E

Goal 5 Sub-Goals

SUB-GOAL 5.1 All DoD Components Implementing Policies by FY 2017 to Reduce the Use of Printing Paper

Metric

The number of DoD Components that: (1) have issued a policy that establishes a program for reducing the use of printing paper, where the program consists of two or more initiatives that drive the transition to a culture of reduced paper and (2) are actively implementing that program. Components counted are the Departments of the Army, Navy, and Air Force, the Defense Agencies, and the DoD Field Activities.

Annual Planning Targets and Results

Fiscal year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Targets	-	1	6	9	13	18	24	29	29	29	29
RESULTS	3	4	7								

SUB-GOAL 5.2 50% of Non-Hazardous Solid Waste Diverted from the Waste Stream by FY 2015 and Thereafter Through FY 2020

Metric

The percent of the total non-hazardous solid waste stream generated and collected by DoD facilities (by weight), without construction and demolition debris, that is directed away from the waste stream, for example by reuse, recycling, and/or composting.

Annual Planning Targets and Results

Fiscal year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Targets	40%	42%	44%	46%	48%	50%	50%	50%	50%	50%	50%
RESULTS	39%	40%	49%								
Generated*	2.014	2.245	2.144								
Diverted*	0.777	0.909	1.048								

*million tons

SUB-GOAL 5.3 60% of Construction and Demolition Debris Diverted from the Waste Stream by FY 2015, and Thereafter Through FY 2020

Metric

The percent of construction and demolition materials and debris generated and collected by DoD facilities (by weight) that is directed away from the waste stream, for example by reuse, recycling, and/or mulching.

Annual Planning Targets and Results

Fiscal year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Targets	50%	52%	54%	56%	58%	60%	60%	60%	60%	60%	60%
RESULTS	73%	77%	74%								
Generated*	4.108	4.140	4.922								
Diverted*	2.984	3.195	3.645								

*million tons

GOAL 6 The Use and Release of Chemicals of Environmental Concern Minimized

Goal 6 Responsible OSD Offices

Sub-Goal 6.1: AT&L/I&E

Sub-Goal 6.2 and 6.3: Armed Forces Pest Management Board

Goal 6 Sub-Goals

SUB-GOAL 6.1 On-site Releases and Off-Site Transfers of Toxic Chemicals Reduced 15% from CY 2006 Levels by FY 2020

Metric

The toxic chemicals released into the environment and transferred off-site (in total pounds), as a percentage of the calendar year (CY) 2006 baseline. The chemicals reported are the sum of releases reported on Environmental Protection Agency Form R Part II from: (1) Section 5 (Quantity of the Toxic Chemical Entering Each Environmental Medium Onsite), (2) Section 6.1 (Discharges to Publicly Owned Treatment Works, and (3) Section 6.2 (Transfers to Other Off-Site Locations) for disposal and treatment. This sub-goal does not include releases and off-site transfers from operational range activities. DoD toxic chemical reporting to the Environmental Protection Agency (EPA) is done by calendar year, so fiscal year reporting on this sub-goal corresponds to data for the previous calendar year (e.g., FY 2012 reporting is CY 2011 data).

Annual Planning Targets and Results

FY	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Targets	-	-	-	-	-	5%	-	-	10%	-	15%
RESULTS	2.8%	2.5%	(6.6%)	<i>(a negative number corresponds to an increase from baseline)</i>							
pounds	20,126,484	20,198,710	22,073,843								
CY 2006 Baseline: 20,710,301											

SUB-GOAL 6.2 100% of DoD Personnel and Contractors Who Apply Pesticides Are Properly Certified

Metric

Percent of personnel who applied pesticides on DoD installations during the fiscal year who were properly certified. Direct hire employees, certified in accordance with DoD 4150.07-M, Volume 1, have a maximum of two years to become certified after initial employment. Contracted employees shall have appropriate State or host-nation certification in the appropriate categories at the time the contract is effective. These certifications are in accordance with EPA rules and regulations and are accepted as valid certifications.

Annual Planning Targets and Results

Fiscal year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Targets	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
RESULTS	99.4%	99.2%	99.0%								

SUB-GOAL 6.3 All DoD Installations Have Integrated Pest Management Plans Prepared, Reviewed, and Updated Annually by Pest Management Professionals

Metric

The percent of DoD installations that maintained integrated pest management plans that a DoD-certified pest management consultant and/or the installation pest management coordinator prepared, reviewed, and updated annually. These plans describe how the installation will prevent, manage, and control animal and plant pests while following the principles of integrated pest management and federal, state, and local laws. The plans are generated by the installation, are updated annually, and are reviewed and approved by the respective Military Department senior pest management professional(s).

Annual Planning Targets and Results

Fiscal year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Targets	-	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
RESULTS	84.6%	90.2%	96.7%								

Objective 4: Continuous Improvement in the DoD Mission Achieved through Management and Practices Built on Sustainability and Community

GOAL 7 Sustainability Practices Become the Norm

Goal 7 Responsible OSD Offices

Sub-Goal 7.1: AT&L/Defense Procurement and Acquisition Policy

Sub-Goal 7.2, 7.3 and 7.4: AT&L/I&E

Goal 7 Sub-Goals

SUB-GOAL 7.1 95% of Procurement Conducted Sustainably

Metric

The percent of contract actions (new contracts and modifications) that adhere to the principles of sustainability by containing requirements for (as relevant and where such products and services meet DoD performance requirements): energy-efficient (ENERGY STAR or Federal Energy Management Program [FEMP] designated), water-efficient, biobased, environmentally preferable, non-ozone depleting, containing recycled content, and/or are non-toxic or less-toxic alternatives. The sub-goal applies to products and services, including task and delivery orders, but excluding the acquisition of weapon systems and their components and spare parts. The Federal Procurement Data System will be used as the source of data on contracts meeting these requirements. In the interim before sustainable procurement data can be collected completely and accurately, the results shown are from DoD’s annual review of a subset of contract actions, as explained in Part III.

Annual Planning Targets and Results

Fiscal year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Targets	-	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%
RESULTS	n/a	82.6%	95.0%								

SUB-GOAL 7.2 Electronic Stewardship and Data Centers

Metrics – This sub-goal consists of four metrics pertaining to agency progress toward electronic product environmental assessment tool (EPEAT), power management, and end of life goals

Fiscal year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
% of Monitors and PCs/Laptops Purchased in FY 2012 EPEAT Compliant Agency-wide											
Targets	-	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%
RESULTS	-	98%	99%								

% of Computers, Laptops and Monitors Agency-wide with Power Management Enabled											
Targets	-	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
RESULTS	-	52%	53%	<i>(estimated)</i>							

% of Electronics at end-of-life disposed through GSA Xcess, CFL, Unicorn or Certified Recycler (R2, E-Stewards)											
Targets	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
RESULTS	100%	100%	100%								

% of Electronics at end-of-life disposed through non-Certified Recyclers											
Targets	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
RESULTS	0%	0%	0%								

SUB-GOAL 7.3 15% of Existing Buildings Conform to the Guiding Principles on High Performance and Sustainable Buildings By FY 2015, and Thereafter Through FY 2020

Metric

The percent of existing buildings over 5,000 gross square feet (owned and leased) that meet the Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings (Guiding Principles), as per the December 2008 implementation guidance developed by the Interagency Sustainability Work Group.

Annual Planning Targets and Results

Fiscal year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Targets	-	7%	9%	11%	13%	15%	15%	15%	15%	15%	15%
RESULTS	0.06%	0.30%	0.61%								
# buildings >5,000 GSF	72,663	51,827	51,953								
# conforming to Principles	43	153	316								

SUB-GOAL 7.4 All Environmental Management Systems Effectively Implemented and Maintained

Metric

Overall DoD status using the Federal EMS Scorecard Metrics as reported in the Defense Environmental Programs Annual Report to Congress. The overall DoD status is a color rating (green, yellow, or red) for all DoD facilities and organizations for which an EMS is appropriate. Status is based on the color ratings for individual facilities determined using the federal EMS Metrics. An overall green rating requires at least 80% of all EMS-appropriate facilities and organizations to have green EMSs, with no more than 5% total red EMSs. An overall yellow requires no more than 10% red EMSs. An overall red is assigned when the status is neither green nor yellow.

Annual Planning Targets and Results

Fiscal year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Targets	-	green	green	green	green	green	green	green	green	green	green
RESULTS	red	red	red								

Part III: Progress Update

The results for the 20 sub-goals for FY 2010 through FY 2012 are compiled in Table 2.

Cross-Cutting Initiatives

Many DoD activities span multiple sub-goals under Goals 1 and 2, which seek to maximize the efficiency of energy and water consumption, respectively. Examples of such activities are provided on the next page, which summarizes energy and water efficiency projects financed with performance contracting – Energy Savings Performance Contracts (ESPCs) and Utility Energy Services Contracts (UESCs). Another example of a cross-cutting initiative is shown in the text box for U.S. Army Garrison (USAG)-Hawaii, which combines sub-goal 1.2 (renewable energy) with sub-goal 1.3 (reduced vehicle petroleum use).

The Army and Air Force have Net Zero programs that cut across Objectives and Goals by addressing energy, water, and solid waste. The Army, which launched its Net Zero initiative in April 2011, will transition Net Zero from a pilot initiative to an Army-wide approach to sustainability in FY 2013/2014. This will involve incorporating Net Zero concepts into Army strategy and developing policies that clearly identify requirements and responsibilities for sustainable resource management. The Army is also developing Net Zero implementation guidance and documenting Net Zero success stories and best practices to facilitate implementation across the organization. In January 2013, the Army completed a [Programmatic Environmental Assessment](#) to evaluate potential impacts across a broad spectrum of possible energy, water, and solid waste projects that could be implemented under the Net Zero Installations initiative.

In June 2012, the Air Force issued a [“Net Zero” Energy, Water and Waste Policy](#) establishing Air Force policy and goals to gradually achieve a “Net Zero” posture for Air Force installation energy, water, and waste. Air Force Net Zero is defined as the net zero consumption of energy and water, and the net zero disposal of waste, to the greatest extent practicable. The Air Force will approach Net Zero by refocusing existing energy, water, and waste investments on finding opportunities that include a combination of cost and resource reduction, conservation, and efficiencies. The policy established a Tiger Team to guide the initiation of the effort, and to draft a Strategic Plan, which is expected to be complete by mid-FY 2013. More details on the Services’ Net Zero programs are provided under individual sub-goals for energy, water, and solid waste.

Solar-Powered Electric Vehicle Charging

USAG Hawaii has partnered with the Army Tank Automotive Research, Development and Engineering Center since 2011 to demonstrate two micro-grids on Wheeler Army Air Field and Schofield Barracks. Each system is equipped with a solar-powered charging station (roof-top photovoltaic (PV) array on the carport) to charge plug-in electric vehicles, coupled with a battery storage system. The two micro-grid stations are also equipped with three mobile solar array trailers used to power several public outreach events. The systems give the garrison independence from the utility grid and save more than \$3 million per year. The five facilities powered by the micro-grid systems—two large supply warehouses, the Garrison Command Group facility, and two additional office buildings—consume net zero energy. *(Photo: charging station at Wheeler Army Air Field; photo credit U.S. Army)*



Table 2. Summary of the DoD Objectives, Goals, and Sub-Goals Comprising the DoD SSPP, and Results for FY 2010 Through 2012

#	Sub-Goal	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Objective #1: The Continued Availability of Resources Critical to the DoD Mission is Ensured												
GOAL #1: The Use of Fossil Fuels Reduced												
1.1	Energy Intensity of Facilities Reduced 30% from FY 2003 Levels by FY 2015 and 37.5% by FY 2020	11.4%	13.3%	17.7%	24%	27%	30%	31.5%	33%	34.5%	36%	37.5%
1.2	By FY 2020, Produce or Procure Energy from Renewable Sources in an Amount that Represents at Least 18% of Electricity Consumed by Facilities	9.6%	8.5%	9.6%	10%	11%	12%	13%	14%	15%	16%	18%
1.3	Use of Petroleum Products by Vehicle Fleets Reduced 30% from FY 2005 Levels by FY 2020	5.3%	11.8%	19.5%	16%	18%	20%	22%	24%	26%	28%	30%
GOAL #2: Water Resources Management Improved												
2.1	Potable Water Consumption Intensity by Facilities Reduced 26% from FY 2007 Levels by FY 2020	12.9%	10.7%	18.6%	12%	14%	16%	18%	20%	22%	24%	26%
2.2	Industrial and Irrigation Water Consumption Reduced 20% from FY 2010 Levels by FY 2020	not applic	not avail.	not avail.	6%	8%	10%	12%	14%	16%	18%	20%
2.3	All Development and Redevelopment Projects of ≥5,000 Sq. Ft. Maintain Pre-Development Hydrology to the Maximum Extent Technically Feasible	not avail.	not avail.	98%	100%	100%	100%	100%	100%	100%	100%	100%
Objective #2: DoD Readiness Maintained in the Face of Climate Change												
GOAL #3: Greenhouse Gas Emissions Associated with DoD Operations Reduced												
3.1	Greenhouse Gas Emissions from Scope 1 and 2 Sources Reduced 34% from FY08 Levels by FY20	3.6%	4.4%	9.2%	10%	13%	16%	19%	22%	28%	30%	34%
3.2	Greenhouse Gas Emissions from Scope 3 Sources Reduced 13.5% from FY 2008 Levels by FY 2020 (with hosted renewable energy credit)	4.8%	(0.1%)	9.1%	2%	3%	4%	5%	7%	9%	11%	13.5%
3.3	30% of Eligible Employees Teleworking at Least Once Per Bi-Weekly Pay Period, on a Regular, Recurring Basis, by FY 2020	not avail.	not avail.	8%	15%	17%	20%	23%	25%	27%	29%	30%
3.4	Greenhouse Gas Emissions from Employee Air Travel Reduced 7% from FY 2011 Levels by FY 2020	not applic	not applic	9.0%	1%	2%	2%	3%	4%	5%	6%	7%
GOAL #4: DoD Climate Change Vulnerability Assessed and Resiliency Improved												

#	Sub-Goal	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Objective #3: The Ongoing Performance of DoD Assets Ensured by Minimizing Waste and Pollution												
GOAL #5: Solid Waste Minimized and Optimally Managed												
5.1	All DoD Components Implementing Policies by FY 2017 to Reduce the Use of Printing Paper	3	4	7	9	13	18	24	29	29	29	29
5.2	50% of Non-Hazardous Solid Waste Diverted from the Waste Stream by FY 2015 and Thereafter Through FY 2020	39%	40%	49%	46%	48%	50%	50%	50%	50%	50%	50%
5.3	60% of Construction and Demolition Debris Diverted from the Waste Stream by FY 2015, and Thereafter Through FY 2020	73%	77%	74%	56%	58%	60%	60%	60%	60%	60%	60%
GOAL #6: The Use and Release of Chemicals of Environmental Concern Minimized												
6.1	On-Site Releases and Off-Site Transfers of Toxic Chemicals Reduced 15% from CY06 Levels by FY20	2.8%	2.5%	(6.6%)			5%			10%		15%
6.2	100% of DoD Personnel and Contractors Who Apply Pesticides Are Properly Certified	99.4%	99.2%	99.0%	100%	100%	100%	100%	100%	100%	100%	100%
6.3	All DoD Installations Have Integrated Pest Management Plans Prepared, Reviewed, Updated Annually by Pest Management Professionals	84.6%	90.2%	96.7%	100%	100%	100%	100%	100%	100%	100%	100%
Objective #4: Continuous Improvement in the DoD Mission Achieved through Management and Practices Built on Sustainability and Community												
GOAL #7: Sustainability Practices Become the Norm												
7.1	95% of Procurement Conducted Sustainably	not avail.	82.6%	95.0%	95%	95%	95%	95%	95%	95%	95%	95%
7.2	Electronic Stewardship and Data Centers	<i>See table in Part II</i>										
7.3	15% of Existing Buildings Conform to the Guiding Principles on High Performance and Sustainable Buildings By FY 2015, and Thereafter Through FY 2020	0.06%	0.30%	0.61%	11%	13%	15%	15%	15%	15%	15%	15%
7.4	All Environmental Management Systems Effectively Implemented and Maintained by FY 2020	red	red	red	green							

HIGHLIGHTS

Objective 1: Using Performance Contracting to Reduce Facility Energy and Water Intensity

Marine Corps Air Station (MCAS) Beaufort

The installation entered into three phases of an ESPC to implement comprehensive energy and water efficiency improvements across the base. The project installed high-efficiency geothermal heat pump heating, ventilation and air-conditioning (HVAC) systems, high-efficiency lighting in the hangar and high bay area, high-efficiency lighting with occupancy sensors, efficient chilled water systems, direct digital controls for HVAC, low-flow water fixtures, a solar-powered hot water system, and a base-wide energy-management control system.

The base has recently made other improvements as well, including advanced meters, a PV array on top of a carport, and a cogeneration plant that provides space heating from the waste heat from electricity generation. Further, MCAS Beaufort has a standard operating procedure requiring facility architects and engineers to incorporate energy-efficiency in all facility designs and specifications.

As a result of its aggressive pursuit of efficiency, the energy intensity for the base was 30% lower in FY 2012 than in FY 2003, while water intensity was 48% lower than the FY 2007 baseline. The particulars on the ESPC are as follows:

- Contract Amount: \$26.4 million
- Pre-performance period payments: \$14.1 million
- Annual Savings, Energy: 91.8 billion Btu
- Annual Savings, Water: 30.2 million gallons
- Annual Savings, Cost: \$1.21 million

Joint Base Charleston

The base conducted energy efficient upgrades through an ESPC on over 80 buildings. Measures included high efficiency geothermal heat pumps, replacement of outdated HVAC equipment, retrofitting with high efficiency lighting and water fixtures, and decentralization of base steam plants.

- Contract Amount: \$48 million
- Annual Savings, Energy: 30% (193,742 million Btu)
- Annual Savings, Water: 55%
- Annual Savings, Cost: \$7.9 million (\$7 million in electricity, \$900,00 for water and sewer)

Naval Air Station Whiting Field

A performance contract awarded April 2012 reduced energy and water consumption for 12 facilities on the installation through: more advanced building energy monitors; direct digital controls for HVAC equipment; equipment and fixture upgrades including infrared heaters, chiller compressor retrofits, energy efficient lighting, and high efficiency plumbing fixtures; and training for personnel on how to use the equipment.

- Contract Amount: \$3.6 million
- Annual Savings, Energy: 10% (14,850 million Btu)
- Annual Savings, Water: 74% (1.3 million gallons)
- Annual Savings, Cost: >\$300,000

Fort Bliss

The ESPC at Fort Bliss included two technologies never used before on Army installations: solar parabolic collectors to preheat water (see photo below) and a solar absorption chiller. Other measures implemented through the contract were lighting upgrades and occupancy sensors, replacing motors and a chiller with energy efficient models, improved energy monitoring and controls systems, insulation, solar PV systems, and water heating system replacements.

- Contract Amount: \$9.7 million
- Annual Savings, Energy: 58.5 billion Btu
- Annual Savings, Cost: \$1.35 million
- Lifetime Cost Savings: \$31.7 million (estimated)

(Photo: U.S. Army; Johnson Controls, Inc.)



Performance Contracting at NS Mayport

Energy efficiency improved in 55 facilities through direct digital controls for managing HVAC systems.

- Contract Amount: \$3.2 million
- Annual Savings, Energy: 9% (>5,000 MWh)
- Annual Savings, Cost: >\$421,000

Sub-Goal 1.1 – Facility Energy Intensity

The Department reduced the energy intensity of its facilities to 96,596 Btu/gross square foot (GSF) in FY 2012, a 17.7% reduction from the FY 2003 baseline. While falling short of the 21% target, DoD's efficiency improvements have been accelerating: performance in FY 2011 was 2.3% better than FY 2010, and FY 2012 showed a 4.4% improvement over FY 2011. As shown in Figure 2, the FY 2015 target of a 30% reduction below baseline is within reach, especially given the Department's increased use of third-party financing through performance contracting.

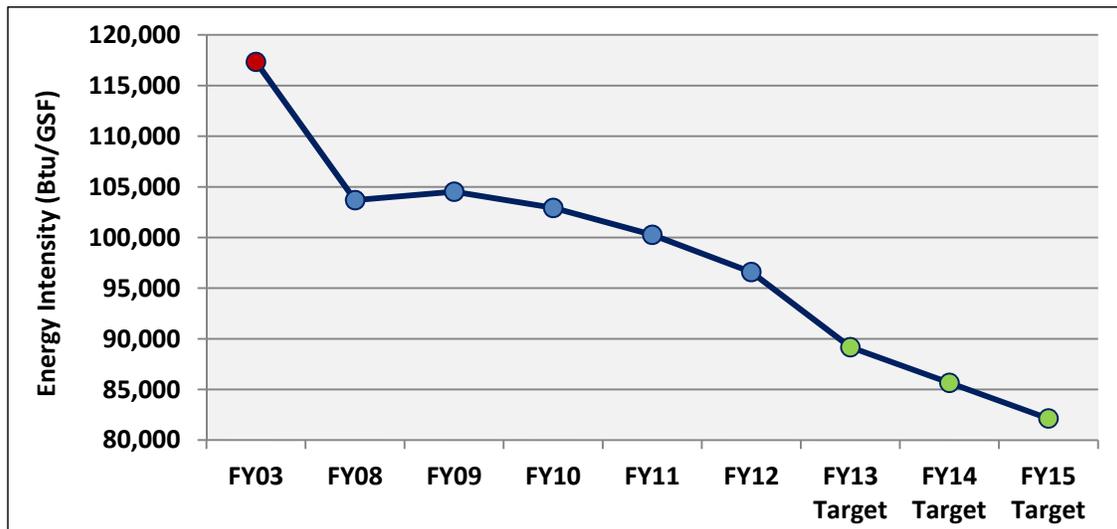


Figure 2. DoD Facility Energy Intensity Since the FY 2003 Base

The Army reduced its facility energy intensity by 15.7% in FY 2012, relative to the baseline, a significant improvement over past years. This progress was possible due to concerted action in FY 2102 on all fronts: policy, guidance, alternative financing, and projects. On the policy front, the Army issued two new energy policies in August 2012 for permanent installations. One specifies energy reduction and renewable energy goals and clarifies responsibilities. The second requires comprehensive energy and water evaluations, with an Army-wide goal to complete evaluations on 25% of buildings each year. Army energy policy was strengthened by updates to the Installation Design Guides, requiring all new buildings and major renovation projects to meet or exceed the performance standards 90.1-2007 of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) and EO 13423, and new projects to be designed to meet LEED Silver-level certification. Additionally, the Army Installation Management Command issued a set of orders to drive improvements in installation energy management. The requirements included: full-time energy managers, the inclusion of energy and water conservation responsibilities in senior position descriptions, energy steering committees, energy security plans, training and awareness programs, the inclusion of energy efficiency in major project designs, and comprehensive energy and water evaluations with implementation of low-cost measures.

The Army made a major push on energy efficiency projects in FY 2012, implementing more than 350 projects, which are expected to yield annual savings of 1,100 billion British thermal units (Btu). Most large capital energy investments involved upgrades to heating, ventilation and air-conditioning (HVAC) systems and central energy plants. The Army received nearly \$50 million in ECIP funding for 13 Military Construction (MILCON) energy efficiency and renewable energy projects in FY 2012. Each project was preceded by a collaborative design planning session (charrette) focused on

optimizing efficiency, and the Army brought in the Idaho National Labs and U.S. Army Corps of Engineers (USACE) to validate each project and conduct detailed life cycle cost analyses for them. The Army made progress under its Net Zero Energy initiative in FY 2012, completing energy assessments at nine pilot installations, including renewable energy assessments. The analyses were used to develop Net Zero Energy Roadmaps for each installation consisting of a set of projects prioritized over several years. The Army also made extensive use of performance contracting in FY 2012, as described in the Best Practices box below.

**BEST PRACTICE: Approach for Widespread Adoption
Army Performance Contracting**

The Military Services are increasingly turning to performance contracting to finance energy efficiency improvements, where the savings from enhanced efficiencies pay for the project costs. The Army made extensive use of ESPCs and UESCs in FY 2012, awarding 29 contracts totaling \$227.2 million for energy efficiency and renewable energy projects, an amount equivalent to 18.5% of the Army's annual energy utility costs. The FY 2012 contract total exceeds the use of performance contracting in the prior year by more than 50%. The projects will avoid the annual expenditure of an estimated \$29 million by saving 750 billion Btu per year. The total Army ESPC investment since the program began in 1996 is over \$1.16 billion, and the total UESC investment since 1992 is over \$543 million.

DON achieved an energy intensity reduction of over 19.6% in FY 2012, compared to FY 2003. The Navy has been steadily pushing down its energy intensity in recent years, but this downward trend in energy consumption softened somewhat in FY 2012, due to a lack of energy efficiency projects in the pipeline in the preceding years. However, significant funding for energy audits in FY 2010 and 2011, combined with installation energy reduction goals developed by the Commander, Naval Installations Command, will accelerate efficiency improvements in the near future. For example, a UESC awarded in September 2012 for \$3.2 million at NS Mayport is estimated to reduce consumption by more than 5,000 megawatt-hours (MWh) per year, for an annual savings of over \$421,000. Three MILCON projects to decentralize steam systems at NS Great Lakes, Naval Support Activity (NSA) Hampton Roads, and NSA South Potomac are projected to generate annual savings of 1,875 billion Btu, almost 84 million gallons of water, and more than \$18 million. Across the Future Years Defense Program, Navy is planning to invest \$1.2 billion in energy projects with an associated average savings of 22.9 million Btu per year.

In FY 2012, the Air Force continued making impressive reductions in its facility energy intensity, achieving a 21.2% reduction in FY 2012. As described above under Cross-Cutting Initiatives, the Air Force launched a Net Zero program in FY 2012, which includes a goal of net zero energy consumption by its facilities. The Net Zero program is grounded in a quest for cost efficiencies. A few examples of successful cost-effective energy efficiency projects in FY 2012 are as follows:

- Dyess Air Force Base (AFB) reduced electricity costs by \$1.8 million through energy efficiency upgrades including ceramic bead solar reflectors on 63,000 square feet of roof, improved building insulation, and occupancy sensors on lighting in 84 facilities.
- Air Force Materiel Command is saving an estimated \$450,000 per year by distributing more than 77,000 power strips that power down electronic devices in workstations when they are not in use.
- Air Force Space Command will save \$1.15 million every year, in both energy and maintenance costs, once it finishes replacing streetlights with light-emitting diodes.

- Yokota Air Base generated \$4 million a year in savings by automating controls on water and indoor climate, reducing energy consumption by 3.4 million kWh and 335,000 gallons of fuel oil for heating annually. The base also reduced fuel consumption by 200 gallons a day by conducting an aerial thermal imaging survey to locate and repair 47 steam leaks.

Energy intensity for DLA was 5.8% lower in FY 2012 than the base year. The DLA Energy Management Program identified, funded, and awarded \$14.6 million in energy efficiency projects, corresponding to 14.7 billion Btu in savings. On the policy side, DLA updated its Sustainable Design and Development Policy to require that all projects using MILCON, Minor Construction, or Sustainment, Restoration, and Modernization funding achieve 40% better efficiency than the ASHRAE 90.1 requirements. DLA is also investing in its energy management personnel: the energy management team at the 11 DLA field activities grew from 16 to 19, and the number of these who are Certified Energy Managers increased from 11 to 14. DLA's energy program continues to focus on lighting, heating, and air-conditioning. Efficiency projects in FY 2012 reduced the amount DLA spent on energy by 2.2% from last year, in spite of an average 9.5% rise in energy rates. Key DLA energy efficiency projects driving the energy consumption reductions in FY 2012 included warehouse lighting upgrades from high-pressure sodium or metal halide to T5 or T8 with occupancy sensors, building controls system upgrades, light-emitting diode outdoor street and buildings lights, boiler replacements with high-efficiency condensing technology, advanced metering, and "cool" (highly reflective) roofs.

WHS energy intensity fell 3.1% in FY 2012 relative to FY 2003. In FY 2012, WHS continued with a recommissioning project begun in FY 2010. The first phase of the project, which is nearing completion, is projected to yield 25,000 million Btu in energy savings, and the second phase is underway. WHS further bolstered efficiency in FY 2012 by removing a large, inefficient building from the inventory.

DIA reduced energy intensity by 23.2% in FY 2012, compared to the FY 2003 baseline. The success was driven by two major ECIP projects as well as focused improvements at the DIA Headquarters. In 2012, DIA installed seven heat recovery chillers at a cost of \$1.4 million, reducing the use of natural gas by 26% in just one year. A \$1.1 million lighting efficiency project reduced electricity use

HIGHLIGHT: Sub-Goal 1.1

Cost-Effective Insulation at Sheppard AFB

Sheppard AFB experimented with a paint additive used by the National Aeronautics and Space Administration that imparts significant insulating properties to a building, at an investment cost much smaller than the resulting savings. Two coats each on the inside and outside of a building are said to have the same insulating effect as an additional six inches of traditional insulation. The base tested the product on one of its older concrete block buildings, with immediate effect. The ceramic particles in the paint created a radiant barrier that reduced the transfer of heat into the building by 30%. Building occupants remarked that they had never seen the building temperature below 80° F, even with the air conditioner running continuously. Keeping the building interior cooler also reduces maintenance and repair costs since the HVAC system is subject to less stress. The additive is highly cost-effective, costing \$12 per gallon of paint, making it a cheap alternative to traditional insulation. *(Photo: U.S. Air Force)*



by 4%. Meanwhile, DIA selected an energy service contractor in FY 2012 under the DOE Super ESPC contract, working with the DLA Energy Office.

The National Geospatial-Intelligence Agency (NGA) was the leader in energy intensity reductions in FY 2012, with a 31.3% reduction below baseline. NGA closed six legacy sites under Base Realignment and Closure in FY 2012, and NGA East relocated to a new LEED Gold certified facility in Springfield, VA. The agency also implemented energy efficiency improvements at the NGA West location, in the St. Louis, MO area, including HVAC equipment improvements, more efficient elevator systems, and projects to improve data center energy efficiency. The end result was an all-time low in petroleum consumption by NGA facilities in FY 2012.



The National Reconnaissance Office (NRO) implemented the following efficiency measures to reduce its facility energy intensity by 5% in FY 2012 from the previous year:

- Replaced water chillers with units that are 40% more efficient.
- Utilized smart scheduling and on-demand shut-off of HVAC resources during non-peak hours and in unused areas, reducing consumption by as much as 30%.
- Upgraded over 170,000 square feet of roofing insulation from a rating of R-2 to R-30.
- Converted 491 metal halide fixtures (175 watts [W] each) to light-emitting diode fixtures (70 W) with occupancy sensors, saving \$43,442 in electricity costs.

Sub-Goal 1.2 – Renewable Energy

As a percentage of electricity consumed by DoD facilities, the Department produced or procured 9.6% from renewable sources (electric and non-electric) in FY 2012. This is shy of the 12% unofficial interim planning target DoD set for its FY 2025 goal of 25%, required by Title 10, United States Code §2911(e)(2). The renewable energy contributions of the Services – which account for the vast majority of the Department’s renewable energy – is shown in Figure 3. In terms of the requirement of the Energy Policy Act of 2005 (EPAct), 4.0% of the total electricity consumed by DoD facilities came from electric renewable sources in FY 2012, falling short of the 5% target (Figure 4). DoD is confident of meeting its long-term renewable goals, due to the concerted efforts underway by the Military Services. One factor dampening the amount of renewable energy the Department can report is its mission-driven decision to focus more resources on increasing renewable energy capacity on DoD property, and fewer on purchasing renewable energy credits.

As of FY 2012, the Air Force had approximately 256 renewable energy projects on 89 sites that were either installed and in operation or under construction. In FY 2012, the Air Force conducted assessments on the resource availability and the economic feasibility of developing renewable resources at 75 installations, with six of these sites being further evaluated. The Air Force is actively using and exploring alternative approaches to accelerate its development of renewable energy, including power purchase agreements (PPAs), enhanced use leasing, and identifying underutilized installation property that can be devoted to renewable energy projects. One such PPA is described under the success stories for sub-goal 1.2, and another was signed in August 2012 for the design, construction, and operation of a 14.5 megawatts (MW) photovoltaic (PV) array at Davis-Monthan

AFB to be built on 170 acres of underutilized base property. The latter project will provide 35% of the base’s electricity requirements while reducing utility costs by an average of \$500,000 per year.

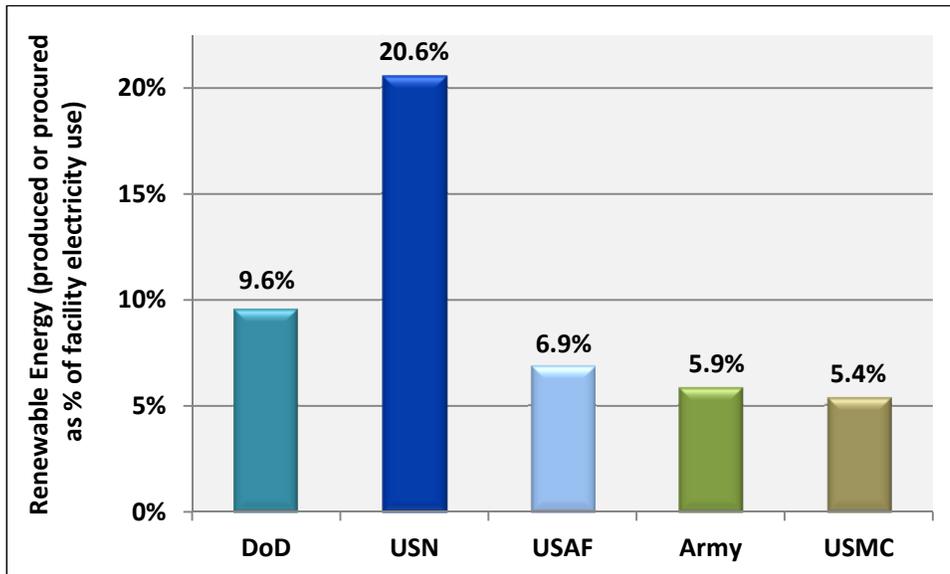


Figure 3. FY 2012 Renewable Energy (Electric and Non-Electric) as Percent of Facility Electricity

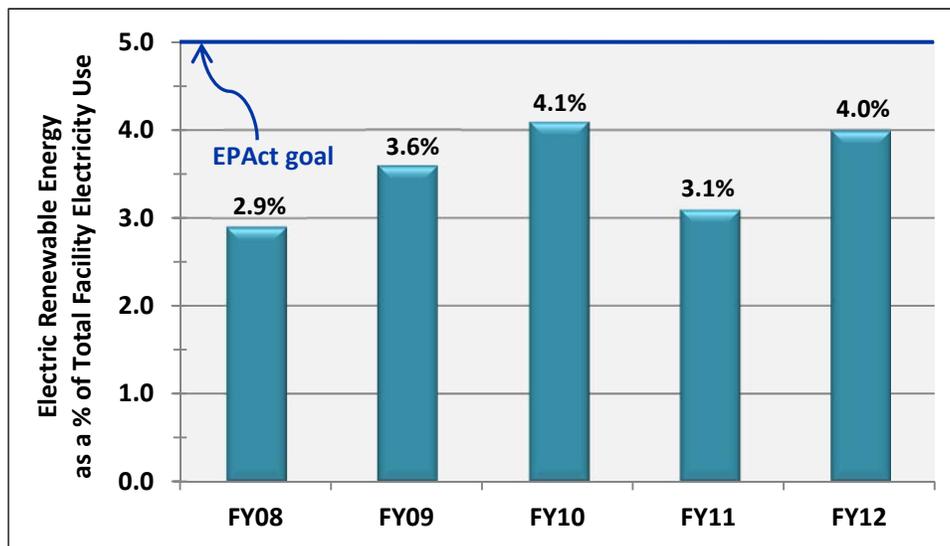


Figure 4. DoD Renewable Electricity Since FY 2008, as Defined by EPACT

The Navy continued pursuing new renewable energy projects in FY 2012 that are cost-effective and promote the mission. For example, a February 2012 rooftop PV installation on the commissary at Fleet Activities Yokosuka is estimated to save the Navy \$300,000 in energy costs annually. It is the largest copper-indium-gallium-selenide thin-film installation in all of Asia and the largest thin-film solar installation of any type in the Navy. In south Texas, the Navy reached agreement with two renewable energy developers to allow new wind farms to be built in the vicinity of Naval Air Station (NAS) Corpus Christi and NAS Kingsville. While not Navy projects, Navy worked with the developers to enable the farms to move forward, while also ensuring that they minimize the potential for interference with the installations’ radar and pilot training.

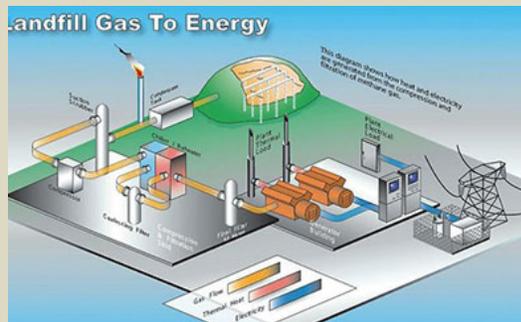
HIGHLIGHTS

Sub-Goal 1.2: Selected DoD Success Stories on Renewable Energy

MCLB Albany Combines Landfill Gas and Cogeneration

Marine Corps Logistics Base (MCLB) Albany used a \$20 million ESPC to utilize biogas from a nearby landfill to fuel a cogeneration plant. The dual-fuel boilers on the plant can run on landfill gas, natural gas, or a blend of the two, generating 1.9 MW of renewable electric power. The boilers are also capable of producing 10 million Btu per hour of steam from the landfill gas. The plant uses a stack heat recovery steam generator to produce 3.3 million Btu per hour of steam for base process operations, from the exhaust heat generated by electricity generation.

This project and other renewable energy generation on the base produce about 17 billion Btu per year, equivalent to more than 10% of the installation's total electricity consumption. The combined projects save the base more than 135 billion Btu and \$2.2 million every year. (Schematic: Chevron Corp.)



Solar Meeting Over One-Third of Electricity Needs at Burlington Air National Guard Base

The base installed 2.2 MW of solar PV capacity over an 11 acre area, which is now meeting 34% of the base's total electricity needs, while reducing electricity bills by an estimated \$250,000 every year. The base won a 2013 Federal Green Challenge Award from EPA for the project.

Edwards AFB PV Arrays Financed with PPA

A 3.0 MW solar PV project spanning three sites on Edwards AFB, CA, was completed in April 2012. The 4,044 panels span 18 acres, and track the sun with a ground-mounted, low-profile, single axis tracking system. Each site has a custom data acquisition system to optimize power output. The base will receive about 4.5% of its total electricity consumption from the project, or approximately 6,700 MWh.

The project was financed through a ten-year power purchase agreement, where the developer designed and built the system, and owns it over the contract period. Edwards AFB buys the power from the developer at a fixed long-term rate.

White Sands Missile Range: World's Largest Low-Concentration PV Array

A new 4.1 MW solar PV array at White Sands Missile Range, NM, was constructed under a \$16.8 million ESPC. Generating about 10 million kWh of electricity per year, the system will supply about 10% of all electricity consumed at the installation (in combination with a 375 kW PV carport), while saving the base \$930,000 every year. The base will consume all electricity generated by the system.

The array is equipped with a ground-mounted single-axis Solaria tracking system that captures up to 30% more solar radiation by following the sun's movement. The contractor will maintain and operate the system, and will sell the electricity to the base at the same rate it was paying the local utility company at the time the contract was signed. The system was under construction from April through December 2012. The Army will maintain ownership of the renewable energy credits. (Photo: U.S. Army)



Other examples of FY 2012 Navy renewable energy projects are a solar farm that will provide 1.23 MW of electrical capacity for more than 600 military homes in Hawaii, and a very large PV array (over 2,500 panels) on the roof of NAS Jacksonville's Hangar 1122. The latter installation – an American Recovery and Reinvestment Act project completed ahead of schedule – will handle about one-quarter of the hangar's electricity consumption.

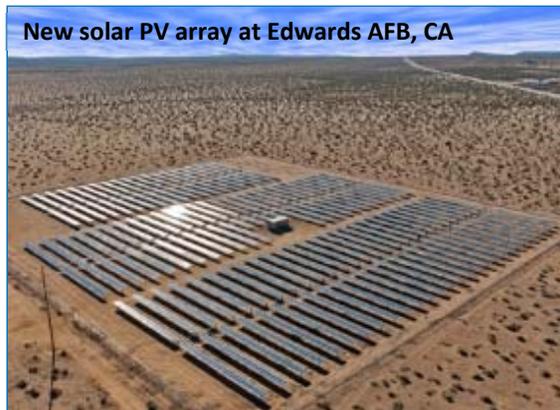


Photo: U.S. Air Force

In addition to building new capacity, the Navy continued conducting research and development to promote renewable energy. In June 2012, Naval Construction Battalion Center Gulfport completed construction of a 196-foot meteorological tower in Gulfport, MS, to measure wind energy resources in southern Mississippi and determine if wind is a viable resource there. The Navy is conducting the project in partnership with two power generators: Mississippi Power and Southern Company. In Kanehohe Bay, HI, DON and DOE worked throughout the year to ensure the availability of a wave energy testing and evaluation facility for the shallow water test site in the bay.

Army activities in FY 2012 will substantially increase the amount of renewable energy available to the Army in the near term, with 16.3 MW of new renewable electricity capacity in the pipeline due to FY 2012 contracts and construction starts. ESPCs, UESCs, and other utility agreements accounted for 14.1 MW, with the remaining 2.2 MW awarded through ECIP. One of the FY 2012 projects is the largest solar PV project in the Army, the 4.1 MW array at White Sands Missile Range (see success story). Further, in August 2012, the Army issued a \$7 billion Multi-Award Task Order Contract Request for Proposal for the procurement of renewable energy (biomass, geothermal, solar, and wind) on or near DoD installations. The funding mechanism will be available to all Services. The funding mechanism will significantly reduce the time needed to procure renewable energy contracts using private sector financing. The Army's Energy Initiatives Task Force, established in 2011, screened more than 180 active Army and Army National Guard installations to identify sites with the best potential for large-scale renewable energy development. Of the initial set screened, the Task Force evaluated 23 potential opportunities and sent 17 of those forward for detailed review using a structured analytical process. The Task Force also conducts extensive outreach on an ongoing basis



Photo: DLA

Installation of ground source heat pump, Defense Supply Center Richmond, VA

to renewable energy companies and others from industry, to promote the Army's renewable energy goals and opportunities.

DLA has been actively ramping up the amount of renewable energy generated on its host facilities. In FY 2011, DLA funded six solar thermal projects and one PV installation, and in FY 2012 the number grew to nine projects. To plan for continued growth, DLA conducted surveys of renewable energy potential at each of its host sites in 2012.

Recovery of Biogas

As of the end of FY 2012, three DoD installations had new projects (online in FY 2010 or later) to make use of biogas, all from landfills:

- 1) Fort Benning, GA;
- 2) Marines Corps Logistics Base Albany, GA; and
- 3) MCAS Miramar, CA.

The MCAS Miramar project was new in FY 2012. Through a PPA with a private contractor, the base will purchase up to 3 MW of electricity from a landfill gas generator being built at the landfill, which is located on the base but owned by the City of San Diego. The biogas generator offsets a significant amount of the Air Station’s annual electricity load.

The Army completed a feasibility study in FY 2012 of 14 active and 107 closed landfills and landfill cells for methane recovery potential. This study evaluated the landfill’s age and waste composition, potential methane generation rates, local utility rates, and proximity to facilities and utilities connections. The study found that only two of the landfills are predicted to generate methane at sustained rates sufficient for cost-effective methane recovery.

Sub-Goal 1.3 – Vehicle Fleets

Petroleum consumption by the Department’s non-tactical vehicles was 19.5% lower in FY 2012 than the base year of FY 2005, far exceeding the target of 14%. Progress DoD has made towards the FY 2020 target is shown in Figure 5. Figure 6 presents FY 2012 performance broken out by Military Service.

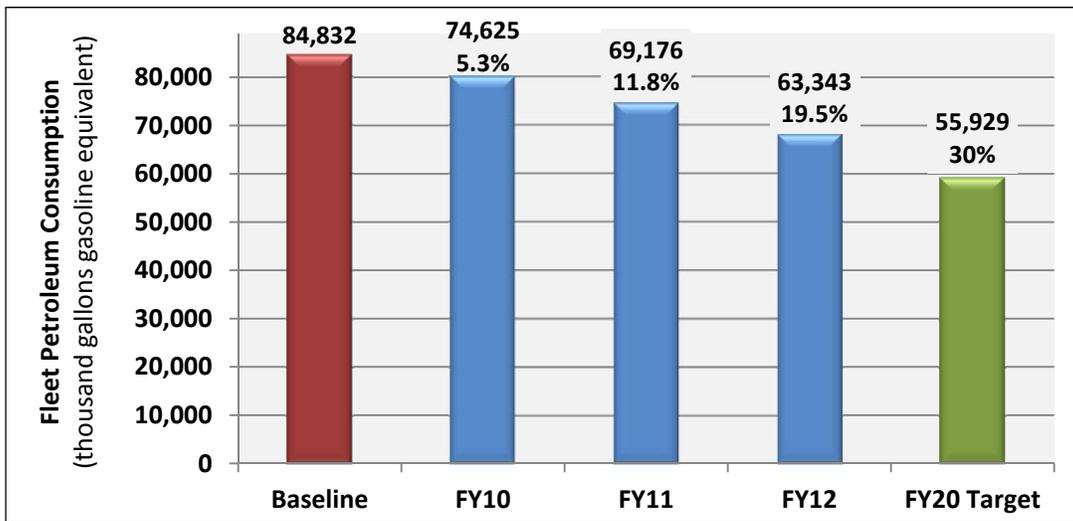


Figure 5. DoD Non-Tactical Vehicle Fleet Petroleum Consumption Since the FY 2005 Base Year

The Navy’s consumption of vehicle petroleum fuel was lower than the baseline by one-fifth. Part of the Navy’s success can be attributed to an increased use of alternative fuels, including electricity. It is participating in a General Services Administration (GSA) pilot study of light-duty vehicles that are either all-electric (Nissan Leaf®) or a plug-in hybrid (Chevrolet Volt). If the pilot results are favorable and the costs comparable, the Navy will purchase additional vehicles. The Navy has also been replacing conventional light-duty vehicles with hybrids, although higher costs and limited model availability have been an issue. In addition to light-duty vehicles, the Navy has been conducting a demonstration project with the other Services to evaluate emerging medium and heavy diesel hybrids, both electric and hydraulic. So far, testing has been completed at Aberdeen Proving Grounds, MD, and the test trucks are now at Naval Station San Diego and Naval Base Kitsap Bangor

for real-world assessment of fuel economy, maintainability, reliability, and in-use performance. To support electric vehicle (EV) infrastructure, some installations in the Southwest have been installing PV panels to power charging stations. The Navy has also continued ramping up infrastructure for alternative fuels, awarding a \$10 million contract in 2012 to install 20 alternative fueling stations. To optimize fleet size and streamline vehicle dispatching, the Navy uses fleet-type car sharing technologies demonstrated by past pilots, including automated (web-based) reservations, geographic tracking equipment, and keyless entry systems. The Marine Corps was also highly successful in driving down its use of vehicle petroleum fuel in FY 2012, reaching a 23.4% reduction relative to the baseline (see Figure 6).

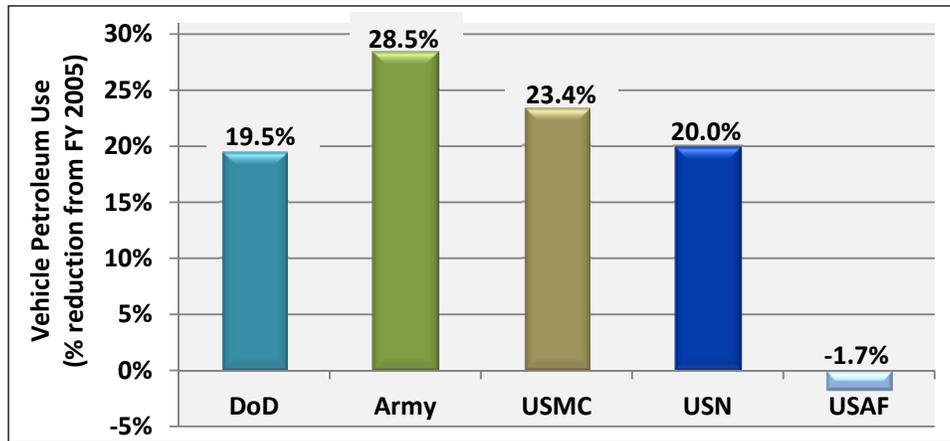


Figure 6. FY 2012 Non-Tactical Vehicle Petroleum Consumption by the Services

The Army reduced its vehicle petroleum consumption by 28.5% in FY 2012, and so it anticipates reaching the 30% mark next year, seven years ahead of the FY 2020 goal. This is possible in large part due three Army requirements for vehicles leased through GSA: (1) vehicles will have the highest rating for GHG emission reductions; (2) vehicles will have the highest fuel efficiency available on the market; and (3) E85 vehicles (that run on a blend of 85% ethanol and 15% gasoline) will only be located where E85 fuel is available, and will utilize the fuel exclusively. The Army continues to use the annual GSA vehicle replacement cycle to eliminate large vehicles (Classes III and IV) not required for justified missions, and in FY 2012 the Army identified 300 vehicles for replacement with smaller, more fuel-efficient vehicles, and approved only 15 Class III and IV sport utility vehicles for retention.

Petroleum consumption in the non-tactical fleet rose somewhat in FY 2012 for the Air Force, 1.7% above the baseline. One step the Air Force took to address this was to update its Fleet Management Plan in FY 2012, to include a standard policy to consolidate or pool vehicles that are required for infrequent mission support. The policy has helped units pare down their fleets, with approximately 1,400 GSA-leased and Air Force-owned underutilized vehicles eliminated since August 2011. In total for FY 2012, the Air Force decreased the size of its vehicle fleet by 768 vehicles. Since FY 2005, 4,111 vehicles were eliminated from the Air Force inventory, a decrease of 7%. Over this same period, the number of alternative fuel vehicles (AFVs) rose from 10% to over 22%, with 9,973 E85 and 1,759 hybrid electric vehicles as of FY 2012. To aid in continuously improving these numbers, the Air Force became a key member of the Hybrid Truck Users Forum of the Tank-Automotive Research, Development and Engineering Center, which seeks to increase hybrids on the GSA schedule for heavy-duty applications.

DLA has aggressively reduced its petroleum vehicle fuel use through four approaches. First was to add this metric to the DLA Director’s Annual Operating Plan review, giving it increased visibility and emphasis. Second, the composition of the fleet was optimized using the Vehicle Allocation Methodology analysis process. Third, DLA doubled the amount of alternative fuel used, both by increasing the availability of E85 and increasing the number of E85 vehicles. Finally, in FY 2012 the agency established a Fleet Management Council to provide guidance on optimizing the fleet, and a Fleet Management Working Group to help execute the Council’s guidance. In October 2012, DIA published its petroleum reduction implementation strategy, DIA Instruction 4500.002, “Management, Control and Utilization of Government Vehicles assigned to the Defense Intelligence Agency,” requiring DIA employees to follow federal and DoD vehicle acquisition guidelines. It also minimizes the number of individuals issued vehicles for their full-time use, and requires employees needing a GSA fleet vehicle for official duties to sign it out from the DIA Transportation Office, significantly reducing the vehicles required and ensuring that they are used only for mission-essential purposes.

Sub-Goal 2.1 – Facility Water Intensity

The Department reduced the water intensity of its facilities by 18.6% in FY 2012, relative to the FY 2007 baseline, well in excess of the 10% target (Figure 7). The relative contributions of the Services to the FY 2012 DoD result is provided in Figure 8.

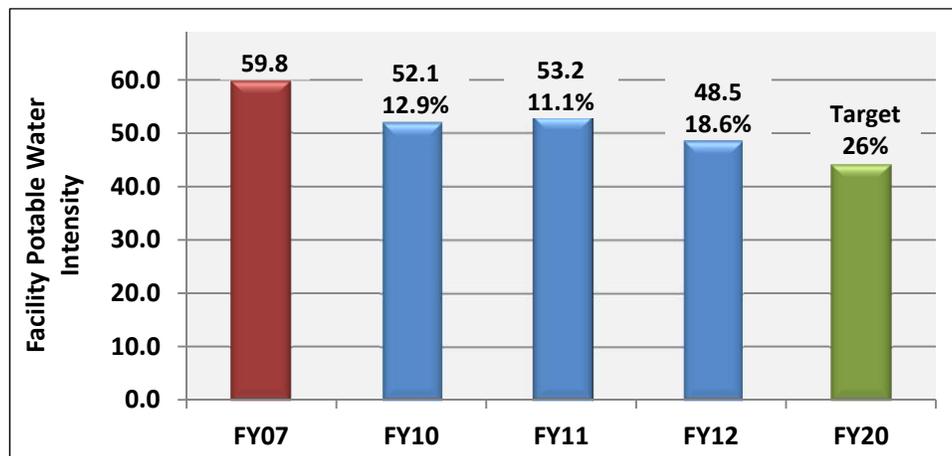


Figure 7. DoD Potable Facility Water Intensity Since the FY 2007 Baseline

The Army had the best performance among the Services, reducing water intensity by more than 25% in FY 2012 relative to the baseline. Its success reflects the Army’s commitment to manage water as a critical resource, institutionalized in the Army Campaign Plan – which has water use and water security as a major objective – and the Army Net Zero Water initiative. In FY 2012, the Army completed water balance assessments on the eight Net Zero Water pilot installations. The assessments calculated baselines and historic and current consumption trends at both the installation and building levels, and identified the largest water consumers and potential problem areas, such as high leak rates. The Army also developed a water and wastewater management plan template to help installations develop meaningful plans for the use of all types of water, and to track usage. The Marine Corps came in a close second to the Army, reducing water intensity by 24.4% through a combination of ongoing facility upgrades and incorporating water efficient designs in new facility construction.

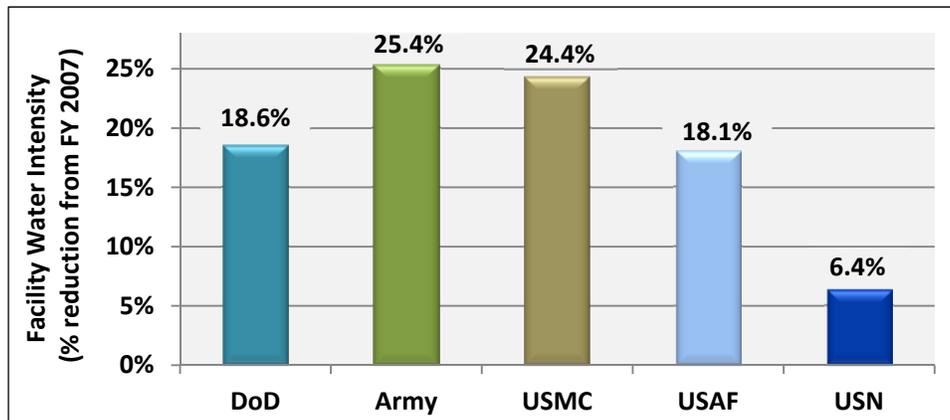
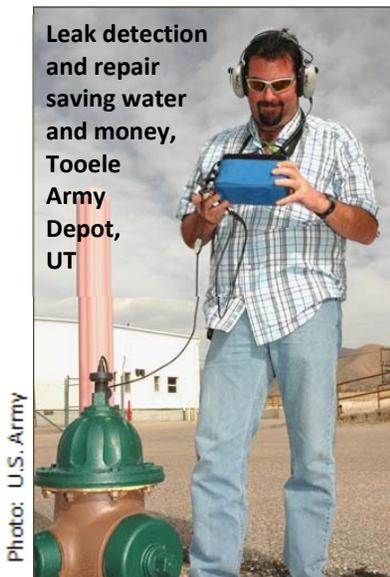


Figure 8. FY 2012 Facility Water Intensity of the Services

The Air Force has been exceeding water intensity targets in recent years, and did so again in FY 2012, with an 18.1% reduction from baseline. It has been driving down its water intensity through a five-step process: (1) leak detection and infrastructure repair; (2) fixture replacement and upgrade; (3) disconnecting irrigation systems; (4) incorporating LEED principles; and (5) using non-potable sources whenever possible.



The Navy reduced water intensity by 6.4% in FY 2012, a performance hindered by a major leak on one of the installations, and perhaps by the inclusion of water consumption by ships in port as part of facility water. The Navy is demonstrating and validating a new “smart” irrigation system in FY 2013 at Naval Base Ventura County, to help installations understand this approach to more efficient irrigation. In September 2012, the existing irrigation system was retrofitted with an advanced control system to reduce the demand for landscape irrigation, and the demonstration project will validate the potential savings possible with this approach.

The WHS Facility Services Directorate is in the process of designing a project that will implement a new automatic boiler blowdown system and heat exchanger at the heating and refrigeration plant. The project is expected to reduce water consumption by 5 million gallons of water annually compared to the current operation. WHS is also conducting several energy and water audits at the Pentagon that will identify potential water savings.

NSA is conducting a feasibility study on using reclaimed water from a local county wastewater treatment plant for its chilled water systems in place of potable water. NRO reduced its overall facility water intensity through a variety of measures at different sites, including:

- Modifying landscaping practices to save an estimated 40,000 gallons of potable water.
- Reducing water usage by urinals by 75% through no- and low-flow urinals.
- Improving the operating efficiency of water cooling towers through an enhanced cleaning process, a significant improvement since approximately 90% of this site’s potable water usage is consumed by plant operations.
- Humidifying only the data center room rather than the entire facility, saving up to 80,000 gallons per month.

HIGHLIGHTS

Sub-Goal 2.1: Selected DoD Success Stories on Reducing Facility Water Intensity

Avoiding High Water Costs with Waterless Urinals at RAF Lakenheath

The high cost of water in the United Kingdom led Royal Air Force Lakenheath (home of the 48th Fighter Wing) to replace 500 water flushing urinals across the base with waterless urinals that work with microbial cubes (“solo cubes”) rather than water. The initiative is expected to save \$400,000 annually, and reduce water consumption by an estimated 20 million gallons of water per year. Another benefit is reduced maintenance costs: in traditional urinals, scale deposits build up on the inside of the piping over time and periodically need to be removed. The microbes in the solo cubes feed on salt in urine and on the scale built up in the pipes, which converts the scale into a softer product that can be flushed down the pipes. There were two lessons learned from the project. One is that during the first four weeks of use, the microbial solo cubes produce an odor as years of built up scale is broken down, but ultimately the process is reportedly more sanitary than traditional urinals. The second is that waterless urinals do not work well in low-traffic bathrooms because a membrane within the urinal can dry out and not function properly.

DLA Installation Cut Water Use by 42%

The DLA Defense Supply Center in Richmond, VA, reduced water consumption by 42% from FY 2011 to 2012, due to several major improvements that came online late in FY 2011. The installation completely renovated the leaking internal water distribution system, replacing (and recycling) the water mains that had been made entirely of cast iron. In addition to reducing leakage, the strength of the new infrastructure enabled the use of high-efficiency variable speed drives and energy efficient fire pumps, which is saving the facility energy as well as water. Also, the improvements have eliminated the need to periodically flush the water lines to maintain water quality, and they have allowed the installation to decommission two elevated steel water storage tanks. All told, this water distribution project reduced the installation’s overall water usage by 42%, a significant accomplishment given that the FY 2010 baseline consumption was almost 45 million gallons at a cost of over \$60,000.

Leak Repairs Slashed Water Consumption by One-Third at Tobyhanna Army Depot

The leak detection program at Tobyhanna Army Depot, in Pennsylvania, reduced water consumption by 34%. The program began in FY 2010 with a leak detection survey of all accessible pipes in the water distribution system. Survey activities were conducted during regular business hours as well as overnight, during off-peak times for both traffic flow and water consumption, allowing quiet leaks to be accurately detected. The leak locations were pinpointed with an electronic correlation system having an accuracy of 1 meter, and estimated the size of each leak in gallons per day. Six potential leaks were detected and repaired, saving an estimated 40,000 gallons of water per day.

In FY 2011, the Depot expanded the effort, installing 55 acoustic leak detection sensors or loggers. The loggers attach magnetically to major valve stems along the water distribution system, and record water sound level and frequency. The data collected is transmitted to a downloading device on the underside of the valve box. To optimize their effectiveness, the loggers were programmed to listen for noises during low water use periods. Eight water leaks, estimated to total 46,000 gallons per day, were identified in FY 2012. Monthly surveillance and data collection typically takes 6 to 8 hours. Tobyhanna estimates their leak detection efforts are saving 17 million gallons per year. Tobyhanna received an FY 2012 FEMP award for their efforts. *(Photo: U.S. Army)*



At its new NGA East facility, NGA installed meters for potable water intake, evaporative loss, waste water discharge, runoff, and irrigation, most of which are integrated with the building's automated systems.

Sub-Goal 2.2 – Irrigation, Landscaping, and Agricultural Water

Although issues are still being resolved to ensure high-quality data on the consumption of irrigation, landscaping and agricultural water, the Services and other Components continue to make reductions, through xeriscaping and drought-tolerant landscaping, reclaiming wastewater for use in irrigation and industrial applications, and more efficient irrigation systems. Some examples of successes are highlighted on the next page.

Sub-Goal 2.3 – Stormwater Runoff

Of the total DoD development and redevelopment sites greater than 5,000 GSF, 98% implemented where technically feasible the requirement for post-development stormwater runoff to be no more than the pre-development runoff, as per the criteria of this sub-goal.

BEST PRACTICE: Approach for Widespread Adoption Institutionalizing Stormwater Management into Day-to-Day Practices

USAG Hawaii has made low-impact development standard operating procedure. Since 2010, the installation has incorporated LID into the designs of nearly two dozen new construction and redevelopment projects. Features have included bioretention facilities, bioswales, permeable paving, rainwater harvesting, downspout disconnection, and underground retention systems with stormwater quality structures, as well as specifications on the use of more drought-tolerant native plants. This is made possible by the installations' Master Plan, which contains actionable goals to increase the use of LID to manage stormwater to reduce runoff, and the issuance of a post-construction stormwater management enforcement policy for new construction and redevelopment. The garrison's Environmental Division staff actively reinforce these LID requirements, including regular maintenance of bioretention features, and the base regularly hosts educational presentations and seminars.

In the Navy, 94% of its covered projects (15 out of 16) implemented where technically feasible with the stormwater runoff requirements of sub-goal 2.3. The Navy reports on its low impact development (LID) requirements using the electronic tool "eProjects" to capture, analyze, and report data. In FY 2012, the Navy deployed a new web-based, process-driven training module with the objective of improved data quality and consistency by ensuring project managers are uploading data appropriately. Also, the Naval Facilities Engineering Command has begun cross-functional discussions to better understand and manage the operation, maintenance, and assessment of the LID program in order to continually improve overall results. One result of the cross-functional discussions was a new Public Works Business Process that specifically documents the process for ensuring that new LID features are enrolled into the installation level operation and maintenance program.

In FY 2012, 64 out of 67 Air Force development and redevelopment projects over 5,000 square feet (95.5%) implemented the pre-development hydrology requirements, and 100% of U.S. Marines Corps (USMC) sites did (17 out of 17).

HIGHLIGHTS

Sub-Goal 2.2: Selected DoD Success Stories Reducing Irrigation, Landscaping and Agricultural Water

Partnering with the Local Municipality for Non-Potable Irrigation Water

Altus AFB in Oklahoma partnered with the City of Altus to provide a non-potable water irrigation system for the base golf course. Water is supplied to the city by the water utility, the Mountain Park Conservancy District, from the Tom Steed Reservoir. The base worked with the City, the utility, and the U.S. Bureau of Reclamation to gain approval to divert 48 million gallons of untreated water per year from the reservoir to the installation. The base is saving about \$48,000 a year by receiving untreated versus treated water.

The base is not the only beneficiary: the City of Altus is saving approximately \$12,000 a year in operational costs to avoid treating the diverted water, and an additional 12 million gallons of water per year are saved that would have been consumed by the treatment process. The project also gives the city additional capacity for their water treatment system.

Using Reclaimed Wastewater for Golf Course Irrigation, NAS Corpus Christi

In February 2012, NAS Corpus Christi and local council members entered into an agreement to bring reclaimed water from the city's wastewater plant—treated but not potable—to the installation's golf course. The City of Corpus Christi Water Department arranged for the purple piping infrastructure to take the water from the wastewater treatment plant to the fence line of the base, a little under one mile away, through a \$1.0 million contract. The base Department of Morale Welfare and Recreation handled the infrastructure on the base, at a cost of \$1.2 million. The cost to the base will quickly be repaid, however. The base is currently using 96 kilogallons (kgal) of reclaimed water on an annual basis, which the City provides at no cost. This represents a savings for the base of \$384,000 per year, based on the city's rate of \$4.00 per kgal, for a payback period of just three years and two months. With the new source of non-potable water, the base is able to maintain the golf course in a better condition.

Waterless Industrial Process, Joint Systems Manufacturing Center, Lima

The Joint Systems Manufacturing Center in Lima, OH, converted their existing paint booths from a water-wash filtering system to a dry-filter system that uses no water. All their paint booths have been converted, or installed with dry filter systems, including the new pre-treat and paint line for the Expeditionary Fighting Vehicle paint process. The change is saving the Center over 39,000 gallons of water every year, with an associated annual savings of \$7,500.

Switching to Xeriscaping in an Arid Climate at NAS China Lake, CA

NAS China Lake has been steadily reducing its water intensity since 2007, cutting its consumption almost in half going into FY 2012. During FY 2012, the base completed plans to replace the existing landscaping of turf and trees with xeriscaping and a much smaller area of turf. Also, the existing irrigation system will be replaced with a more efficient one. The project, being implemented during FY 2013, will reduce the amount of water used for irrigation by another 37% (185,000 kgal), for a cumulative reduction of about 85% since efforts began. Although xeriscaped, the end result will be more aesthetically pleasing grounds, creating an official parade ground and increasing the numbers and species of trees and shrubs. After this project, the base has set its sights on another 35 sites to be re-landscaped in ways that will save an additional estimated 150 million gallons of water per year.



Laying pipe to deliver non-potable water to Altus AFB, OK

Photo: U.S. Air Force

The Army uses the LEED certification process, which has a stormwater requirement equivalent to sub-goal 2.3, for its new developments and redevelopments. Therefore, since all 124 projects were LEED-certified (121 of them at Silver or higher), 100% of all FY 2012 projects implemented the stormwater runoff requirements. In January 2013, the Army issued two comprehensive guidance documents on LID: broad guidance titled [Army Stormwater Management Using Low Impact Development](#), and a Technical User Guide titled [Army Low Impact Development Technical User Guide](#) targeting installation Departments of Public Works and especially Master Planners and LID project designers. To complement these, the Army issued an automated LID design application planning tool. The Army LID guidance helps installation personnel understand how to incorporate LID into the initial stages of project planning, the Planning Charrette, Design Charrette, Parametric Design Report, and cost estimate process, and how to prepare the Military Construction Project Data Sheet (DD Form 1391). The USACE [Sustainability & Energy Portal](#) houses all of these materials. The Army continued to hold formal LID training courses in FY 2012, with approximately 100 Command, installation, and USACE District master planners and project designers receiving training in two courses.

Goal 3 – GHG Emissions Associated with DoD Operations Reduced

For those DoD GHG emissions targeted by the Department’s GHG reduction commitment, DoD reduced its total FY 2012 emissions by 2.5 million metric tons (9.2%) from the FY 2008 baseline. Total DoD GHG emissions for FY 2012 (subject to the reduction target) were 31.3 million metric tons of CO₂-equivalent emissions, when third-party operated renewable energy generation is included.² The relative contributions to DoD’s FY 2012 GHG inventory from different sources are shown in Table 3 and Figure 9, illustrating the significance of fossil fuel energy sources to DoD’s GHG emissions across all Scopes.

Sub-Goal 3.1 – Scopes 1 and 2 GHG Emissions

The Department has been making steady progress reducing its GHG emissions from Scopes 1 and 2 sources, as shown in Figure 10. In FY 2012, DoD’s reduction reached 9.2% from the FY 2008 baseline, reflecting continued reductions in the energy used by its facilities, evidenced by the decline in GHG emissions from purchased electricity and on-site stationary combustion (8.0% and 9.7% from the baseline, respectively).

Van Sharing for Joint Base Elmendorf Richardson Employee Commuting

Joint Base Elmendorf Richardson’s Share-A-Ride program has 63 vans that transport employees to and from the base on a daily basis, greatly reducing the number of trips made by single occupancy vehicles. The program is estimated to eliminate more than 2 million miles of vehicle travel every year, along with the consumption of 82,368 gallons of fuel. Since each van takes up to 11 cars off the road, the program also reduces traffic congestion and pollution. *(Photo: U.S. Air Force)*



Share-A-Ride van at Joint Base Elmendorf Richardson, AK

²This total reflects the inclusion of Scope 3 renewable energy credit DoD receives for third-party operated renewable energy generation hosted on DoD land, for which DoD does not retain the renewable energy certificates (RECs). Without this credit, target subject emissions totaled 32.0 million metric tons of CO₂-equivalent.

Table 3. Change in DoD Target Subject GHG Emissions From FY 2008 to FY 2012

Scope and Category		DoD GHG Emissions, MT CO ₂ (e) ^a				% Decrease (FY08-12)
		FY 2008 (for FY12)	FY 2010	FY 2011	FY 2012	
Scope 1	Stationary Combustion	6,734,997.9	6,675,076.1	6,402,834.9	6,079,765.1	
	Non-highway Vehicles, Aircraft, Ships, Equipment	1,735,214.5	985,175.7	1,563,140.2	1,456,532.9	
	Passenger Fleet Vehicles	728,564.4	677,659.0	640,370.9	616,337.6	
	Fugitive, Fluorinated Gases, Other	222,646.0	298,922.8	231,000.4	195,250.9	
	Fugitive, On-site Wastewater Treatment	6,088.2	6,355.6	6,429.9	6,565.2	
	Fugitive, On-site Landfills	216,438.2	1,098,382.1	255,782.4	249,466.4	
	Industrial Process Emissions	3,401.4	3,323.6	3,776.4	0.0	
Scope 2	Purchased Electricity	16,349,506.1	15,908,249.1	15,740,309.1	15,045,723.9	
	Purchased Biomass Energy	0.0	9,815.4	5,356.5	8,651.3	
	Purchased Steam and Hot Water	858,251.8	1,764,419.2	1,016,068.5	954,996.5	
	Purchased Chilled Water	0.0	0.0	1,681.4	0.0	
	Purchased CHP Electricity, Steam & Hot Water	0.0	0.0	27,965.9	0.0	
	Reductions for Renewable Energy Use	0.0	-415,116.8	-213,943.7	-226,262.6	
Scopes 1 and 2		26,855,108.6	27,012,261.8	25,680,772.7	24,387,027.2	9.2%
Scope 3	Transmission & Distribution Losses	1,048,499.6	1,037,453.3	1,012,183.2	980,601.1	
	Adjustment, Transmission & Distribution Losses RECs	n/a	n/a	n/a	-12,466.7	
	Employee Business Air Travel	2,301,318.0	1,886,310.6	2,385,018.8	2,093,246.3	
	Employee Business Ground Travel	244,181.2	328,139.9	241,877.3	258,197.1	
	Employee Commuting	3,397,096.5	3,473,736.3	3,842,157.3	3,819,943.3	
	Off-site Wastewater Treatment	7,726.6	7,493.0	7,443.6	7,346.0	
	Contracted Municipal Solid Waste Disposal	635,324.9	621,688.8	593,354.8	457,644.9	
	Credit for Hosting Renewable Energy Facilities	n/a	-747,640.8	-658,473.0	-665,522.7	
Scope 3^b		7,634,146.9	6,607,181.2	7,423,562.0	6,938,989.3	9.1%
Total Emissions		34,489,255.5	33,619,443.0	33,104,334.7	31,326,016.5	9.2%

^aMetric tons of carbon dioxide equivalent. Does not include excluded emissions.

^bWhen renewable energy hosting credits are not included, the decrease in Scope 3 emissions from FY 2008 to 2012 is 0.4%, and the decrease in total GHG emissions is 7.2%.

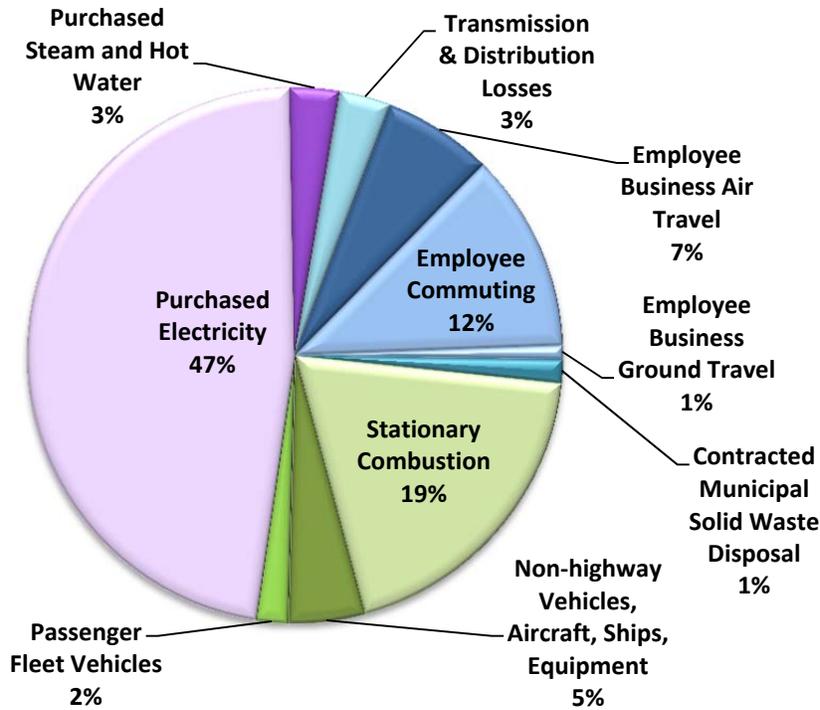


Figure 9. The Top Ten Contributors to the DoD FY 2012 GHG Inventory
 (Categories based on percent of total DoD target subject emissions. Scope 1 emissions are shown in green, Scope 2 in purple, and Scope 3 in blue.)

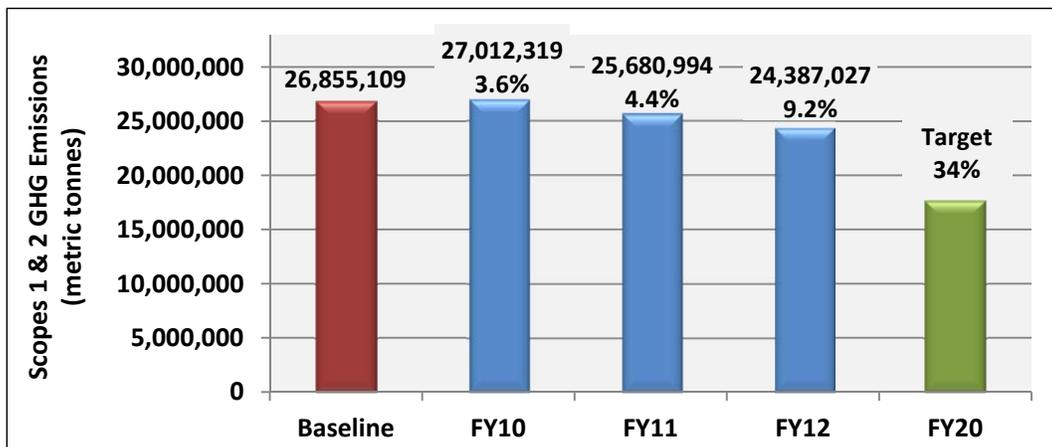


Figure 10. DoD Scopes 1 and 2 Target Subject GHG Emissions Since the FY 2008 Base Year
 (percent reductions are from the baselines submitted for each respective reporting year)

Sub-Goal 3.2 – Scope 3 GHG Emissions

The Department’s Scope 3 emissions were considerably lower in FY 2012: a decline of 9.1% relative to the FY 2008 baseline (revised in FY 2012), when hosted renewable energy is included. Reduced transmission and distribution losses, tracking the reduction in purchased electricity, is responsible for some of this progress, along with a 9.0% decline in emissions from employee air travel. Employee commuting in FY 2012, however, was more than 12% *higher* than the baseline due to increases in the U.S.-based population due to redeployment of forces from overseas. Overall, DoD

progress reducing Scope 3 emissions, compared to the baseline and FY 2020 target, is illustrated in Figure 11 (hosted renewable energy included).

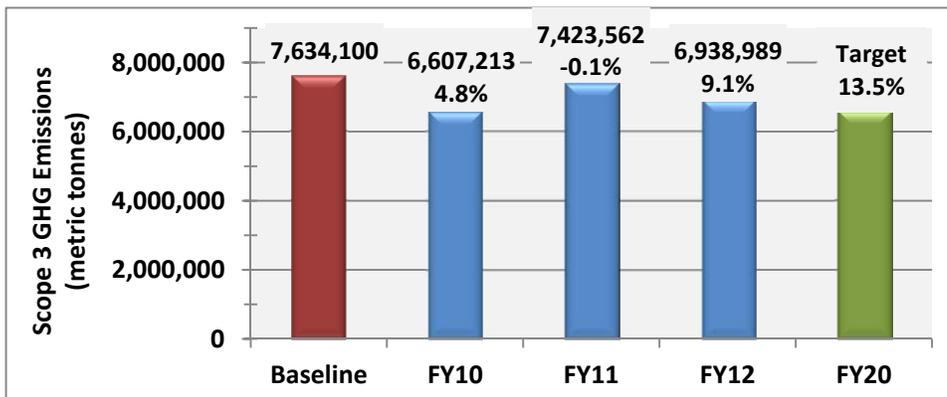


Figure 11. DoD Scope 3 Target Subject GHG Emissions Since the FY 2008 Base Year
(including hosted RE credit; percent reductions are from the baseline revised in FY 2012)

Sub-Goal 3.3 – Telework

Of those DoD employees eligible for regular, recurring telework in FY 2012, about 8% did so at least once per bi-weekly pay period, falling short of the 10% target for FY 2012. The FY 2012 result is an estimated figure, since reporting and determinations of eligibility are based on position eligibility. Employee eligibility has not yet been finalized across the Department, but will likely be reduced, with a concomitant percent increase in participation, since all employees in eligible positions will not be eligible to telework due to employee performance or conduct status. While the aggregate target was not achieved in FY 2012, noteworthy progress has been made with several Components achieving or significantly exceeding the participation target. DON achieved 10% teleworking in FY 2012, and the Defense Media Activity receives the DoD distinction for the highest telework participation, with 41%.

Several DoD enterprise-wide initiatives and actions contributed to a successful increase in telework participation in FY 2012. One was the revised DoD Instruction (DoDI) 1035.01, [Telework Policy](#), issued by the Department on April 4, 2012. The revised policy ensures that the requirements of the federal government Telework Enhancement Act of 2010 are met, and it created the conditions for successfully implementing enhancements to the DoD telework program.

Shifting the DoD culture to recognize telework as a normal way of doing business was facilitated by ongoing OSD efforts to develop the functionality for determining position and employee eligibility in the Defense Civilian Personnel Data System. DoD requires telework eligibility to be established in the system before new positions can be recruited, allowing DoD organizations to identify position eligibility from the onset of the recruitment process. By the end of FY 2012, 53% of DoD positions were determined to be telework eligible.

The Department further promoted teleworking in FY 2012 by implementing a DoD Telework Strategic Communication and Marketing Plan. This plan resulted in the use of multiple methods of communication to promote telework in DoD, such as an interview with the Deputy Assistant Secretary of Defense for Civilian Personnel Policy on the Pentagon Channel, postings on defense.gov, and media outreach. The outreach facilitated increased employee, management, and

senior leader awareness of DoD telework policy and the benefits of telework. Also in FY 2102, the Defense Civilian Personnel Advisory Service provided status briefings on the telework program to the Civilian Personnel Policy Council, keeping DoD Executive Level Human Resources leadership apprised of implementation progress. The Defense Civilian Personnel Advisory Service also held monthly meetings with the DoD Component telework coordinators, and these will continue to be a practice to facilitate ongoing DoD-wide effective communication in 2013.

Among the individual DoD Components, efforts continued during FY 2102 to increase regular employee participation in teleworking. The Navy continues to train managers and supervisors on telework eligibility determination, developing telework agreements for employees, and the benefits of telework. In FY 2012, the Army completed its review to determine the eligibility of its workforce for teleworking, coding 96,555 (38%) of the 253,622 civilian employees (excluding National Guard Technicians and Local National employees) as eligible. Of those eligible employees, 4.7% teleworked at least once per bi-weekly pay period on a regular, recurring basis. The Army improved the connectivity for teleworking employees in FY 2012 by beginning the transition to Enterprise Email and launching a webmail application that improves access to Army email accounts. The USMC developed a formal telework plan and continues to train managers and supervisors on telework eligibility determination, developing telework agreements for employees, and the benefits of telework.

DLA has an active telework program that is highly visible with employees and focused on mission continuity and readiness. Participation in teleworking has been steadily increasing at DLA, both in terms of the percentage of employees eligible and the percent of those teleworking. The portion of DLA employees deemed eligible to telework was 61.4% in FY 2012, up almost 14% from FY 2009. Eligible employees teleworking on a regular basis have increased every year since FY 2009, and now stands at 32.3%. See the Best Practices box on the next page for details on how DLA has been successful with its telework program. Out of 2,350 civilian employees in MDA, 403 were determined to be eligible for regular, recurring telework at least once every two weeks. As of January 2013, about one-quarter (99) of these had telework agreements. In FY 2012, MDA completed all discussions between supervisors and employees regarding job duties and expectations, resulting in a more accurate determination of eligibility to telework on a regular recurring basis, versus a situational basis.

In NGA, 25% of eligible employees are teleworking at least once per bi-weekly pay period. The agency has increased participation through a number of measures: interagency agreements to share work space; administrative changes to improve the accuracy of reporting; and increasing the technical capability to work from remote locations, for example by issuing tokens that enable access to classified and unclassified networks from remote locations. NRO added three secure telework locations in FY 2012. Currently, 60 NRO employees telework to one of five approved alternate work locations, saving approximately 150,000 commuter miles in FY 2012. With DIA, a major obstacle with teleworking is the classified nature of its mission, which primarily requires that work be performed in a sensitive compartmented information facility using classified computers. However, DIA expects more participation due to the growing availability of secure "hoteling" or "flexiplace" options. As part of its efforts to promote teleworking, in June 2012, DIA issued Instruction 1500.002, "Telework Program." More than half of Tricare Management Activity (TMA) employees eligible to telework did so on a regular basis at least once per pay period, due in part to the positive attitude generated by senior management.

BEST PRACTICE: Approach for Widespread Adoption

Telework Works at DLA

Of those DLA employees eligible to telework, almost one-third telework on a regular basis, an amount that has been steadily increasing. The portion of employees determined to be eligible for teleworking has also been steadily increasing each year at an even more rapid rate. Further, DLA's annual employee survey and annual reports from DLA activities indicate that supervisors and employees believe performance is either stable or improved with telework. The reasons for this success can be traced to a five-pronged approach:

1. **Engage senior leadership** – DLA established enterprise-wide metrics for telework, and engaged senior leadership by aligning telework targets with the strategic planning process, thereby holding officials accountable for program advancement.
2. **Use flexible workplace alternatives** – Hoteling, which sets aside work stations for teleworkers needing occasional office space, was successfully demonstrated with a pilot in the DLA Energy Activity. Based on successes and lessons learned from the pilot, DLA activities are now authorized to use more creativity in managing their footprints.
3. **Identify barriers** – DLA added an in-depth telework array to its 2012 culture/climate survey instrument to identify remaining barriers to teleworking, while also raising awareness.
4. **Help Inform supervisors** – DLA deployed job aids to supervisors to help determine eligibility.
5. **Train and raise awareness** – DLA updated telework information on their web site, published comprehensive answers to frequently asked questions, and customized mandatory training with DLA-specific procedures.

Sub-Goal 3.4 – Employee Air Travel

Miles flown by DoD employees in FY 2012 declined by 4.7% compared to the FY 2011 baseline, with a corresponding decrease in GHG emissions. The Services and other DoD Components are reducing emissions in part by following the [Track Four Efficiency Initiatives Decisions](#) issued on March 14, 2011, by the Secretary of Defense. The directive mandates that all travel requests justify why alternate means, such as video teleconferencing or other web-based communication, are not sufficient to accomplish the objectives of the proposed travel. Continued fiscal restrictions also contributed to the decline.

Goal 4 – DoD Climate Change Vulnerability Assessed and Resiliency Improved

The four broad goals introduced in DoD's 2012 Climate Change Adaptation Roadmap serve as the foundation for support of the Department's vision.

- 1) Define a coordinating body to address climate change
- 2) Utilize a robust decision making approach based on the best available science
- 3) Integrate climate change considerations into existing processes
- 4) Partner with Federal agencies and allies on the challenges of climate change

Ongoing activities relative to these goals include a DoD Climate Change Adaptation Working Group (CCAWG), comprising the four military Services and nine additional department organizations. The CCAWG reports to the SSC, which is responsible for coordinating climate change adaptation efforts within DoD. CCAWG activities include developing DoD climate change adaptation policy

and a strategy to perform screening-level vulnerability assessments. The assessments will be performed by coordinating a multi-agency regional scenario working group, and forming an internal subgroup focused on vulnerability assessment protocol development. In addition to internal groups, DoD continues participating in various external groups and partnerships. These include:

- Interagency Climate Change Adaptation Task Force (co-chaired by CEQ, the Office of Science and Technology Policy, and the National Oceanic and Atmospheric Administration) and associated Agency Adaptation Working Group),
- United States Global Change Research Program Working Group on Adaptation Science
- Interagency National Climate Assessment Working Group,
- Federal Climate Change Adaptation Community of Practice, and
- Southeastern Regional Partnership in Sustainability and Planning.

DoD continues to identify climate science-related projects on new topics, such as climate change impacts to built infrastructure in Alaska (a FY 2014 initiative).

Sub-Goal 5.1 - The Use of Paper

By the end of FY 2012, the following seven DoD Components had issued and are implementing policy to reduce the use of printing paper: DON, the Air Force, DLA, MDA, NGA, NRO, and TMA.

DLA Document Services continually seeks to reduce the use of paper throughout DoD, through the aggressive promotion of duplex printing, scanning and conversion, electronic document management, print on demand, and distribute and print approaches. Because of these efforts, the number of impressions and hardcopies produced by DLA Document Services decreased by 8% (91 million fewer units) and the total sheets of paper purchased decreased by 12% (65 million fewer sheets of paper) in FY 2012 compared to FY 2011. Specific approaches taken by DLA Document Services include:

- 1) **Duplex Printing.** During FY 2012, DLA Document Services competitively placed, renewed, or refreshed 11,860 multi-functional devices within the DoD Components. The devices were pre-configured with duplex printing as the default, saving an estimated 82 million sheets of paper in FY 2012.
- 2) **Scanning and Conversion.** DLA Document Services continued their aggressive approach to promote, monitor, and track hardcopy documents to be converted to digital format across DoD. Approximately 19 million hardcopy pages were converted to digital format during FY 2012, reducing storage requirements for over nine million sheets of paper (assuming double-sided printing).
- 3) **Electronic Document Management.** DLA Document Services provides digital storage of original digital documents and the storage of documents scanned and converted at its field locations. In FY 2012, 24 million pages were added to digital storage, bringing the total number of stored digital pages to 412 million. Assuming all pages would have been printed double-sided, this prevented 206 million sheets of paper from being printed and stored.
- 4) **Print on Demand.** Print on Demand is “print what you need, as you need it” output. Print on Demand output totaled 102 million pages in FY 2012, a 75% increase over FY 2011, as a direct result of performing work that DLA Document Services previously outsourced and warehoused.
- 5) **Distribute and Print.** The Distribute and Print approach prints exactly what is required at a given time by distributing document files electronically and printing to the DLA Document

Services at locations closest to the end user, which virtually eliminates the historical over-ordering of publications, estimated at approximately 10%. This approach saves the DoD shipping costs, warehousing costs, and millions of sheets of paper normally disposed as unneeded publications originally ordered to ensure enough quantities were available on-hand. FY 2012 Distribute and Print technical orders totaled 36.2 million pages, an 11% decrease from FY 2011.

DON issued guidance on duplex printing in 2011, and in January 2013, it issued policy on the management and use of all copiers, printers, fax machines, scanners, and multi-functional devices. The most recent policy, dated January 25, 2013, establishes a comprehensive mandatory, enterprise-wide policy to efficiently manage costs associated with paper usage. DON will work closely with DLA Document Services to leverage their established efficient procurement and managerial capabilities and processes to reduce use of stand-alone duplication devices, increase use of networked multi-functional devices, and obtain associated consumables and maintenance at reduced cost. This significant cost savings policy, which represents the first large department or agency to mandate a cradle-to-grave management approach for its copiers, printers, faxes, scanners and multifunction devices, includes "Printing Best Practices" that are expected to significantly reduce the amount of printing, paper, and ink usage, by instituting printing and copying settings at the server level, requiring user override.

Digital staff action systems and electronic filing systems have been implemented across the Army to improve records control and reduce the use of paper. Most Army organizations have replaced their older printers with newer energy-efficient models capable of being set to default to duplex printing. Fort Polk, LA, a Net Zero Waste pilot installation, aggressively worked to reduce the volume of waste generated on Post, including waste office paper. Fort Polk's Net Zero Waste team, working with their Public Affairs Office, produced and disseminated public service announcements and news articles encouraging installation employees and residents to "go paperless" when feasible and set their printers to default to duplex printing when printed copies must be made.

To advance its concept of a largely "paperless" Air Force, in FY 2012 the Air Force Civil Engineer Center began rolling out eDASH, a new SharePoint-based communications tool originally established to support installation-level EMSs. The system, accessible through a ".mil" account using a common access card, provides up-to-date guidance and information on environmental and sustainability topics. eDASH provides electronic storage of standardized EMS documents and facilitates their periodic management review, thus reducing the amount of paper used and storage space required. From March 2012 to March 2013, the system averaged 5,000 hits per day and 200 unique users per day. The Air Force also configured all of its printers, copiers, fax machines, and multifunction devices to be duplex-capable and to be set to duplex prior to shipment. To further reduce the use of paper, most offices use electronic communications as the primary means of maintaining information on policies and procedures; maintain or submit in electronic format most reports, plans, checklists and other documentation unless prohibited by other regulations; and use electronic staff workflow and coordination processes.

NGA actions in FY 2012 and early FY 2013 to reduce the use of paper included developing an electronic fax program and enabling 100% (1,300) of the agency printers for duplex printing at the NGA Campus East facility. The agency also purchased multi-functional printers that enable scanning multiple copies of documents for email disseminations, storage of electronic files on servers, and document and file transfers. NGA implemented the use of electronic tablets for senior

leadership meetings and briefings, expanded the capacity for electronic display of briefing slides in 86 video teleconferencing rooms, and increased the use of video teleconferencing (including Skype).

NRO implemented the following policies in FY 2012 to reduce the uses of printing paper:

- All printers on both secure and open networks are duplex-capable, and the agency conducted socialization programs to encourage double-sided printing.
- NRO personnel are encouraged to utilize electronic records and paperless systems for training and evaluation of on-site personnel.
- NRO encourages all meetings to be paperless, and electronic document media to be used for communication and record keeping.
- One NRO site's reprographic services group implemented a policy that all print jobs be double-sided unless approved for single-sided copying by a government official, and all self-serve copy machines in the center are set to double-sided printing.

Sub-Goals 5.2 and 5.3 – Solid Waste Diversion

The Department surpassed both FY 2012 targets for solid waste. DoD diverted 49% of its non-hazardous solid waste away from the waste stream during FY 2012, up from 40% last year. Of its construction and demolition (C&D) debris, DoD diverted 74% from disposal, down somewhat from 77% the previous year. The percentage of C&D debris diverted from the waste stream may experience substantial fluctuations year to year due to the large variability in the number and types of projects worked.



Photo: U.S. Army

The Army conducted material flow analyses at six Net Zero Waste pilot installations in FY 2012. These analyses examined sources of waste by analyzing the supply chain, and the fate of the waste stream (the recycling and waste disposal rates). The information was collected and analyzed by activity type – such as food service, housing, operations and maintenance, and motor pool operations – which allowed the pilot installations to link the volume of

waste generated to an activity and source in the supply chain. Data from these material flow analyses identifies the priority waste streams, and is being used to develop installation-specific Net Zero Waste reduction strategies and action plans. The plans will include improved purchasing practices, expanded re-purposing and re-use strategies, additional waste streams targeted for recycling or composting, and potential energy recovery technologies.

In FY 2012, the Army opened up its monthly Net Zero Waste collaboration calls to all Army installations, beyond just the eight pilot installations. Currently nearly 20 installations routinely participate to share success stories and address common challenges. Active inter-agency collaboration contributes to the success of the Net Zero Waste initiative. The calls have broad participation, not only across the Army organizational structure, but including the DOE Pacific Northwest National Laboratory, the Defense Commissary Agency, and the Army and Air Force Exchange Service. The Defense Commissary Agency has been a key Net Zero Waste collaborator, working tirelessly to address food waste and increase recycling at commissaries. In FY 2012, several

Army installations generated \$1 million or more in Qualified Recycling Program proceeds, demonstrating the financial benefits of recycling to Garrison and Mission Commanders.

BEST PRACTICES: Approaches for Widespread Adoption

Modifying the Qualified Recycling Program so All Recyclables Remain Government Property

In 2010, MCLB Albany in Georgia added a recycling statement of work to all maintenance and construction contracts, giving MCLB Albany exclusive recycling rights to construction and maintenance projects, mandating that all salvable materials and equipment disconnected or removed during the course of the work, and not slated for reuse, remain the property of the Government. All recyclable materials must be recycled in accordance with the Marine Corps *Environmental Compliance and Protection Manual* (Marine Corps Order 5090.2A) through the base Qualified Recycling Program. A wide range of materials are recyclable, including metals, switch gear, conduit, copper wire, distribution and control panels, nuts, bolts, washers, old motor starters, obsolete breaker, cable lugs, conduit fittings, connection boxes. Revenue from the program grossed over \$502,000 in FY 2012, and more than \$300,000 in FY 2011, which enables the base to grow the program each year. The change to the Qualified Recycling Program created jobs for the community and supports the base mission through monetary contributions. Additionally, MCLB Albany has developed a better understanding of the cradle-to-grave aspect for each recycled commodity by ensuring that the materials reach the correct venues.

Material Flow Analyses Aid Solid Waste Management

Joint Base Lewis-McChord (JBLM), a Net Zero installation for waste, conducted material flow analyses to identify the best diversion opportunities. The results were incorporated into the Base Integrated Solid Waste Management Plan, which now identifies 36 potential diversion opportunities which are being evaluated for cost and effectiveness. To supplement the material flow analyses, the base also conducted a waste characterization study for 254 waste disposal containers from 13 different facility types. Waste from these containers was systematically separated into seven major divertable materials types, photographed, and tabulated. The survey concluded that food waste and other compostable materials were the largest waste streams by volume, and identified specific buildings to target for segregation and treatment at the on-post composting facility. The JBLM Commissary is also working to decrease food waste disposal and increase recycling. Over 960 tons of food waste, cardboard, plastic, and mixed paper were composted or recycled, reducing the Commissary's waste disposal costs by nearly \$155,000 in FY 2012.

The Air Force released a new policy in April 2012, titled [*Achieving Efficiencies Through Pollution Prevention and Waste Elimination*](#). The policy establishes aggressive, non-hazardous solid waste reduction targets and goals, including the diversion of 65% of non-hazardous solid waste (by weight) from landfill disposal by 2020 (excluding C&D debris), with interim goals to divert 55% by 2015 and 60% by 2018. The Air Force Space Command issued guidance to incorporate C&D waste diversion considerations in every step of a project life cycle. The guidance explains how effective C&D waste management can lower disposal costs and support Air Force goals for solid waste reduction. It also provides strategies, definitions, resources, tools, and templates to help installations and relevant professionals implement sustainable C&D debris management programs.

The Navy is leading the greening of military packaging materials by initiating and chairing the DoD Sustainable Packaging Materials Working Group. In addition to the Services, the Group includes subject matter experts from the Defense Contract Management Agency and DLA Packaging. In FY 2012, the group completed a usage analysis, prioritized candidate packaging materials, and began identifying material specifications that can be revised to incorporate Green Procurement attributes.

HIGHLIGHTS

Sub-Goals 5.2 and 5.3: Successes Diverting Solid Waste from the Waste Stream

Recycling Wins Over Tipping Fees

DLA Land and Maritime in Columbus, OH, diverted 83% of its C&D debris from disposal in FY 2012 by taking advantage of the cost savings of recycling versus landfilling. The Columbus site estimated average contractor tipping fees at between \$30 and \$50 per ton for landfilling, compared to \$20 to \$30 per ton to be handled by a C&D debris processing facility. If the material is properly separated, the savings are even higher: no tipping fee for concrete, a \$0–\$10 tipping fee for wood, and \$24–\$30 per ton income for cardboard and metals. Even with the added labor required to properly separate the materials, the contractor found diversion to be the most cost-effective option. If the material cannot be separated, the average tipping fee is still reduced by turning the materials into a C&D processing facility.

Recycling 55-Gallon Drums

Marine Corps Base Camp Lejeune contracted with a DLA Disposition Services to sell 55-gallon drums for refurbishing rather than manually deheading, rinsing, crushing, and recycling the scrap metals. Reconditioning the drums is less energy intensive than manufacturing new ones, and saves the base \$17,000 per year in labor costs.

Single Stream Bins Increase Recycling

Waste stream audits conducted at Peterson AFB from 2006 to 2011 revealed that more than 40% of what was discarded at the surveyed facilities could have been recycled. Since recycling costs are on average half that of municipal solid waste disposal costs, diverting recyclables from the landfill has a significant cost impact. To make recycling as easy as possible, the 21st Civil Engineer Squadron converted three buildings to single-stream recycling bins. As a result, during FY 2012, the amount of trash thrown away per building was reduced by 20-30%, and the amount of waste recycled per building increased by 30-60%, depending on the building.

Finding Ways to Make it Happen

With a minimum shipping distance of 2,500 miles to major recyclable commodity markets, Joint Base Elmendorf Richardson, AK, needed to develop a suite of innovative solutions to avoid disposing of a significant portion of its solid waste:

- In FY 2012, the base's Qualified Recycling Program used the proceeds from recycling expended small arms cartridge casings to launch a program to collect and recycle paper and cardboard from over 100 Army and Air Force facilities. The program recycled 208,000 pounds of paper and cardboard in FY 2012.
- The base improved the quality of life for soldiers and airmen by providing an on-base recycle center and 24-hour drop-off locations.
- Through partnerships with the Solid Waste Association of North America and a local cellulose insulation manufacturer, more than 50 tons of cardboard from the base were converted into insulation.
- The base engaged other Alaska military installations for regional approaches to sustainable recycling through the Alaska Regional Military Recycling partnership.
- Participation by base personnel and the local community has increased through the "JBER Recycles" site on Facebook, community newsletters, and sharing lessons learned.
- Over 20,000 gallons of used oil was recycled.
- The base mandated downstream recycling in Defense Reutilization and Marketing Office disposal contracts.

Recycling Office Paper Saves Money

In FY 2012, NGA recycled 150 tons of paper (classified and unclassified), generating \$8,921 in revenue and avoiding \$10,031 in classified waste disposal costs.

Repurposing Asphalt and Concrete

Grissom Air Reserve Base in Indiana converted 49,420 tons of asphalt millings and concrete from the installation's airfield projects into materials used as backfill to cover airfield drainage ditches, to address bird aircraft strike hazards.

Also during FY 2012, the Navy drafted a comprehensive revision of its integrated solid waste management policies as part of an update to the Chief of Naval Operations Instruction 5090.1C, [Environmental Readiness Program Manual](#), and established a Service-level working group to foster communication among integrated solid waste managers and share best practices.

Sub-Goal 6.1 – Chemical Use, Release, and Transfer

DoD toxic chemical releases, as defined by Sub-Goal 6.1, increased 6.6% in calendar year (CY) 2011, compared to the CY 2006 baseline. DoD chemical releases have been falling in recent years, but there can be year to year variability due to events such as increased loads on wastewater treatment plants due to forces returning from overseas and accidental releases. The Department continues its efforts to decrease its use of hexavalent chromium, which is a known carcinogen but has historically been used in numerous DoD weapons systems platforms to prevent corrosion. In FY 2011, DoD amended the Defense Federal Acquisition Regulation Supplement to prohibit the delivery of items containing hexavalent chromium in materials acquired by DoD unless there is no acceptable alternative. In June 2012, DoD further amended the rule to clarify that the hexavalent chromium policy applies to commercial items and components.

The Army has established additional toxic chemical reduction targets that affect critical weapon system support activities. The Army's reduction targets for 2010 to 2013 include: 15% reductions in the use of trichloroethylene and methylene chloride, and a 9% reduction in the use of epoxy primers containing hexavalent chromium. One installation, Anniston Army Depot, has accounted for 94% of the Army's total use of methylene chloride and 86% of the Army's use of trichloroethylene. Through the implementation of process modifications, as well as the identification and use of alternative paint strippers, cleaning technologies and substances, Anniston reduced methylene chloride releases by 81% and trichloroethylene releases by 84% by the end of FY 2012.

Nitrate compounds currently account for approximately 40% of the Navy's annual reportable non-exempt releases. To address this, the Navy is upgrading several wastewater treatment plants to meet increasingly stringent National Pollutant Discharge Elimination System permit requirements nationwide, and in support of the Chesapeake Bay initiative. Annual releases from reporting installations can fluctuate widely, and for this reporting period the Navy saw an increase in its releases due to a significant increase in maintenance workload on submarines and aircraft carriers at one installation. The Naval Facilities Expeditionary Warfare Center worked with Naval Base San Diego to develop a cost-effective technique for pin-pointing the sources of elevated levels of heavy metals observed in storm water discharge. A streamlined methodology and tool were developed to



Photo: U.S. Air Force

identify possible sources of the metal pollutants with 75% to 80% accuracy. After characterizing the possible sources of metal pollutant releases, a geographic information system tool performed a statistical analysis to identify the most likely pollutant sources for further investigation and sampling.

In April 2012, the Air Force issued its Air Force Policy on [Achieving Efficiencies through Pollution Prevention and Waste Elimination](#) to further incorporate pollution prevention into the Air Force EMS. The policy builds on Air Force policy

on EMSs, and directs commanders to utilize the standardized EMS aspect/impact identification methodology to identify and manage daily operations that generate waste and pollution, and use the pollution prevention hierarchy as a guide to select implementation options. The new Air Force policy established aggressive toxic chemical release reduction goals: reduce Toxic Release Inventory (TRI) releases by 35% by 2020 from the 2006 baseline, with interim goals to achieve a 20% reduction by 2015 and 30% by 2018. The Air Force regularly reviews TRI releases to identify potential chemicals, processes, and installations where reduction opportunities exist.

In CY 2006, DLA's principal TRI release was attributed to the pollutants released during the combustion of fuel oil in boilers. Until CY 2010, TRI releases were from a previous boiler system combusting a 1:1 ratio of No. 2 and No. 6 fuel oil. In February 2011, DLA's new central heating plant came online, which burns 100% No. 2 fuel oil, greatly lowering DLA's TRI releases in CY 2011.

Sub-Goals 6.2 and 6.3 – Pesticides

To help ensure that individuals apply pesticides only when necessary and do so safely and effectively, DoD requires individuals applying pesticides on its installations to be appropriately certified. The overall rate for certification of DoD applicators and its contract personnel by the EPA in FY 2012 was 99.0% (3,137 out of 3,169). Due to constant turnover in personnel, the Department is unlikely to achieve a 100% rate. However, under EPA guidelines, DoD's uncertified personnel may apply pesticides as long as they are under the direct supervision of someone who is appropriately certified. In addition, uncertified personnel have a two-year window to achieve certification; thus far, none of the reported uncertified applicators have exceeded that two-year window.

The Department updated the Measures of Merit in DoD Instruction 4150.07 for 2012 and the goal of DoD installations having Integrated Pest Management (IPM) Plans prepared, reviewed, and updated annually by Senior Pest Management Professionals remains in place. Approval rates for plans are reported up the chains of command of the respective Services and DLA. An annual DoD data call forwards this information to the Armed Forces Pest Management Board, which consolidates it into a single report. The Department initiated this metric in 1993, when just over 50% of DoD installations had such plans in place.

The percentage of installations having approved and updated Integrated Pest Management plans continues to show an upward trend increasing from 90.2% in FY 2011 to 96.7% (447 out of 463) in FY 2012. Installation IPM plans are valid for five years and 100% of installations have such plans in place. However, all plans must be updated and reviewed annually. It is this annual requirement that continues to be the most difficult to achieve. Local personnel shortages and continuing operational tempo in support of overseas contingency operations continue to limit the capability of installations and headquarters to review those annual updates. Because of these circumstances, the likelihood of DoD achieving its goal of 100% over the course of the next several years is low. In its efforts to control pests (such as insects, ticks, rodents, weeds, and fungi) that impact its personnel, facilities, and materiel, the Department closely adheres to the principal of Integrated Pest Management: effectively combining biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks. Applying pesticides is only one tool that the Department uses and DoD applies them only after careful analyses ensure that they are the best method. The DoD Components actively monitor and report their pesticide usage on an annual basis. Application rates today continue to be approximately half the reported amount in 1993, and 2012 usage increased by 12,683 pounds (2.8%) over the amount reported in 2011. While DoD continues to work at minimizing the amount of pesticides it uses, herbicide use to control invasive

HIGHLIGHTS

Sub-Goal 6.1: Selected Successes Reducing the Release of Chemicals of Environmental Concern

Less Polluting Alternative Also Less Expensive

In FY 2011, the Army successfully replaced the extremely potent GHG SF₆ with a helium-based system for detecting leaks in helicopter blades. The installation where the new approach was tested, Corpus Christi Army Depot, reduced the use of SF₆ by 95% and realized a cost savings of \$16,303 per year, since the cost of SF₆ is substantially higher than the cost of helium. In FY 2012, the Army issued a Maintenance Engineering Order to document the helium-based leak detection process, which was approved by the Army's Aviation Engineering Directorate, paving the way for the technology to be adopted by the 1107th, 1108th, and 1109th Theater Aviation Sustainment Maintenance Groups.

Reducing Chemicals through Authorized User Lists

Navy installations in the Hampton Roads area of Virginia cut in half the amount of TRI chemicals they issued between 2006 and 2012. This was achieved using a three-pronged approach: (1) training Hazardous Material Coordinators and purchase card holders about greener alternatives; (2) streamlining and improving the Authorized User List review process; and (3) conducting more audits and inspections of hazardous material storage areas to ensure that tenants are adhering to the requirements of the Authorized User List.

Installation tenants have an Authorized User List of chemicals, and products that contain TRI chemicals are not approved for inclusion on tenants' lists unless there is a mission-related justification or there are no alternative green products. Environmental, Industrial Hygiene and Safety annually reviews hundreds of requests for products containing TRI chemicals—approximately 700 and 800 in 2011 and 2012, respectively. In 2012, Fleet Logistics Center Norfolk continued to educate users, adding numerous guidance documents on the Authorized User List to its website, and refining the review process.

Exemplary Chemical Reductions at Marine Corps Bases (MCBs)

The largest reduction in a TRI chemical in the Marine Corps was achieved by MCB Quantico, which decreased nitrate compound releases by 83.1%, or 170,734 pounds, from CY 2010 to CY 2011. The impressive decrease was possible due to process improvements and enhanced management practices implemented at the installation's main-side wastewater treatment facility. MCAS Cherry Point achieved the second largest reduction, decreasing the amount of ethylene glycol released by 55.4% (15,988 pounds) in CY 2011 from CY 2010. This was achieved by recycling antifreeze and decreasing the fleet size.

Converting from Coal to Natural Gas

The old, inefficient coal-fired boilers at Wright Patterson AFB, OH, are no longer able to meet the Maximum Achievable Control Technology emissions standards for boilers under the Clean Air Act. Also, the old boilers accounted for between 25% and 30% of the Air Force reportable CY 2010 TRI releases. The boilers are being replaced with new efficient models fueled by natural gas.

Saving Money by Recycling Motor Oil

The U.S. Army Tank-Automotive and Armaments Command approved an oil-fuel blending system that converts used motor oil into fuel. When oil is changed in high-mobility, multipurpose wheeled vehicles, the system automatically filters and blends diesel or JP-8 jet fuel with the vehicle's used engine oil and injects the blend back into the vehicle's fuel tank. The mixture performs with no decrease in engine performance or vehicle emission quality. USAG Hawaii is working to introduce the use of the system for military units training at the remote Pohakuloa Training Area on Hawaii Island, projecting \$11,000 per year in savings for fuel and disposal costs. The base projects savings of more than \$50,000 per year if the process is used across the garrison. Each gallon of used oil blended avoids the cost of \$4.50 cost per gallon of new diesel fuel, as well as the cost of disposing of the used oil off-site.

species remains a significant issue because these situations often require quick, safe, and effective measures and pesticides often end up being the weapon of choice. In addition, in 2012, many DoD installations were impacted by the West Nile Virus epidemic resulting in a slight increase in pesticide use to control vector mosquitoes.

Sub-Goal 7.1 – Procuring Sustainable Goods and Services

Sufficient automated systems are not yet in place to enable the Department to accurately report the extent of sustainable procurement. Meanwhile, the Department manually reviewed 1,995 contract actions from FY 2012 with values over \$3,000 for their compliance with sustainable procurement requirements.³ The review found 95% of them to be in compliance (up from 82.6% in FY 2011). The review process included contracts from the Military Services, DLA, MDA, the Defense Commissary Agency (DeCA), Defense Contract Management Agency, Defense Finance and Accounting Services (DFAS), NGA, NSA, TMA, and WHS. The applicable sustainability categories examined were: EPA Designated Recycled Content, ENERGY STAR- or FEMP-designated energy efficient products; products designated by the U.S. Department of Agriculture as biobased; products that are environmentally preferable, registered with the Electronic Product Environmental Assessment Tool (EPEAT), comply with WaterSense or are otherwise water-efficient; reduced ozone depleting substances; and non- or low-toxic or hazardous constituents.

During FY 2012, DLA Acquisition advised the acquisition workforce of sustainability changes to acquisition regulations in the Federal Acquisition Regulation, Defense Federal Acquisition Regulation Supplement, and Defense Logistics Acquisition Directive at monthly Policy Chief Calls, as well as the February 2012 [Presidential Memorandum](#) on biobased products. Also in FY 2012, DLA identified points of contact at each of the DLA supply chains for green procurement issues, and it continues to investigate the possibility of establishing a sustainable procurement compliance advocate in the contract policy office at each of these offices. In addition to these actions, DLA Acquisition coordinated with DLA Installation Support on the revised [DLA Green Procurement Plan](#), which DLA reissued in December 2012.

The Navy developed the “[Buy It Green 2012: How to Buy Green for a Sustainable Navy](#)” Guide that provides users with green procurement requirements, customized ordering instructions for DLA and GSA purchasing sites, guidance on green procurement considerations for contracting specialists, and a consolidated list of products available that meet the goals of the green procurement initiatives. Online [Knowledge Nuggets training tutorials](#), targeted for Navy purchase card holders, were also developed to demonstrate specific card program processes or procedures that focus on green procurement. Active engagement with purchase card training coordinators and contracting specialists helps to disseminate the Guide to users.

The Army launched a new sustainable procurement website on their internal procurement policy website. This site has links to training resources, model contract clauses, and links to resources on other federal sustainable procurement websites (e.g., FedCenter, GSA). In FY 2012, the Army launched periodic sustainable procurement webinars and conference calls under the Net Zero Waste initiative and completed a study to improve purchasing practices and increase waste diversion in Army food service facilities. The Army is also developing Quick Guides to improve purchasing

³Out of 14,256,078 actions, 10,815,722 of which were for various transportation service requirements with the U.S. Transportation Command.

practices for common installation activities, such as food service, grounds maintenance, and vehicle maintenance.

Due to the classified nature of its work, DIA uses its own Contract Management System rather than the Federal Procurement Data System (FPDS), which is not yet capable of tracking purchases for sustainability elements. The system provides provisions and contract clauses pertaining to sustainable procurement. DIA updated the system in FY 2012 to give contracting officials the ability to indicate procurement of green products or services on Award Contract Line Item Numbers. The upgrade was implemented in February 2013, and DIA is providing guidance to contracting professionals on how this functionality is to be used. The improvement will enable DIA to better track its sustainable procurement.

All MDA contract actions audited were found to contain green contract clauses for sustainable goods or services. However, striving for continuing improvement, the audit identified opportunities for additional environmental requirements that can be included in future contract statements of work. On an ongoing basis, the MDA contracting office works closely with the environmental office to promote sustainable acquisitions. The agency released a Green Procurement training course that explains the need to purchase goods and services with favorable energy or environmental attributes. The course is required of employees whose jobs involve development, award, and review of procurements.

NSA and WHS also sponsored green procurement training for personnel in key procurement roles within their agencies. In addition, WHS developed standard operating procedures for Green Cleaning to ensure that future custodial contracts follow sustainable purchasing and green cleaning best practices. WHS is also providing sustainability training to groups across the agency to improve the sustainability language in contract statements of work. NRO developed and published an Affirmative Procurement Policy in FY 2012 and completed some initiatives to promote sustainability practices as the norm: developed a site tracking system to ensure requestors consider green products where available, trained requestors and end-users to identify a green product, and initiated a “Just in Time” supply delivery system to minimize waste and overage.

Sub-Goal 7.2 – Electronic Stewardship and the Efficient Use of Data Centers

Of all covered electronics acquisitions in FY 2012, 99% were registered with EPEAT. For those DoD Components that tracked the data in FY 2012, 53% of all eligible computers and monitors had power management actively implemented and in use.

The Department handles the disposition of all of its excess or surplus electronic products in an environmentally sound manner. The vast majority of DoD electronics equipment at the end of its useful life passes through the DLA’s Disposition Services, which has long had a rigorous system in place to ensure the environmentally sound disposition of electronics.



Photo: U.S. Navy

Cataloging electronic waste for proper disposition, Naval Support Activity Naples, Italy

Sub-Goal 7.3 – High Performance, Sustainable Buildings

During FY 2012, DoD more than doubled the number of its buildings complying with the [Guiding Principles of Federal Leadership in High Performance and Sustainable Buildings](#) (hereafter referred to as the Guiding Principles): 168 additional DoD buildings came into compliance in FY 2012, bringing the DoD total to 316 buildings out of 51,953 applicable buildings, owned and leased (0.61%). DoD progress meeting the Guiding Principles since FY 2010 is shown in Figure 12. The Department issued a crucial UFC in May 2012 to improve the sustainability of its building inventory: DoD UFC 2-100-01, [Installation Master Planning](#), which provides direction and guidance on the master planning of sustainable facilities at military installations. The next page provides some example of DoD successes with sustainable buildings in FY 2012.

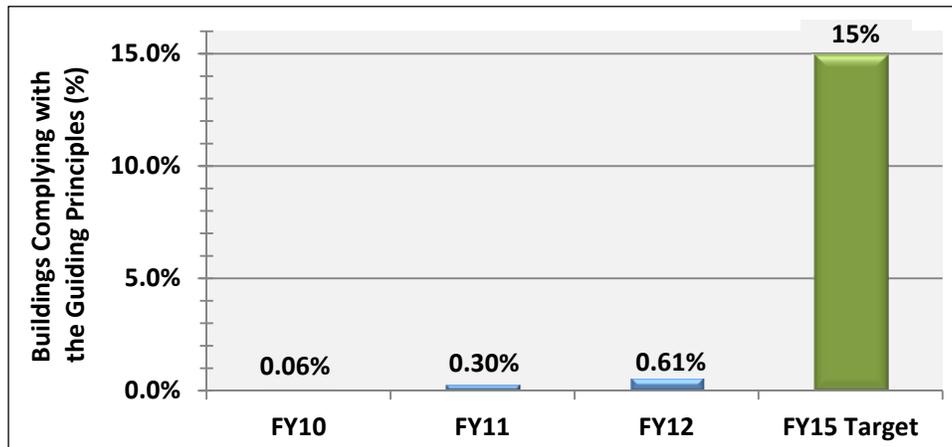


Figure 12. DoD Progress Complying with the Guiding Principles, Compared to the FY 2015 Target

In addition to the DoD-level UFCs, the Navy and Marines follow the Naval Facilities Engineering Command [Engineering and Construction Bulletin 2011-01](#), which requires that all repair or alteration of existing buildings exceeding a threshold of \$2.5 million comply with the Guiding Principles. Since the Navy has been using LEED to estimate the number of its buildings that are high-performance and sustainable buildings, it conducted an analysis comparing the LEED checklist with the system used by EPA’s ENERGY STAR Portfolio Manager to document conformance to the Guiding Principles. The Navy estimated that up to 50% conformance to the Guiding Principles could be achieved through updating and applying more than a dozen policies; 8% could be achieved through the use of an integrated team to implement sustainable building operations and develop a sustainable training program; and another 7% could be achieved through energy metering. WHS performed its first sustainability assessment against the Guiding Principles in FY 2012, developing a checklist with a four-tiered rating system to assess how close a facility is to meeting each guiding principle. WHS facilities will use this system moving forward to improve compliance.



Photo: U.S. Navy

HIGHLIGHTS

Sub-Goal 7.3: Selected DoD Success Stories with High Performance Sustainable Buildings

From Leaky Roof to Power Generator

When a badly leaking roof at Laughlin AFB in Texas was slated for replacement, Air Force engineers decided on a white, thermoplastic elastomeric roof that provides exceptional resistance to heat, solar ultraviolet rays, ozone, and oxidation. Welded onto the rooftop without penetrating it were 500 solar panels, each of which was tied into its own micro-inverter connected to a new electrical sub-panel, which in turn ties into the facility electrical panel. The solar panels for both dormitory buildings are estimated to generate 155,751 KWh per year, enough that excess electricity is at times sent back to the grid. Annual cost savings generated by the solar panels are expected to be over \$18,000.

High Efficiency at No Extra Cost

The Community Emergency Services Station at Fort Bragg, NC, received a LEED Platinum rating, demonstrating that high-performance buildings can be achieved without increasing the cost of the construction. Among the station's key features are:

- a transpired solar collector that functions as a heat exchanger,
- a solar domestic hot water system,
- geothermal heat pumps,
- insulated concrete form walls,
- a 10,000 gallon underground rainwater collection cistern that captures 45,000 gallons of rainwater per year for toilet flushing and truck washing,
- a cool roof that keeps the roof surface 50 °F cooler in the summer, and
- daylighting via clerestory windows and light shelves that reach 90% of the building's interior.

The 8,250 square foot building uses 35% less energy than a typical building of its size, and 83% less potable water. Of the C&D debris, 90% was diverted from the waste stream through recycling and reuse.

The knowledge gained through the project design and construction is being incorporated into the Army's standard design guidance for military construction. This project was an FY 2012 Federal Energy and Water Management Awards winner.

Largest LEED Gold building in Federal Portfolio

The New Campus East facility of NGA, located on Fort Belvoir in Springfield, VA, was built in response to a BRAC mandate to consolidate six locations into one. The resulting facility is the largest building in the federal portfolio to be certified as LEED Gold. Although mandated to be only LEED Silver, the team was determined to make it meet the Gold level of certification if it could be done at no additional cost.

Energy savings due to the sustainable design are projected at 44% through a wide range of features, including a chilled beam HVAC system, dual temperature chilled water distribution, high performance building envelope (including heat reflecting low-emissivity glass), and a transparent roofing system for the atrium that reduces energy by using daylight for lighting. Also, the overall building design takes advantage of the sun's orientation to help regulate heating and cooling in the building.

Water consumption is better than 40% less than it would have been with traditional approaches. An estimated 8 million gallons a year is saved through the use of dual-flush toilets, low-flush urinals, and other low-flow fixtures, such as lavatory faucets with auto-shut-off controls and low-flow showers. Rainwater collection systems can save up to another 30 million gallons per year.

Sustainability and the health of the building occupants is maximized by using materials that are low in volatile organic compounds, contain recycled material, and use environmentally certified materials, such as wood products certified by the Forest Stewardship Council. Finally, the facility was built on a brownfield site. *(Photo: U.S. Army Corps of Engineers)*



Sub-Goal 7.4 – Environmental Management Systems

The overall EMS rating for the Department is red for FY 2012, with 42% of DoD EMSs earning a green rating. The percentage of red ratings decreased slightly to 14%, from 15% in FY 2011. During the same time period, the percentage of green ratings decreased from 52% to 42%, while the percentage of yellow ratings increased by an almost equivalent amount (from 33% to 44%).

The Navy's performance improved on individual EMS metrics in FY 2012; however, only 39 of 87 EMSs scored green (or 45%), an unexpected decline compared to 67 green EMS ratings (77%) in FY 2011. The decline was primarily a result of out-of-date Declarations of Conformance due to unresolved audit findings. Through the implementation and maintenance of EMSs, the Navy has observed improvements in EMS records, increased efficiency and effectiveness of environmental media program management, improved decision-making at the process level, and improved relationships with regulators. Overall, the Marine Corps EMS performance was 45% green, 32% yellow, and 23% red. To improve performance towards the EMS sub-goal, Headquarters Marine Corps completed five EMS Lead Auditing Training courses across their installation Commands during FY 2013.

In FY 2012, of the Air Force's 88 EMSs, 50% were rated green, 26% were rated yellow, and 24% were rated red. This marked improvement was due to several initiatives. In October 2011, the Air Force issued a policy to standardize the Air Force EMS, making it the basic management construct for the newly centralized environmental program. The standardization helps ensure that installation-level investment decisions are taking the objectives of Major Air Command, Service Headquarters, and the Department into consideration. The Air Force's policy, Achieving Efficiencies Through Pollution Prevention and Waste Elimination, issued April 2012, requires the use of the Air Force EMS as the framework to identify and manage daily operations that generate waste and pollution. In FY 2012, Headquarters Air Force convened an EMS/Pollution Prevention cross-functional team, comprised of representatives from core business areas, to establish a consistent methodology to capture, consolidate, and prioritize the significant aspects and processes of Air Force mission activities. In addition, in March 2013 eDASH was implemented at all Air Force EMS appropriate facilities, enabling the agency to have its first ever enterprise-wide assessment of its environmental program through the lens of the standardized EMS. These efforts will facilitate the enterprise-wide visibility of high-valued opportunities for risk reduction and efficiencies across the life cycle of planning, developing, operating, and maintaining facilities and weapon systems. At the same time, the Air Force is working to understand the significant environmental aspects being identified in the field, rolling those up at the enterprise level, and developing new goals and objectives based on information from the EMS.

Of the Army's 141 EMSs, 35% were green. The Army issued updated EMS policy guidance in FY 2012 to Army Commands to renew focus on EMSs, reiterate the need to comply with federal EMS metrics, and clarify the EO 13514 requirements on Contracts and Concessionaire Agreements. The Army's emphasis on maintaining a robust EMS is evident at Fort Hood where the EMS Coordinator conducted annual internal audits and aspect reviews of approximately 20 civilian, contractor, and military activities to evaluate EMS conformance and awareness. As a Net Zero Waste pilot installation, Fort Hood updated their EMS objectives to include Net Zero Waste. USAG Hawaii uses an ISO 14001-conformant Sustainable Environmental Management System as their overarching tool to establish, track, and manage the installation's environmental goals. In FY 2012, they identified five significant environmental aspects and impacts associated with their activities: natural resources and cultural resources interaction; recyclables and garbage generation; hazardous material and waste generation; contaminant spills to soil and water; and energy consumption.

**Eggs of endangered bird on Naval Base Coronado
– preserving ecosystems is one function of an EMS**



Photo: U.S. Navy

Of DLA's 11 EMSs, 55% were green in FY 2012. DLA continued integrating its external EMS conformance audits with environmental compliance audits, providing a comprehensive view of the management system and its impact on and relation to the environmental compliance posture. DLA expects its performance to improve due to the award of an EMS expansion contract in FY 2013, to assist DLA organizations that have not achieved green on their metrics, completion of

conformance evaluations at DLA organizations that have not yet achieved EMS conformance, and development of a DLA-wide strategy including training and data management.

Part IV: The Way Ahead

Cross-Cutting Initiatives

The Army plans to develop a single integrated sustainability and energy strategy in FY 2013, replacing the separate strategies issued in FY 2010. The effort will be overseen by the Army's Senior Energy and Sustainability Council. Also in FY 2013, the Army will continue to utilize its four-star level Senior Energy and Sustainability Council to institutionalize sustainability and energy in doctrine, policy, training, operations, and acquisitions across the entire Army enterprise. The Council meets quarterly and is supported by a two-star level Advisory Board and Working Group comprised of officer level O-6 and civilian level GS-15 staff. The Working Group meets monthly to track and report Army progress in implementing the DoD SSPP and other sustainability-related actions. The Army also incorporated sustainability into the FY 2013 Army Posture Statement. Building on its Net Zero pilot program, the Army will issue a Net Zero policy in FY 2013, directing Army installations to strive to achieve Net Zero energy, water, and solid waste goals where fiscally responsible. Also in FY 2013, the Army will issue a progress report summarizing the best practices and lessons learned from the first two years of the Net Zero pilots; the top five best practices in each category of energy, water, and waste are being evaluated for implementation across all Army installations. Similarly, the Air Force will complete around mid-2013 a Net Zero Strategy and Guidance document to help Air Force organizations and permanent installations identify cost-effective Net Zero initiatives targeting energy, water, and waste.

Sub-Goal 1.1 – Facility Energy Intensity

DoD-Wide

DoD took two critical steps in the spring of 2013 that will significantly advance its efforts to reduce facility energy intensity across the Department. One is a policy issued in April 2013, *Utilities Meter Policy*, requiring that all DoD Components use advanced metering to measure at least 60% of their total consumption of electricity and natural gas by the end of FY 2020. The policy also requires Components to develop Meter Data Management Plans that set Component-specific metering goals, and to meter facility district steam systems and the more water-intensive facilities. The policy is an improvement over the previous approach to require metering based on building size, because it gives Components the flexibility to determine which buildings to meter. The other crucial measure implemented by the Department in FY 2013 is the issuance in March of new building standards. The requirements, in the form of DoD UFC 1-200-0, [High Performance and Sustainable Building Requirements](#), are discussed in more detail under sub-goal 7.3.

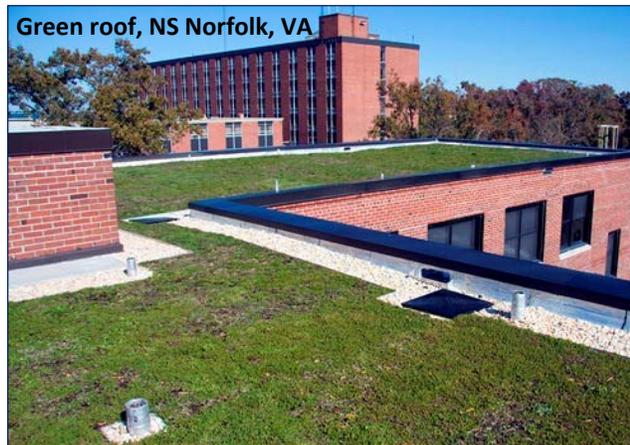


Photo: U.S. Navy

Another important driver of continued improvement in energy performance is the Department's increasing use of performance-based contracting. In FY 2012, DoD awarded 37 ESPC and UESC projects with a total value of \$343 million. For FY 2013, performance-based contracts either already

awarded or in the pipeline total \$363 million, and so far for FY 2014 there are \$581 million worth of projects in the pipeline.

The Military Services

Personnel: Strategic Planning, Guidance, and Training

In FY 2013, the Air Force updated its [Energy Strategic Plan](#), which is built upon four priorities: Improve Resiliency, Reduce Demand, Assure Supply, and Foster an Energy Aware Culture. Each priority is defined and further developed to include enterprise-wide goals and objectives essential to helping the Air Force achieve its energy vision, sustain readiness, and support the mission. The plan will provide the overarching framework for achieving Air Force energy goals by continually improving energy utilization to maximize efficiency and promote alternative energy. Also in FY 2013, the Air Force will issue a Net Zero Strategy and Guidance document to further drive energy efficiency. Since a large portion of the energy consumed by the Air Force is process energy – energy consumed directly in manufacturing, maintenance, equipment overhaul, rehabilitation or refurbishment, and similar processes – by the end of 2013, the Air Force expects to develop a plan detailing an approach to reducing industrial process energy consumption. The Air Force’s enterprise-wide energy conservation program is managed by the Headquarters Air Force Energy Management Steering Group.

The Navy – to help achieve the Secretary of the Navy goal for 50% of installations to be net zero by 2020 – will continue to invest in facility energy management systems, audits, and personnel to provide leaders greater visibility of energy consumption by tracking consumption at the facility-level. This will enable Navy energy consumption practices to evolve by instilling a culture of conservation through data transparency, and directly linking consumption to behavior awareness and accountability at the individual, installation, and regional Command levels. The Marine Corps strategy on facility energy intensity will continue to be based on its 2011 Marine Corps Expeditionary Energy Strategy, which as it applies to installations expands on the Commandant of the Marine Corps’ Facilities Energy and Water Management Program Campaign Plan (“Ten by ‘10”). As described under Cross-Cutting Initiatives above, the Army’s Senior Energy and Sustainability Council will integrate sustainability and energy into a single strategy in FY 2013, and issue a Net Zero policy directing all installations to strive to achieve Net Zero energy, water, and solid waste goals where fiscally responsible.

Metering

The Army Meter Program calls for the installation of advanced electrical meters to be completed by the end of FY 2013, covering about 65% of total energy consumption with an estimated 13,210 meters installed on 9,823 facilities. The metering systems will report to an enterprise Meter Data Management System, scheduled for completion by FY 2014. The system will support integrated facility and data management capabilities for Enterprise Energy Information Management business processes, operational capabilities, and business systems. The Navy will accomplish its initial drive for “smart energy/smart grid” by continuing its ongoing installation of advanced metering infrastructure, and integrating the meters with two management systems: the Centralized and Integrated Reporting for the Comprehensive Utilities Information Tracking System (CIRCUITS) and Public Safety Net (PSNet). The Navy is evaluating whether to follow this initial phase with further integration of the advanced metering infrastructure with other industrial control systems, include direct digital controls, and supervisory control and data acquisition systems. In FY 2013, the Air Force will continue implementing a standard, enterprise-wide advanced meter reading system that began in FY 2011 on 80 of the larger Air Force installations. The Air Force plans to have the system

deployed and operational on all 80 installations by the end of FY 2014, covering electricity, water, steam, and natural gas consumption.

Financing and Assessments

The Navy plans to reduce shore energy consumption through implementation of a phased approach to dedicate funds towards proven energy efficiency technologies to first lower the total energy demand, then focus on renewable energy sources. Across the Future Years Defense Program, the Navy is planning to invest \$1.2 billion in energy projects, with savings expected to average 23 million Btu per year. The primary path by which the Marine Corps will achieve its facility energy intensity goals is through direct funded construction and repair of facilities to put energy conservation mechanisms in place. It will also employ some alternative financing mechanisms through UESCs and ESPCs.

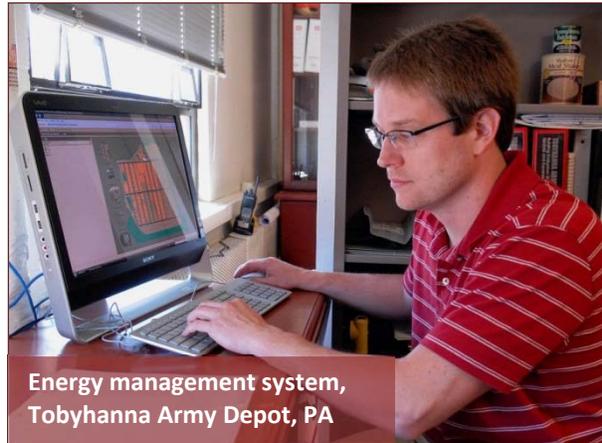


Photo: U.S. Army

Energy management system,
Tobyhanna Army Depot, PA

The Army will continue to program and budget projects that reduce installation energy demand and improve energy security, including alternative financing through ESPCs and UESCs. The Army is developing over \$400 million in ESPC investments, and \$100 million in UESC investments, for potential award in FY 2013–2014. In more traditional financing approaches, the Army will continue developing projects for funding through Utilities Modernization Funding and the ECIP program. Across the five years of Program Objectives Memorandum FY 2014–2018, \$1.25 billion in Army installation facility energy security projects were validated for Utilities Modernization Funding, consisting primarily of energy efficiency and utilities infrastructure projects. Of its \$50 million ECIP budget for FY 2013, the Army is committed to using approximately 60% for energy efficiency projects.

The primary source the Air Force uses to identify energy efficiency projects is through installation audits. By the end of FY 2013, the Air Force expects to have completed 75% of its Sustainable Infrastructure Assessments on buildings covered by EAct, with the balance scheduled for completion in FY 2014. For those energy efficiency and conservation projects deemed to be cost-effective by the assessments, the Air Force has budgeted \$194 million for ECIP funding (9.3% for design and the balance for projects), and \$767 million in Energy Conservation Focus funds, for the period from FY 2013 through FY 2017. Third-party investments through ESPCs and UESCs are now an integral component of the Air Force energy conservation strategy, allowing the Air Force to focus on large energy conservation measures, such as heat plant decentralization and more complex technologies.

Other DoD Components

With ECIP funding received in FY 2012, WHS will implement two energy efficiency projects in FY 2013: installing revolving doors at major Pentagon entrances to tighten the building envelope, and a pilot project to save fuel by shredding classified documents rather than incinerating them. With FY 2013 ECIP funding, WHS is going to improve the efficiency of 14 Pentagon data centers, saving up to 38 billion Btu annually. It is also developing a green information technology (IT) policy and program for implementation in FY 2014 that will address the purchase, management, and disposal

of electronics, and improve the efficiency of data centers. Based on a Reservation-wide audit completed in FY 2012, plus additional steam and water audits to be conducted in FY 2013, in FY 2013 and 2014 WHS will develop strategies for implementing the recommended projects from the audits.

DIA is undergoing a multiyear renovation process on its original headquarters building, which includes improved lighting efficiency, increased insulation, and upgraded HVAC systems. It also conducted an investment grade audit at headquarters, and worked with the DLA Energy Office to develop an ESPC, scheduled for award in FY 2013, to implement efficiency improvements and renewable energy generation. DIA is now able to look beyond headquarters, thanks to the fact that many facilities where DIA is a tenant under Inter-Service Support Agreements are now metered. The agreements are being modified to charge DIA the full cost of its energy use, so DIA modified its Energy Performance Master Plan to incorporate energy saving strategies at these facilities.

DLA's future energy intensity performance will improve due to a number of energy efficiency projects awarded in FY 2012 under funding from ECIP, the Defense Working Capital Fund, and the Sustainment, Restoration, and Modernization Program. Two key projects for reducing fossil fuel intensity are now under construction on DLA's 1.7 million square foot Eastern Distribution Center: a 26 billion Btu solar thermal wall and a combined roof upgrade and HVAC replacement that will save 10.5 billion Btu.

NRO will implement a significant HVAC improvement (waterside economizer) at one of its sites in 2014, using ECIP funding. The project will save 13 million Btu per year and significantly reduce water consumption during winter months. NSA's plans moving forward are to identify energy saving opportunities in lighting, water consumption, and building controls, based on energy and water audits.

Sub-Goals 1.2 – Renewable Energy

Each Military Department set a goal to develop one gigawatt of renewable energy on its installations, although the timeframes for doing so differ: 2016 for the Air Force, 2020 for DON, and 2025 for the Army.

The Army's renewable energy efforts will continue on two fronts in FY 2013–2014: large-scale projects developed by the Energy Initiatives Task Force, and smaller-scale projects initiated at installations. In FY 2013, the Task Force will also conduct an initial assessment of over 475 MW in renewable energy project opportunities on Army land, and validate 360 MW in opportunities. The Task Force is planning to award a combined \$7 billion in multiple award task order contracts to purchase renewable energy, and to issue contract mechanisms for a potential total of 150 MW in renewable energy projects at Fort Detrick, MD, Fort Drum, NY, Fort Bliss, TX, and Fort Irwin, CO. The Army is also aggressively pursuing smaller-scale systems. Some of these are being incorporated into MILCON-funded projects where cost-effective, but the Army is also identifying opportunities for alternative financing through ESPCs, UESCs, and enhanced use leasing. The roadmaps developed in FY 2012 and FY 2013 for the Army's nine Net Zero Energy pilot installations identify specific renewable energy projects for the pilot installations, but they also include strategies that can be used by all Army installations.



Photo: U.S. Navy

The Air Force has so far planned almost 430 MW in renewable energy projects (1.6 million MWh per year) between FY 2013 and FY 2016. In keeping with its three-tier priority order for pursuing renewable energy on a cost-effective basis, most of the projects are funded using a third-party, either through PPAs or enhanced use leasing. The projects range in size from approximately 1 MW to 220 MW. Leadership and coordination of renewable energy planning in the Air Force is handled by the Air Force Renewable Energy Project Development Subpanel, which provides a forum, process, and tools for evaluating and identifying viable renewable options that are compatible with the local Air Force mission.

In FY 2013, the Navy will determine which installations have the best opportunity to achieve Net Zero energy cost-effectively, based on an analysis the Navy conducted in FY 2012 in partnership with DOE's National Renewable Energy Laboratory. The Navy plans to utilize all available funding opportunities in support of its renewable energy goals, including ECIP, PPAs, and enhanced use leasing. The Marine Corps is committed to taking a leadership position in on-site renewable power development, with the assistance of private sector financing and development expertise, using ESPCs, PPAs, and enhanced use leases in addition to directly funded construction.

Based on the combination of projects already awarded and those anticipated, DLA expects to have 7.5% of its electricity consumption coming from renewable energy installations on its host sites by FY 2017. DIA expects to finalize an ESPC task order for a

comprehensive investment grade audit on its Headquarters campus in late 2013. The contract will include renewable energy as well as energy efficiency. Once its ESPC is awarded in early FY 2014, DIA anticipates up to 1,300 kilowatt (kW) of solar PV on the DIA Headquarters roof and over a large parking lot, which are projected to generate between 3 and 4 million kilowatt-hours (kWh) of electricity per year, beginning in FY 2015. Under the terms of the ESPC, DIA will purchase power from the energy service company through a PPA, at a price competitive with grid electricity.

Examples of Large Scale DoD Renewable Energy Projects in Progress

Holloman AFB, NM – In July 2012, the Air Force entered into a licensing agreement to explore the development of a 20 MW renewable energy project at Holloman AFB that will use wood waste to create power for commercial use. The 80 acre enhanced use lease Black Bear Biomass project will take in forest thinnings from surrounding national and state forest lands, orchard prunings, sawmill residue, used pallets, and other locally-sourced green waste as feedstock to generate energy. The fuel wood can be stored as wood chips or whole logs, and ash from the plant can be used to augment soil, make a road base, or cover landfills. If approved as expected by the New Mexico Public Regulatory Commission, construction on the project will begin later in 2013, with startup currently planned for 2015.

Fort Bliss, TX – In April 2013, work began on a 20 MW solar farm on Fort Bliss, a partnership between the Army and an electric utility, El Paso Electric. Another 20 MW solar installation is still in the procurement process with the utility, as is a project to convert waste to energy. Installation officials are also exploring wind and geothermal generation, all part of the base's Net Zero Energy strategy.

Davis-Monthan AFB, AZ – In August 2012, the Air Force entered into a PPA for the design, construction and operation of a 14.5 MW PV solar array at Davis-Monthan AFB, to be built on 170 acres of underutilized base property. When completed, it is expected that the project will provide 35% of the base's electricity requirements while simultaneously reducing utility costs by an average of \$500,000 annually. The existing 6 MW solar array at the Soaring Heights Communities combined with the 14.5 MW from the new array will make Davis-Monthan AFB home to one of the largest solar-energy generating capacities in DoD.

Recovery of Biogas

The Air Force currently has two biogas projects under development and is assessing a third:

- 1) *Landfill gas recovery at Joint Base Elmendorf Richardson, AK* – The Air Force continued developing this project in FY 2012, in which scrubbed biogas will power up to six 1.4 MW generators.
- 2) *Landfill gas cogeneration at Tinker AFB, OK* – In August 2012, the Air Force issued a sources sought notice to collect information necessary to evaluate the feasibility of a power purchase agreement with a private commercial firm to install, own, operate, and maintain an electrical co-generation station fueled by landfill gas to provide electricity and hot water for use at Tinker Aerospace Complex facilities on Tinker AFB.
- 3) *Landfill gas cogeneration at Ramstein AB, Germany* – The Air Force is assessing the potential for this project, which could provide roughly one-third of Ramstein’s heat requirement at a significantly reduced cost.

In FY 2013, the Army will finish its evaluation of the potential for methane recovery from its on-site wastewater treatment plants. At that point, the Army will prioritize the sites for design and construction as funding becomes available. The Navy has no plans to implement biogas energy recovery systems at its landfills since Navy landfills are poor candidates for cost-effective biogas energy use. The Navy continues to investigate the feasibility of recovering biogas from its wastewater treatment plants. None has proved viable so far, but one Navy facility is investigating the potential for biogas recovery at its plant.



Sub-Goal 1.3 – Vehicle Fleets

In March 2012, the DoD Strategic Environmental Research and Development Program contracted with Lawrence Berkeley National Laboratory to demonstrate a management and optimization tool for DoD installations to manage a fleet of plug-in EVs. The demonstration is taking place at Los Angeles AFB, CA, using a vehicle-to-grid fleet management technology currently under development. Additionally, as part of the broad DoD program to incorporate 1,500 plug-in EVs into the DoD non-tactical fleet, SERDP selected Andrews Air Force Base and McGuire Air Force Base to participate in the study. The goal is for fleet managers to be able to schedule the discharging and charging of EVs in such a way that it generates revenue by discharging energy from the batteries into the grid, while coordinating with other electrical loads and generation sources on the base and maintaining energy security. The project will run through May 2014.

The Marines Corps has made consistent efforts in recent years to improve the accuracy of its data pertaining to vehicle petroleum consumption. It is currently piloting an automated fuel tracking and dispensing technology that allows the fueling infrastructure to communicate with each vehicle and with the USMC’s Fleet Management Information System. The Corps plans to implement this technology, which will make data collection more accurate and allow Fleet Managers to spend more time managing fleets and less time tracking fueling records. The Marine Corps will continue its strategy of using smaller and more efficient vehicles, replacing petroleum-dedicated vehicles with AFVs, replacing standard sized vehicles with low-speed EVs wherever possible, and annually reviewing vehicle assignments in order to reduce the size of the overall fleet. Likewise, the Navy

will continue to follow its strategy to reduce petroleum consumption by non-tactical vehicles by using the most fuel-efficient and cost-effective vehicle based on the mission, driving conditions, and fuel availability. Specifics of the Navy approach are to:

- install alternative fuel infrastructure;
- locate AFVs where fuel and fueling infrastructure are available, or will soon be;
- replace gasoline vehicles that do not leave the base with neighborhood EVs, to the maximum extent practical;
- downsize vehicles and the vehicle fleet wherever possible; and
- explore opportunities to pilot full-size EVs and other advanced technology vehicles.

Also, the Navy plans to participate in an expanded GSA pilot of EVs.

The Army will conduct the following management activities for its non-tactical fleet in FY 2013:

- determine the best options for GSA vehicles selected for replacement during the FY 2013 cycle in terms of reducing petroleum consumption;
- downsize vehicles where appropriate and eliminate all unjustified vehicles;
- continue relocating vehicles that run off E85 (a mixture of 85% denatured ethanol fuel and 15% gasoline) to areas where the fuel is available; and
- continue evaluating opportunities to install dispensing pumps for E85 and B20 (a blend of 20 biodiesel with 80% diesel) on installations that dispense over 100,000 gallons of fuel per year.

Also, the Army is reviewing a DOE project where a DOE contractor will provide charging stations for selected installations within the DOE project regions. Under the Memorandum of Agreement with DOE, the contractor will install one or more charging stations at selected installations. The charging stations will be installed in common areas where anyone having access to the installation can use the station. Usage data will be provided to the DOE contractor for further evaluation. At the end of the project period, the charging stations will become Army-owned property at no cost to the Army.

In FY 2013, the Air Force will continue a variety of successful approaches it has been using to reduce the consumption of petroleum by its non-tactical vehicle fleet, including:

- executing its Vehicle Fleet Management Plan;
- deploying Automotive Information Module 2 Radio Frequency Identification devices on all fleet vehicles located in the continental U.S., allowing for more effective tracking and reporting of fuel consumption, and to monitor and reduce vehicle idling;
- evaluating the relocation of AFVs to areas where alternative fuels are available, and the installation of fueling infrastructure;
- participating in the Hybrid Truck Users Forum (of the Army's Tank-Automotive Research, Development and Engineering Center) to increase the number of hybrids on the GSA schedule for heavy duty applications;
- procuring low-GHG emitting vehicles;
- right-sizing the fleet; and
- populating and refining an enterprise-wide energy dashboard that includes ground vehicles.



DLA plans to reduce its vehicle inventory by 6% by December 2013. Efforts are currently underway to install E85 fuel dispensers at two DLA Host Sites—New Cumberland, PA, and Tracy, CA—and DLA will acquire alternative fuel medium- and heavy-duty, special-purpose vehicles through GSA where applicable and where alternative fuel is available. DLA is also in the process of acquiring three plug-in hybrid EVs as part of a GSA pilot program, enabling the agency to better estimate life cycle costs and evaluate the benefits of operating this type of vehicle. DLA continues to create more motor pools to centrally manage underutilized vehicles, and to educate drivers through a DLA “Driver Energy Conservation Awareness” training program on efficient vehicle operation.

WHS recently developed a Pentagon Master Plan and Transportation Management Plan. One of the major goals identified through this effort was a set of long-term (2017–2030) strategies for reducing vehicle petroleum use, including:

- improving pedestrian and bicycle circulation around the Pentagon reservation;
- integrating EVs and charging stations into the fleet motor pool; and
- providing bus and mass transportation options for employees and tenants.

In FY 2013 and FY 2014, WHS will work to determine feasible strategies for reducing the use of petroleum by the Pentagon Force Protection Agency vehicle fleet without compromising security, since it is the foremost user of petroleum products in the WHS fleet. Also, the WHS Environmental, Sustainability and Energy Branch is planning to prepare a fleet fossil fuel reduction policy and plan that will suggest additional strategies for reducing the size of the current WHS vehicle fleet, replacing vehicles with AFVs, and restricting idling.

Sub-Goals 2.1 and 2.2 – Potable Water Consumption

In FY 2013, the Air Force will issue a Net Zero Strategy and Guidance document to further focus efforts to reduce consumption of potable water to an amount no more than can be practicably captured and reused, repurposed, or aquifer-recharged. It will also continue to fund and implement water efficiency projects with high return in terms of water and financial savings, based on evaluations of proposed projects submitted each year. The Air Force expects to achieve continued success reducing potable water consumption in FY 2013 by: conducting system leak checks and repairs; retrofitting with low-flow bathroom fixtures; using xeriscaping and native plants in landscaping; achieving more efficient irrigation and irrigating with reclaimed water and captured rainwater; and incorporating LEED design principles into new construction. The Air Force will also continue to implement lessons learned and share best management practices across the enterprise using a variety of communications media.

The Army has added water use and water security as new objectives in the FY 2013 Army Campaign Plan, which will be reported and reviewed quarterly. The water security objectives are in addition to the potable water intensity and industrial, landscaping, and irrigation water consumption metrics. To support the new objectives, the Army issued a policy memorandum in December 2012 titled [Water Goal Attainment Responsibility Policy for Installations](#), spanning reduced water intensity and use, stormwater management, and leak detection. Also in FY 2013, the Army will implement its

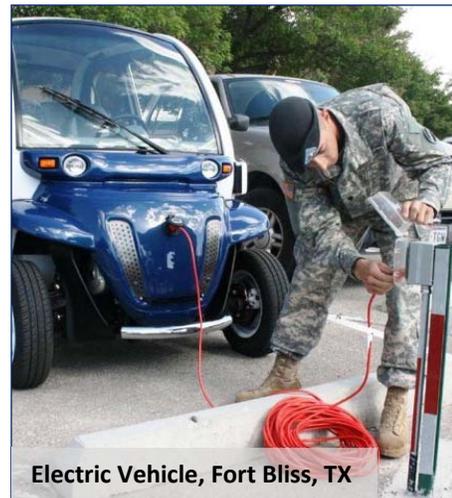
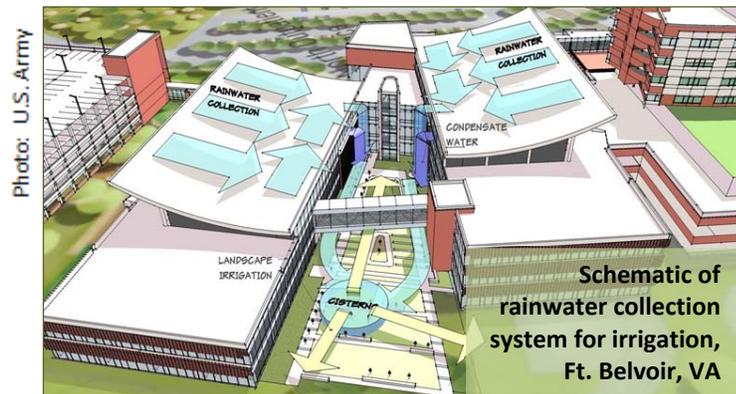


Photo: U.S. Army

Electric Vehicle, Fort Bliss, TX

water management plan template across the Army, which will standardize installation-level plans and improve their alignment with the goals of EO 13514.



Under the Army's Net Zero Water pilot initiative, the Army will complete installation-specific Net Zero Water 'roadmaps' in FY 2013 at the eight pilot installations, using data and analysis from the water balance assessments completed in FY 2012. Each roadmap provides a detailed description of projects the pilot could implement to achieve the Net Zero Water goals, including: improving water distribution system integrity to reduce losses, renewed emphasis on water awareness and education, reduced irrigation, and conversion to more efficient water fixtures and cooling systems. The Army also plans to complete water availability studies at four Net Zero Water pilot installations in FY 2013, to evaluate current and future water supplies and water availability.

The Navy found that FEMP's [Water Efficiency Best Management Practices](#), originally implemented as a result of EO 13123, have proven valuable to the Navy as part of its overall water reduction strategy, and it will continue to employ the best management practices in FY 2013 and beyond. The Navy is also demonstrating and validating an integrated suite of commercially available smart water conservation technologies for irrigated landscapes, including:

- 1) Advanced weather-tracking, evapo-transpiration irrigation controllers
- 2) Centralized and site-specific sensor inputs (rain, soil moisture, and leak detection)
- 3) Efficient water delivery systems
- 4) Systems to harvest rooftop rainwater and HVAC water condensate for irrigation.

The Navy will measure the success of the technologies by the resulting reduction in potable water used for irrigation, the reduction in potable water costs, and the payback period.

Finally, every four years the Navy conducts energy and water evaluations for those facilities covered under EISA, and funds those measures that rank well based on return on investment, legal requirements, and impact to critical infrastructure. The Navy follows up on its water efficiency projects with periodic measurement and verification. The Marine Corps approach to water efficiency is to complete a comprehensive water evaluation of facilities every four years, update water metering systems with advanced meters, increase the water efficiency of new construction, procure products that use water efficiently, and use landscaping with low-water requirements, especially in desert areas.

Specific to water used for industrial and irrigation applications, the Army plans to work with the DOE Pacific Northwest National Laboratory in 2103 to approximate



the Army's FY 2010 industrial and irrigation water consumption baseline, using limited direct data collection and modeling. The project will also create an implementation plan that Army installations can use to measure industrial and irrigation water consumption once the baseline is established. Also in FY 2013, the Army plans to assess the feasibility of using the centrally-funded Army meter program to meter industrial and irrigation water. The Army will update its sustainable design and development policy to require new construction and major renovations to use at least 50% less outdoor water, as per the March 2013 DoD UFC 1-200-02 ([High Performance and Sustainable Building Requirements](#)).

Sub-Goal 2.3 – Stormwater Runoff

In addition to the November 2010 UFC 3-210-10 on [Low Impact Development](#), which establishes standardized criteria that provide a uniform approach to implementing the requirements of EISA Section 438, the new UFC (1-200-02) on High Performance and Sustainable Building Requirements reiterates that DoD Components are required to comply with UFC 3-210-10. Between these DoD requirements and guidance, and additional policies and tools of the Services, all Services anticipate full compliance with this sub-goal, or nearly so, moving forward. The Air Force's 2011 Sustainable Design and Development Guidance, for example, already incorporates the methods for implementing the EISA Section 438 requirements on stormwater runoff.

The Navy and Marine Corps use the eProjects project management tool of the Naval Facilities Engineering Command to evaluate and track implementation the requirements of DoD LID policy and EISA Section 438, from planning through construction. (The Marine Corps, however, separately tracks projects not done under the Naval Facilities Engineering Command.) The Navy plans to address any remaining constraints to full compliance by issuing improved policy and guidance to ensure that Stormwater Pollution Prevention Plans are properly executed. Regular reporting of compliance with these plans will require that stormwater management features be monitored and maintained, and associated costs reported to leadership. This will also ensure that DON appropriately programs and budgets the operation and maintenance of stormwater management features. The Navy will continue to improve awareness through a new web-based, process-driven training module that is structured to improve data quality.

The Army has existing policy requiring that all master planning, project development, and project site planning follow Section 5 of [ASHRAE Standard 189.1](#) (*Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings*). In addition, to the greatest extent possible, the project must: incorporate LID criteria, maximize use of the existing topography (including slope, hydrology, flora, and soils), and minimize site clearing and soil grubbing activities. In FY 2013, the Army plans to update its sustainable design and development policy to reference both the 2010 DoD LID UFC and the March 2013 sustainable buildings UFC. The Army also plans to develop guidance on incorporating LID considerations into the early project planning and design phase (DD-Form 1391), and tracking compliance at the project and installation level (Department of Army Form 4283 and the Real Property Asset Database).

Sub-Goal 3.1 – Scopes 1 and 2 GHG Emissions

The main path by which the Department intends to achieve its goal for Scopes 1 and 2 GHG emission reductions is through Goal 1: a reduced consumption of fossil fuels by facilities and vehicles, and an increased use of renewable energy.

Sub-Goal 3.2 – Scope 3 GHG Emissions

The Department's main approach to reducing Scope 3 GHG emissions is through reduced emissions from employee commuting and air travel (Sub-Goals 3.3 and 3.4, respectively).

Sub-Goal 3.3 – Telework

In FY 2013, the DoD Defense Civilian Personnel Advisory Service will continue its efforts to fully document employee eligibility data in the Civilian Personnel Data System, and more accurately capture the actual amount of time teleworked in the automated time and attendance systems. The Department expects both refinements to increase the percentage of routine telework accomplished in DoD.

At the Component level, the Army will continue outreach activities in FY 2013 to encourage eligible Army employees to telework where practical, and to highlight available IT solutions, such as Common Access Card readers, Webmail, and Defense Connect Online, an internet sharing platform for both the Unclassified but Sensitive Internet Protocol Router Network and the Secret Internet Protocol Routing Network. In FY 2013, the Air Force expects to issue an Air Force Instruction that more clearly defines eligibility requirements, roles, and responsibilities around teleworking, to ensure that the Air Force is aligned with the DoD Instruction, *Telework Policy*, DoDI 1035.01. As part of its formal telework plan, the Marines Corps continues to train managers and supervisors on telework eligibility determination, developing telework agreements for employees, and the benefits of telework.

In FY 2013, DLA will build upon its successful telework program by continuing to focus on mission continuity as a primary driver, supporting the expansion of flexible workplace alternatives including hoteling and desk-sharing, and implementing refreshed guidance that clarifies telework flexibilities and obligations. TMA is currently revising TMA Administrative Instruction No. 001, *TMA Telework Guidance*, and expects to issue it in 2013. DIA is working to fully promote and adopt its new (June 2012) DIA Instruction 1500.002, "Telework Program," which will include actively promoting the telework program and identifying opportunities and obstacles to participation. MDA set goals for 25% and 26% of its eligible civilians to be routinely teleworking in FY 2013 and FY 2014, respectively. In this time period, MDA plans to institute systems and procedures to track teleworking, develop an education module on teleworking for MDA's General Environmental Awareness Training, and continue planning for and procuring infrastructure, such as laptops needed to support teleworking. WHS expects to have a teleworking plan of action developed by the end of FY 2013.

Sub-Goal 3.4 – Employee Air Travel

Air travel is getting increased scrutiny across the Department, with all employees required to justify that travel is necessary to meet objectives, as per the 2011 DoD Track Four Initiatives Decision. The Department has an education and communication campaign to increase employees' awareness of virtual tools and facilities, and online training on these tools and facilities. Some Components reinforce the requirement; for example, a January 2013 memorandum from the Secretary of the Army stated that proposed travel in FY 2013 will continue to be scrutinized for other effective means of communication and only mission essential travel will be authorized. In FY 2013, the Air Force will encourage employees to consider travel distances in deciding where to site meetings, and to use alternative travel modes, such as rail between cities on major rail corridors.

WHS currently has two proposed methods for reducing GHG emissions from employee air travel in the pre-feasibility assessment stage – a multi-faceted policy, and a project to promote video teleconferencing – and in FY 2013 and FY 2014 it plans to conduct working groups to assess and develop them. MDA set targets for reducing GHG emissions from employee air travel by 3.5% and 4.5% in FY 2013 and FY 2014. In February 2013, the MDA Chief Financial Officer directed the agency to reduce travel expenditures 10% by minimizing “non-mission critical” employee business travel and promoting telecommuting and video conferences as an alternative to costly business travel. MDA will continue to plan for and procure the technology necessary to support meetings with geographically dispersed participants, and it will add an education module into its General Environmental Awareness Training, discussing the need to reduce air travel and increase the use of video teleconferencing technologies.

Goal 4 – DoD Climate Change Vulnerability Assessed and Resiliency Improved

To improve the resiliency of the Department to climate change, DoD plans to begin implementing its strategy to perform screening-level vulnerability assessments. The DoD Climate Change Adaptation Working Group will continue to identify and support steps to implement DoD’s Climate Change Adaptation Roadmap.

Sub-Goal 5.1 – The Use of Paper

DLA Document Services continues to reduce its production of hardcopy duplication at a rate of approximately 15% yearly, anticipating a reduction of an estimated 153 million sheets in FY 2013 and an additional reduction of 130 million sheets by the end of FY 2014. Efforts to market the conversion of paper documents into digital format and aggressively promote duplex printing of all hardcopy requirements will continue in FY 2013. DLA Document Services will continue its conversion to Electronic Document Management for digital document storage, archival, and retrieval, averaging approximately 25 million new pages stored yearly. During FY 2013, DLA Document Services plans to finalize the Scan and Conversion pilot study and conduct an extensive analysis of the results. Over 15 million documents will be converted to digital files, eliminating the need for hardcopy dissemination and transfer and reducing storage space requirements. DLA Document Services is in the process of negotiating with DLA Distribution and the National Geospatial Information Agency to stand up a new Print on Demand operation to address DoD mapping requirements. To address performance issues caused by the variety of document conversion formats used today, DLA Document Services initiated a pilot test of an enterprise-level standard document conversion configuration solution. The study is designed to determine the effectiveness of condensing high skill functions (e.g., template creation, quality control, document archival) to a few locations while allowing document scanning at many locations using existing scanning devices.

In FY 2013, the Air Force will complete its evaluation of the benefits (and potential unforeseen impacts) associated with moving from a traditional paper-based flight publication system to an electronically-based system. An electronic flight bag is an electronic information management device that helps flight crews perform flight management tasks more easily and efficiently with less paper. An Air Force business case analysis projects a savings of over \$5 million per year in avoided costs for printing Air Force Instruction and flight manuals and navigational charts. Another advantage is weight: a traditional flight bag can weigh anywhere from 60 to 80 pounds, largely due

to paper. Moving to electronic flight bags will not only reduce paper waste, but the analysis estimates that \$772,000 per year will be saved in fuel costs due to the weight reduction.

As directed in the January 25, 2013 policy signed by the DON CIO, "[Mandatory Guidance Regarding Management of Department of the Navy Copiers, Printers, Fax Machines, Scanners, and Multifunction Devices](#)," the Navy and Marine Corps will develop implementation plans and implementing policy to execute the requirements in the DON policy. The Marine Corps will draft a Marine Administrative Message to implement mandatory double-sided printer settings, mandatory duplexing to the fullest extent possible, duplexing capability in all new copying and printing devices, and replacement of devices at the end of their life cycle with duplex-capable devices.

TMA will implement a Print Optimization Protocol in FY 2013, requiring the following practices to reduce printing paper usage: use of the duplex default 100% of the time, reduce margin settings for non-official correspondence, and conduct paperless meetings where feasible. TMA has completed a check of its copiers and will begin reducing the number of printers in FY 2013, as well as upgrading them with newer, more efficient models. WHS will finalize and implement a policy by the end of FY 2013 that will require all existing capable printers to be set to duplex printing by default, and all new printers to have duplex printing capabilities and be set to duplex default. DIA's Paper Reduction Policy Team plans to develop a paper reduction policy in FY 2013 addressing printer purchasing, default duplex printing, and the elimination of default printing of fax receipts. In addition, the team plans to implement at least one major procedural change to reduce unnecessary printing across the agency, such as replacing printed forms of time sheets and leave forms with electronic handling.

Sub-Goals 5.2 and 5.3 – Solid Waste Diversion

The Department continues to move forward in its process to finalize the DoD Instruction on integrated solid waste management. DoD has developed a disposition chart for non-hazardous solid waste to help installations understand which solid waste is eligible for the DoD diversion metric to be included in the Instruction. Also, the Military Services are stepping up their efforts to evaluate composting processes for removal of food waste from entering the landfill.



In April 2012, the Air Force issued policy on [Achieving Efficiencies Through Pollution Prevention and Waste Elimination](#), setting aggressive reduction goals for hazardous waste, non-hazardous solid waste, and TRI releases. Consistent with that policy, in FY 2013 the Air Force will implement measures to

achieve a diversion rate of 65% by weight of non-hazardous solid waste from landfill disposal by CY 2020, excluding C&D debris, with interim goals of diverting 55% by 2015 and 60% by 2018. The target diversion rate for C&D debris is 60% by weight by CY 2015. In FY 2013, the Air Force will continue to implement an Asset Management Program that includes Waste Management as one of its five primary mission lines, and to develop Waste Activity Management Plans to guide the investment strategy and approach for achieving solid waste management and diversion rate program goals. Based on the recent results of an audit by the Air Force Audit Agency, in FY 2013 the Air Force will develop and provide training and guidance documents, and further refine C&D

data collection and reporting methods, to help installations manage their C&D debris in accordance with integrated solid waste goals. The Air Force expects to issue a Net Zero Strategy and Guidance document by the end of FY 2013 to further focus waste reduction and diversion efforts.

The Army is planning to develop updated solid waste management guidance in FY 2013 to improve its solid waste diversion performance. The Army will also integrate several new solid waste management goals into the planned FY 2103 update of its sustainable design and development policy. Projects will be required to include conveniently located and appropriately sized space for reuse and recycling for building occupants. The policy will require also all new construction and major renovation projects to achieve at least 60% diversion of C&D debris, and that deconstruction (versus conventional demolition) be implemented where cost-effective. In addition, information from the Army's Net Zero Waste pilots (e.g., material flow analyses, a Net Zero Waste roadmap template, best practices, success stories, and lessons learned) will be widely distributed to all Army installations. For example, the material flow analyses determined that 25%–40% of the solid waste generated on Army installations is food and other organic waste, much of which is compostable. To help Army installations more effectively manage this waste stream, the Army is developing a guidance document for implementation of traditional land-based composting, organic digester systems, and dehydration systems. In FY 2014, the Army plans to implement an improved solid waste reporting system that will replace the currently used Solid Waste and Reporting Web.

Building upon strategies initiated in the FY 2011 comprehensive study of integrated solid waste management practices, the Navy is planning to establish a working group to update methods and guidance for the collection of data, revise the Qualified Recycling Program guide, and revise solid waste management policy for incorporation into the recently updated Chief of Naval Operations Instruction 5090.1D (scheduled for release in FY 2013).

In FY 2013, the Marine Corps plans to conduct a review of installation solid waste management plans to identify areas for improvement and successes approaches that can be shared among installations. It will also survey a representative set of installations to identify areas where Headquarters Marine Corps can provide support by issuing policy or guidance to help improve diversion from disposal.



Photo: U.S. Army

DLA will strategize to enhance communication and education approaches to increase its diversion rate in FY 2013. In addition, DLA Land and Maritime Columbus, OH, plans to complete surveys at a number of facilities to establish optimal recycling bin placement and determine the need for additional bins, and DLA Distribution Susquehanna, PA, is incorporating composting in their recycling program and plans to expand its use. DLA will continue its existing approaches to increasing diversion, such as education, assessing waste streams and commercial recycling markets to identify new recycling opportunities, and incorporating recycling requirements in construction project contracts.

In FY 2013, WHS plans to train construction and alteration groups to ensure they are aware of C&D diversion requirements and understand procedures for recycling C&D waste within the Pentagon. WHS also plans to implement a sustainability checklist for use by project managers to ensure that

construction and renovation projects are meeting WHS sustainability goals and reporting the quantity of C&D waste that is diverted from landfills.

Sub-Goal 6.1 – Chemical Use, Release, and Transfer

In FY 2013, the Department will further amend the hexavalent chromium rule in the Defense Federal Acquisition Regulation Supplement to better capture its application to legacy systems. This revision is expected to be finalized in FY 2014. To reduce the release of munitions constituents on operational land-based ranges, DoD is developing a best management practices document to help Components evaluate and apply technologies (fielded and under development) that remove, degrade, or stabilize munitions constituents in soil and groundwater, and to provide advice on technology selection and implementation. Live-fire training is a necessary military function to maintain the mission readiness of our nation’s warfighter, but these training activities can release munition constituents onto the range. DoD will publish the best management practices document in FY 2013.

Consistent with the April 2012 Air Force policy on [Achieving Efficiencies Through Pollution Prevention and Waste Elimination](#), in FY 2013 commanders will utilize the Air Force EMS framework to identify and manage daily operations that generate waste and pollution. The framework will use a hierarchy that gives first preference to eliminating or reducing pollution at the source by adopting less hazardous alternatives and reengineering processes, packages, systems, and facilities. In FY 2013, the Air Force plans to roll out a methodology to capture, consolidate and prioritize the significant environmental aspects and impacts of Air Force processes and mission activities, including information on chemical use, release, and transfer. Resulting information will be managed through the eDASH, allowing the Air Force to identify pollution prevention opportunities, target high-valued opportunities for reducing risks and improving efficiencies across the life cycle, and share lessons learned and best practices across the Air Force.

Anniston Army Depot in Alabama has historically accounted for the vast majority of the Army’s total use of methylene chloride and trichloroethene. By the end of FY 2013, the base anticipates nearly eliminating its use of methylene chloride by continuing efforts to replace paint strippers containing methylene chloride with an alternative that does not. For trichloroethene, to date Anniston has achieved an 84% reduction through process modifications and the identification and use of alternative cleaning technologies and substances. In FY 2013, Anniston plans to further reduce trichloroethene use by ‘right sizing’ remaining processes still relying on the chemical.



During FY 2013, the Navy will continue to devolve responsibility for chemical data management and reporting, and installation-level chemical reduction efforts to the Naval Facilities Engineering Command and the Commander, Navy Installations Command. In addition, the Navy will continue to emphasize the integration of pollution prevention plans (including efforts to reduce TRI releases) into EMS programs at the installation level. Both efforts will be formalized via policy changes in the revised Chief of Naval Operations Instruction 5090.1D, scheduled for release in FY 2013. The Navy

continues to place increased reliance on third-party logistics solutions for hazardous materials management, where a contractor owns the Navy's hazardous material inventory until it is requisitioned for use by a unit or shop. This greatly reduces the amount of hazardous materials owned by the Navy and consequently the amount of hazardous waste generated due to shelf-life expiration.

As it does every year, the Navy will review past releases to identify potential chemicals, processes, and installations where reduction opportunities exist. The review results inform the research efforts of the Navy Environmental Sustainability Development to Integration program, in cooperation with the DoD Environmental Security Technology Certification Program and the Joint Services Solvents Substitution team. For example, the program is part of efforts with these two partners to develop new non-aqueous solvent/cleaner specifications for environmentally compliant solvents, and to identify alternative materials and processes to eliminate the use of hexavalent chromium.

The Marine Corps will reduce the use and release of chemicals of environmental concern by continuing to purchase sustainable materials and implement its Authorized Use List policy, which prohibits installations from purchasing or using hazardous materials not found on an approved list. It will also increase the tracking and visibility of hazardous materials.

NSA normally does not have on-site releases of toxic chemicals, but it plans to gather data during FY 2013 to establish a baseline for the off-site transfer of toxic chemicals, enabling it to report on progress on the future.

Sub-Goals 6.2 and 6.3 – Pesticides

Installations are required to maintain current Integrated Pest Management (IPM) Plans, review and update the plans annually, and revise every five years, per [DoDI 4150.7](#). In addition, installations are required to utilize the Integrated Pest Management Information System to collect pesticide certification and pesticide use data. During FY 2013, the Components will continue to update IPM plans and manage the associated data in the IPM Information System as required, although funding shortfalls may present challenges to accomplishing all required plan revisions.

The Marine Corps is strengthening established compliance audit mechanisms, through the Marine Corps Environmental Compliance Evaluation Program, to ensure that installations have implemented an effective IPM plan and are complying with IPM requirements for personnel who apply pesticides on USMC installations. To ensure compliance with the pesticide certification requirements, DLA will continue the following activities during FY 2013: spot inspections of applicators, review of monthly pesticide application reports, conducting an annual data call, on-site pest management reviews (every three years), and periodic site visits. WHS will develop and implement a strategy in FY 2013 to ensure that the pesticide certification requirement is included in contract documents. Beginning in FY 2013, WHS will coordinate with the building management organizations at all installations to ensure that IPM plans are in place, and reviewed and updated annually.

Sub-Goal 7.1 – Procuring Sustainable Goods and Services

DoD's Green Procurement Program Work Group is developing a Green Procurement DoD Instruction to establish policy, assign responsibility, and provide direction for sustainable procurement of goods and services. The Instruction also will outline compliance goals, procurement

preferences, new contract requirements, training procedures, and program evaluation processes for sustainable procurement. Formal coordination of the Instruction will begin by the end of FY 2013.

The Army's planned FY 2013 sustainable design and development policy update will also include measures to improve sustainable procurement. All new construction and major renovation contracts will include clauses requiring compliance with applicable sustainable procurement requirements (e.g., biobased, energy efficient, water efficient, recycled content) and contracting officers will be required to report these clauses in the Federal Procurement Data System. The Army will continue to develop "quick guides" in FY 2013 that summarize sustainable procurement requirements for common installation-level activities such as food service, motor pools, building operation and maintenance, and administrative offices. The guides also identify sources for corresponding sustainable products, such as DoD EMALL and GSA Advantage®.

The Air Force plans to focus on the following sustainable procurement initiatives in FY 2013:

- Continue participation in the DoD Green Procurement and Sustainability Implementation Workgroups.
- Provide technical and programmatic inputs to support the development of the DoDI on Green Sustainable Procurement and implement associated requirements.
- Participate in outreach activities highlighting the ease of use and life cycle benefits of green procurement practices.
- Educate contracting personnel on existing green procurement requirements and responsibilities.
- Collaborate with GSA and DLA on ways to make environmentally preferable products more visible and accessible through GSA and DLA procurement tools.

The Navy will update the training and awareness catalog titled [*Buy It Green 2012: How to Buy Green for a Sustainable Navy*](#), with issuance anticipated for late FY 2013 or early FY 2014. The catalog includes background information and requirements for sustainable procurement, a listing of green products for high demand items, guidance to assist cardholders with web-based shopping, and sample FAR clauses and statements of work for contracting professionals.

During FY 2013, the Marine Corps will continue to educate contract writers, vendors, and product purchasers about sustainability requirements and mandates. In FY 2012, the Marine Corps initiated several biobased product field demonstrations that solicited feedback from installation staff members on their understanding of the sustainable acquisition and procurement program. In FY 2013, the Marine Corps will analyze the survey results to identify methods to support better outreach to installations. The Marine Corps will continue to work with GSA and DLA to procure sustainable products at all installations, while purging all unnecessary products, such as Styrofoam™, from the supply chain.

The active promotion of sustainable procurement is a central focus for DLA on an ongoing basis. During FY 2013, DLA will continue a process it began in the last half of FY 2012 to revise DLA reporting requirements in order to heighten awareness of sustainable procurement and ensure compliance. In addition, DLA will continue implementing the following approaches in its ongoing efforts to ensure that sustainable procurement is the normal way of doing business:

- Research possible changes to the Enterprise Procurement contract writing system (also known as EProcurement) to improve its ability to track or measure compliance with environmental regulations.

- Investigate the possibility of establishing a sustainable procurement compliance advocate in the contract policy office at each DLA Field Activities.
- Review all procurements forwarded to Headquarters DLA and all waiver documentation for sustainable procurement compliance.
- Review regulatory coverage for potential changes and incorporate changes as necessary in DLA policy and guidance to ensure clarity and delete redundant wording.
- Emphasize biobased products for applicable procurements in support of the Presidential Memorandum on [Driving Innovation and Creating Jobs in Rural America through Biobased and Sustainable Product Procurement](#).

WHS will provide sustainability briefings to acquisition staff in FY 2013, and in FY 2014 it will develop a sustainable purchasing policy for implementation throughout WHS. WHS is investigating the feasibility of developing a memorandum of understanding with the Pentagon Storefront, which conducts a significant amount of purchasing for the Pentagon Building Management Office and for the Alterations Work Group. WHS provided recommendations to the Storefront for sustainable purchases, and plans to implement sustainable purchases with it throughout FY 2013 and FY 2014.

MDA will issue a Green Procurement Directive in FY 2013, which will document the Agency's policy regarding sustainable procurement and identify roles and responsibilities for implementing the program. MDA will continue to enhance its capability to conduct electronic searches of contract information (e.g., statement of work, performance work statements, and contract clauses) in all contracts, in one place and format, to improve the effectiveness of compliance audits. Finally, the agency will continue identifying opportunities to improve future solicitations and contract actions during FY 2013, including additional environmental requirements in contract statements of work.

Sub-Goal 7.2 – Electronic Stewardship and the Efficient Use of Data Centers

Disposition of Electronics

During FY 2013, DLA Disposition Services will continue its ongoing practices for the disposition of excess electronics using best available practices. For commercial electronics, where practical, this means disposition through the full reutilization, transfer, donation, and sales cycle. Military unique electronics are made available to reutilization customers only. All remaining items are destroyed and the resultant residues are recycled. Ultimate disposition processes include demanufacturing through a service contract and a memorandum of agreement with Federal Prison Industries. Any precious metals bearing components are recovered and refined via a service contract.

The Navy's primary means of disposal for excess or surplus electronics is DLA Disposition Services. When used or excess electronics are not eligible for DLA Disposition Services, they are designated as hazardous waste due to toxic constituents, thus ensuring handling and disposal in an environmentally sound manner, including recycling where feasible. In FY 2013, the Navy will issue updated integrated solid waste management policies in Chief of Naval Operations Instruction 5090.1D, including specific guidance regarding the disposal of electronic products.

The Air Force will continue its approach to the environmentally sound disposition of excess or surplus electronic products during FY 2013. Equipment that is still useful is disposed to school districts, other federal agencies, or non-profits, while commercial products with no remaining utility and military unique electronic equipment are sent to DLA Disposition Services. NSA follows EPA's

EPEAT guidance and seeks ENERGY STAR certification when purchasing electronics in order to ensure utilization of the most energy-efficient options. NSA will train personnel in FY 2013 to seek out these products when viable. In FY 2013, MDA will continue a program it began in FY 2012 to send defunct hard drives—degaussed and crushed—to DLA Disposition Services for precious metals recycling.

Data Centers

During FY 2013, the Air Force will continue efforts to achieve an eventual 75% reduction in data centers, with the majority of data center closings occurring in the FY 2015–FY 2017 time period. The data center consolidation plan includes a short-term strategy focused on pre-existing and ongoing IT consolidation and efficiency initiatives, and a long-term alignment with the Joint Information Environment. The latter is implementing a hierarchy of data centers across the department focused on minimizing the number of required data centers and promoting efficient operations through extensive use of server virtualization and application rationalization.

Within TMA, the Military Health System is developing plans to consolidate medical systems located at 101 military treatment facilities into six Defense Enterprise Computing Centers in the Defense Information Systems Agency and 20 Military Health System Application Access Gateway sites. The Military Health System began several pilot projects to validate plans and provide lessons learned for future consolidation efforts, with the results and lessons learned from the pilot expected by the end of FY 2013. The results will be incorporated into data center consolidation plans.

WHS received ECIP funding to implement best management practices for energy efficiency in some of its data centers during FY 2013. Following this demonstration, WHS will assess additional data centers for energy efficiency improvements or potential consolidation.

NGA has been designated as the service provider for a program called the Virtual Enterprise Service Provider for Energy Reduction, or “VESPER,” the purpose of which is to improve the management and energy efficiency of the data centers serving the “Big Six” Intelligence Community agencies.⁴ The program has three phases:

- 1) reduce the energy consumed by workstation computers and server processing devices;
- 2) develop solutions for improving the management of data center infrastructure, including integrating IT power management capabilities with those of facilities, developing metrics for data center energy use, and providing energy management training; and
- 3) deploy the integrated data center infrastructure management capability developed in phase two into the government cloud data center, and evaluate scalability, energy savings, technology performance, and return on investment.

NRO supports the use of virtualization technologies, reduction in numbers of networks, and the use of energy efficient equipment at several sites. In FY 2013, NRO will transition a support system that allows for the elimination of one Top Secret network, and provides virtualized servers and higher capacity storage with better reliability—all with a reduced physical and electrical footprint.

The MDA follows the Telecommunications Industry Association Telecommunications Infrastructure Standard for Data Centers (TIA-942). In FY 2013, MDA will continue efforts to virtualize data center

⁴ Apart from the three Defense Agencies (NGA, NSA and NRO), the Big Six consists of the Department of National Intelligence, Central Intelligence Agency, and Federal Bureau of Investigation.

servers to increase computing efficiency and allow removal of unnecessary servers, thus saving electricity (both in CPU operation and data center cooling). The MDA will continue to upgrade the electronic switchgear and backup generators with more energy-efficient equipment.

Sub-Goal 7.3 – High Performance, Sustainable Buildings

In March 2013, the Department issued DoD UFC 1-200-0, [High Performance and Sustainable Building Requirements](#), which “provides minimum unified requirements and coordinating guidance for planning, designing, constructing, renovating, and maintaining, high performance and sustainable facilities that will enhance DoD mission capability by reducing total ownership costs.” The March 2013 UFC represents 18 months of effort by subject matter experts from every construction discipline who pulled together the best, most cost-effective elements of leading edge commercial building standards to create a standard that raises the bar for all new construction and major renovation undertaken by the Department. The Department intends the document to provide MILCON project managers with a contract-enforceable standard that removes the guesswork typically associated with complying with the variety of energy, water, and sustainability federal mandates, including the Guiding Principles.

The Naval Facilities Engineering Command estimates that up to 65% of Navy buildings can conform with the Guiding Principles by updating and applying its many relevant policies and guides, and those of DON. It will be developing guidance on the use of EPA’s ENERGY STAR Portfolio Manager to document conformance to the Guiding Principles. As the Navy continues its rollout of advanced metering infrastructure, the additional data will help the Navy identify and prioritize existing building renovation and repair requirements based on returns on investment, and it will inform future guidance. The Marine Corps will revise its Order for Energy to incorporate the Guiding Principles requirement and facilitate tracking of performance.



The Army’s FY 2013 sustainable design and development policy update will align with the new DoD UFC and also require enhanced commissioning, which will be used to benchmark that high performance milestones from capital investments are realized. The Army also requested funding to modify and implement BUILDER, web-based facility management software, to capture Guiding Principles criteria for Army facilities and help estimate the investments needed to meet the Guiding Principles criteria. The Air Force will conduct its combined Sustainable Infrastructure Assessments on 25% of its buildings (by area) each year to determine their high-performance sustainability status and provide investment grade project documentation. The documentation will include savings-to-investment ratios so projects to improve building sustainability can compete with other energy and water infrastructure projects for resources.

WHS is implementing a program for building-level energy and water metering on the Pentagon reservation, including software to analyze the data. The meters and software are expected to be in place by the end of FY 2014. WHS is evaluating the feasibility of pursuing LEED operations and maintenance certification for three of its existing buildings, and it will pursue LEED certification for all new construction moving forward.

Sub-Goal 7.4 – Environmental Management Systems

Each of the Military Services and DLA will continue to have external conformance audits performed on each of their EMSs every three years. DLA is in the process of developing an Environmental Management policy memorandum, instruction, and manual that will provide detailed EMS requirements for all levels of the agency.

The Air Force will fully deploy the eDASH electronic document management and communications tool in mid-FY 2013, after which time the Air Force will migrate installations to the standardized EMS format. The Air Force established an EMS Panel to develop a standardized Air Force EMS model and identify the best ways to meet the EMS goals. The Panel will establish cross-functional teams to integrate ESOH requirements into mission processes, making them a normal consideration in daily mission processes.

In late FY 2013, the Army will deploy an enterprise environmental reporting system with an improved module for conducting external and internal EMS audits. The system will provide greater visibility of installation-level audit results, resulting in better analysis and oversight capabilities, improved ability to address systemic issues and implement corrective actions, and the identification of opportunities for improvement.

The Navy has deployed EMSWeb at most of its locations. EMSWeb is an online, enterprise-level environmental management system tool. The system tracks external and internal audits, associated findings, and follow-up corrective actions. The system also provides the ability to respond to data calls, manage EMS-related information and documentation, and contains robust reporting tools. The Navy will continue to update EMSWeb, with major planned improvements for FY 2013 including improved dashboard functionality and the incorporation of List Builder into EMSWeb.

Headquarters Marine Corps is developing a comprehensive online environmental management data collection portal in the Web Compliance Assessment and Sustainment System. Once complete, installations will have on-hand access to current and historical environmental management metric data, which will assist in identifying trends and tracking progress towards environmental management goals and requirements. The Marine Corps will also continue implementing several initiatives to improve performance towards the EMS goals:

- Equipping installations to more accurately identify EMS requirements and track progress toward meeting them.
- Revising self-audit guides and the web-based compliance assessment system to help installations ask the right questions when looking critically at their EMS.
- Incorporating an automatic linkage between compliance findings and their EMS element root cause in the EMS auditing tool, which allows Headquarters Marine Corps to identify systemic EMS issues, both within installations and Marine Corps-wide.
- Emphasizing the role of EMS in supporting sustainability goals outlined in the Marine Corps Order 5090.2A, [Environmental Compliance and Protection Manual](#).



Photo: U.S. Air Force

Appendix A. Acronyms and Units

AFB	Air Force Base
AFV	alternative fuel vehicle
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
AT&L	Acquisition, Technology and Logistics
Btu	British thermal unit
C&D	construction and demolition
CCAWG	Climate Change Adaptation Working Group
CO ₂	carbon dioxide
CY	calendar year
DENIX	Defense Environmental Network and Information eXchange
DIA	Defense Intelligence Agency
DLA	Defense Logistics Agency
DoD	Department of Defense
DOE	Department of Energy
DoDI	Department of Defense Instruction
DON	Department of the Navy
ECIP	Energy Conservation Investment Program
EISA	Energy Independence and Security Act of 2007
EMS	environmental management system
EO	Executive Order
EPA	Environmental Protection Agency
EPAct	Energy Policy Act
EPEAT	Electronic Product Environmental Assessment Tool
ESPC	Energy Savings Performance Contract
EV	electric vehicle
FEMP	Federal Energy Management Program
FY	fiscal year
gal	gallon(s)
GGE	gallons of gasoline equivalent
GHG	greenhouse gas
GSA	General Services Administration
GSF	gross square foot/feet
GWP	global warming potential
HFC	hydrofluorocarbon
HVAC	heating, ventilation, and cooling
I&E	Installations and Environment

IPM	Integrated Pest Management
IT	information technology
JBLM	Joint Base Lewis-McChord
kgal	kilogallon(s)
kW	kilowatt
kWh	kilowatt-hour
LEED	Leadership in Energy and Environmental Design
LID	low impact development
MCAGCC	Marine Corps Air Ground Combat Center
MCAS	Marine Corps Air Station
MCB	Marine Corps Base
MCLB	Marine Corps Logistics Base
MDA	Missile Defense Agency
MILCON	Military Construction
MMT CO ₂ (e)	million metric tons of carbon dioxide equivalent
MW	megawatt(s)
MWh	megawatt-hour(s)
NAS	Naval Air Station
NGA	National Geospatial-Intelligence Agency
NRO	National Reconnaissance Office
NSA	National Security Agency
OEPP	Operational Energy Plans and Programs
OSD	Office of the Secretary of Defense
PPA	power purchase agreement
PV	photovoltaic
RE	renewable energy
REC	renewable energy certificate
SSC	Senior Sustainability Council
SSO	Senior Sustainability Officer
SSPP	Strategic Sustainability Performance Plan
SF ₆	sulfur hexafluoride
TMA	Tricare Management Activity
TRI	Toxics Release Inventory
UESC	Utility Energy Services Contract
UFC	Unified Facilities Criteria
USACE	U.S. Army Corps of Engineers
USAG	U.S. Army Garrison
USMC	United States Marine Corps
WHS	Washington Headquarters Service

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Appendix C. 2013 Addendum to the DoD FY 2012 Climate Change Adaptation Roadmap

The Department of Defense (DoD) FY 2012 Climate Change Adaptation Roadmap (CCAR) fulfilled a requirement of Executive Order 13514, *Federal Leadership in Environmental, Energy and Economic Performance*. All Federal Departments and Agencies should evaluate climate change risks and vulnerabilities to manage both the short- and long-term effect of climate change on the agency's mission and operations. Although an updated CCAR is not required for FY 2013, DoD chooses to provide the 2012 CCAR and a 2013 Addendum as an appendix to its 2013 Strategic Sustainability Performance Plan.

As articulated in the Department's Strategic Sustainability Performance Plan, DoD's sustainability vision is to maintain our ability to operate into the future without decline, either in the mission or the natural and man-made systems that support it. Maintaining readiness in the face of climate change is one of four key priority areas for the Department. Including climate change considerations in DoD planning processes will enhance operational and infrastructure resilience.

The four broad goals introduced in the 2012 CCAR serve as the foundation for support of the Department's vision.

1. Define a coordinating body to address climate change.
2. Utilize a robust decision making approach based on the best available science.
3. Integrate climate change considerations into existing processes.
4. Partner with Federal agencies and allies on the challenges of climate change.

Ongoing Activities Since 2012 CCAR Submission

- A DoD Climate Change Adaptation Working Group (CCAWG), comprising the four military Services and nine additional department organizations, was established in November 2012 and reports to the Senior Sustainability Council (SSC). The SSC is responsible for coordinating climate change adaptation efforts within DoD. CCAWG activities include:
 - Developing DoD climate change adaptation policy.
 - Developing a strategy to perform screening-level vulnerability assessments by: a) coordinating a multi-agency regional scenario working group and b) forming an internal subgroup focused on vulnerability assessment protocol development.
- In addition to internal groups, DoD continues participation in various external groups and partnerships, such as:
 - Interagency Climate Change Adaptation Task Force (co-chaired by White House Council on Environmental Quality (CEQ), the Office of Science and Technology Policy (OSTP), and the National Oceanic and Atmospheric Administration (NOAA)) and associated Agency Adaptation Working Group
 - United States Global Change Research Program Working Group on Adaptation Science
 - Interagency National Climate Assessment Working Group
 - Federal Climate Change Adaptation Community of Practice

- Southeastern Regional Partnership in Sustainability and Planning
- Earth System Prediction Capability (collaboration between NOAA, Navy, Air Force, DOE, the National Aeronautics and Space Administration, and National Science Foundation)
- National Climate Assessment Indicators Technical Teams
- DoD continues to identify climate science-related projects on new topics, such as climate change impacts to built infrastructure in Alaska (FY14 initiative). More can be found at URL:
<http://www.serdp.org/>

Appendix D. DoD FY 2012 Climate Change Adaptation Roadmap

The Department of Defense (DoD) Climate Change Adaptation Roadmap (CCAR) fulfills a requirement of Executive Order 13514, *Federal Leadership in Environmental, Energy and Economic Performance*. All Federal Departments and Agencies should evaluate climate change risks and vulnerabilities to manage both the short- and long-term effect of climate change on the agency's mission and operations, and include an adaptation planning document as an appendix to its annual Strategic Sustainability Performance Plan.

1. Policy Framework for Climate Change Adaptation Planning

The foundation for DoD's strategic policy on climate change adaptation began with the publication of the Quadrennial Defense Review (QDR) in 2010 by the Secretary of Defense. The QDR is a principal means by which the tenets of the National Defense Strategy are translated into new policies and initiatives. The QDR sets a long-term course for DoD as the Department assesses the threats and challenges that the nation faces and re-balances DoD's strategies, capabilities, and forces to address today's conflicts and tomorrow's threats. The QDR acknowledged that climate change has national security implications and must be addressed by DoD and its partners.

The QDR recognized that climate change will affect DoD in two broad ways.

- First, climate change will shape the operating environment, roles, and missions that the Department undertakes. It may have significant geopolitical impacts around the world, contributing to greater competition for more limited and critical life-sustaining resources like food and water. While the effects of climate change alone do not cause conflict, they may act as accelerants of instability or conflict in parts of the world. Climate change may also lead to increased demands for defense support to civil authorities for humanitarian assistance or disaster response, both within the United States and overseas.
- Second, DoD will need to adjust to the impacts of climate change on its facilities, infrastructure, training and testing activities, and military capabilities. DoD's operational readiness hinges on continued access to land, air, and sea training and test space, all of which are subject to the effects of climate change.

Through its planning and adaptation actions, DoD will be better prepared to effectively respond to climate change and to ensure continued mission success, both in the near term and in the future.

As climate science advances, the Department will need to regularly reevaluate climate-related risks and

opportunities in order to develop policies and plans that manage climate change's impacts on the Department's operating environment, missions, and facilities. Managing the national security implications of climate change will require DoD to work collaboratively, with both traditional allies and new partners.

"Our mission at the Department is to secure this nation against threats to our homeland and to our people. In the 21st Century, the reality is that there are environmental threats which constitute threats to our national security. For example, the area of climate change has a dramatic impact on national security: rising sea levels, severe droughts, the melting of the polar caps, more frequent and devastating natural disasters all raise demand for humanitarian assistance and disaster relief."
— Secretary Leon E. Panetta, May 2, 2012

1.A Vision and Goals

As articulated in the Department’s Strategic Sustainability Performance Plan, DoD’s sustainability vision is to maintain our ability to operate into the future without decline, either in the mission or the natural and man-made systems that support it. Including climate change and climate variability considerations in our planning processes will enhance operational and infrastructure resilience.

Four broad goals support the Department’s vision, as detailed below; implementation is discussed in Section 3.

5. Define a coordinating body to address climate change.
6. Utilize a robust decision making approach based on the best available science.
7. Integrate climate change considerations into existing processes.
8. Partner with Federal agencies and allies on the challenges of climate change.

“Our ability to advance constructive cooperation is essential to the security and prosperity of specific regions, and to facilitating global cooperation on issues ranging from violent extremism and nuclear proliferation, to climate change, and global economic instability-issues that challenge all nations, but that no one nation alone can meet.” (p. 11)

— 2010 National Security Strategy

1.B Responsible Senior Agency Official

The Department’s Senior Sustainability Officer (SSO) is the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(ATL)) and is responsible for overseeing the implementation of the requirements of Executive Order 13514, including climate change adaptation efforts. The Deputy Under Secretary of Defense for Installations and Environment (DUSD(I&E)) is the Department’s Senior Climate Official and reports progress to the SSO. Given the broad range of potential impacts to the Department’s operational, training, and test and infrastructure capabilities, the Department will analyze how climate change adaptation measures can be incorporated into the full scope of its missions and operations.

2. Agency Vulnerability: Analysis of Climate Change Risks and Opportunities

Climate change is expected to play a significant role in DoD’s ability to fulfill its mission in the future. Climate-related effects already are being observed at DoD installations throughout the U.S. and overseas. The physical changes are projected to include rising temperature and sea level and increases in both heavy downpours and the extent of drought. These will cause effects such as more rapid coastal erosion, shifts in growing seasons, and changing water tables.

The direction, degree, and rates of the physical changes will differ by region, as will the impacts to the military’s mission and operations. By taking a proactive, flexible approach to vulnerability assessment and adaptation planning that recognizes uncertainty and incorporates the best available science, the Department can keep pace with changing climate patterns and minimize their impact on operations.

The military is potentially vulnerable to climate change in many of the same ways as the rest of society, and in ways that are unique due to its operations and mission. The following table summarizes the potential high-level climate change impacts to the Department’s mission and operations. More comprehensive and region/installation-specific vulnerability assessments are needed to determine what adaptive responses are the most appropriate.

Table 1. Climate Phenomena and Potential DoD Mission Vulnerabilities

Climate Change Phenomena	Potential Impacts	Potential Mission Vulnerabilities
Rising temperatures	Rising mean temperatures; seasonal temperature increases; increased number of cumulative days with temperatures exceeding 95°F; opening of Arctic waters; thawing permafrost and ice sheets; lengthening ice-free seasons; human health effects ; vegetation transition (species and biome shifts); changes in incidence/distribution of vector-borne diseases; wildfire risk; soil warming; electrical grid stress; equipment performance	Increased occurrence of test/training limitations due to high heat days; reduced military vehicle access (e.g., thawing permafrost); degrading infrastructure and increased maintenance costs for roads, utilities, and runways; reduced airlift capacity; reduced live-fire training; potential degradation or loss of cold weather training venues; increased energy costs for building and industrial base operations; increased operational health surveillance and risks; change in operational parameters for weapons and equipment development and testing; increase in seasonal Arctic commerce and transit
Changes in precipitation patterns	Seasonal increases and decreases in precipitation; increases in extent and duration of drought; increases in extreme precipitation events; changes in number of consecutive days of high or low precipitation; change in form of precipitation (i.e., snow-ice-rain); increased wildfire risk; altered burn regimes; impacts to air quality; stream bank erosion and gulying of vegetative cover; impacted soil function and resilience (desertification); soil loss; infrastructure damage; water supply constraints; impacted groundwater quality; increased dust; protected species stress and potential for more species placed at risk; spread of invasive species; changes in incidence/distribution of vector-borne diseases; land management impacts; competing non-military land use	Reduced land carrying capacity for vehicle maneuvers; increased maintenance costs for roads, utilities, and runways; limits on low-level rotary wing flight operations; icing on aircraft; increased regulatory constraints on training land access; reduced live-fire training; reduced water availability and greater competition for limited water resources; reduced training land access; reduced training carrying capacity; operational health surveillance and risks; increased flood control/erosion prevention measures
Increasing storm frequency & intensity (coastal and inland)	Flooding; water quality issues; soil and vegetation loss; impact to soil function and carbon/nutrient cycling; wind damage	Military personnel safety; temporary or prolonged disruption of military operations or test and training activities due to intense storms and resulting storm damage; inundation of and damage to coastal infrastructure; reduced access to military water crossings and river operations; reduced off-road maneuver capacity; increased maintenance costs; increased flood control/erosion prevention measures; transportation infrastructure damage

Climate Change Phenomena	Potential Impacts	Potential Mission Vulnerabilities
Rising sea levels & associated storm surge	Loss of coastal land; damage to physical infrastructure (roads, targets, ranges) and protected ecosystem resources; saltwater intrusion; reduced capacity of protective barrier islands and coastal wetlands	Degradation or loss of coastal areas and infrastructure; increased cost of infrastructure reinforcement to withstand increased storm intensities; increased cost of infrastructure modification (e.g., raising pier heights); impacts to littoral and shore training and ranges; increased regulatory constraints on training land access; impacts on supply chain from potential shipping interruptions; increased demand for freshwater resources and associated increased cost of saltwater intrusion countermeasures; impact to future land availability and siting of new construction
Changes in ocean temperature, circulation, salinity, and acidity	Potential greater change to global climate system; negative impacts to general populations that rely upon fish as their main source of protein; coral reef losses that may impact ocean productivity and storm surge/wave dampening benefits	Exacerbation of conditions and mission impacts discussed above; coastal installation vulnerability; regional instability; increased potential for conflict or humanitarian assistance

3. Process for DoD Adaptation Planning and Evaluation

The QDR provides broad direction for future DoD strategies that will define plans and policies. Prompted by the QDR, the Department is prudently considering how to factor climate impacts into its mission areas. Given the diversity and complexity of DoD’s mission and operations, there is an equally wide array and magnitude of planning processes across DoD. The Department recognizes that both operational and infrastructure plans and processes present opportunities to integrate climate change risks and opportunities to enhance the resilience of our mission, at home and abroad.

DoD is well-versed in employing systematic methodologies and modeling frameworks in order to assess potential threats and risks to national security. The use of these risk assessment tools is an essential element of accomplishing the DoD mission. The Department anticipates employing a similar risk-based approach to evaluate multiple scenarios of potential climate change effects on the DoD mission. Many of the Department’s current efforts are focused on assessing potential climate change impacts to, and adaptation strategies for, facilities, built infrastructure, key ecosystems and protected species, and capabilities where military training is conducted or supported, and evaluating potential actions DoD can take to respond to these impacts. Sections 4 and 5 discuss specific efforts.

DoD intends to move forward with the previously stated goals for adaptation planning and evaluation. Goal implementation is described below.

“Preventing wars is as important as winning them, and far less costly.” (p. 7)
 — 2011 National Military Strategy

Goal 1: Define a coordinating body to address climate change.

The Department intends to define an appropriate structure utilizing existing bodies and organizations within DoD to guide the development, implementation, and evaluation of climate-related policy, guidance, and practice. The Senior Sustainability Council (SSC) is currently responsible for coordinating climate change adaptation efforts. The SSC will establish a technical advisory committee or working group to take direction from and provide advice to the council regarding the state of climate science, vulnerability and impact assessment, and adaptation science and practice. The advisory committee will analyze technical constraints and considerations related to climate change-related policy, guidance, and practice. The advisory committee will focus on ensuring that the Department has access to the climate-related information necessary to make informed decisions that support the Department's mission. This structure would identify those offices and existing forums, with authority in this area, those that would assist in coordination and guidance, and those that would be involved in support and implementation.

The DSB recommended the Secretaries and Chiefs of the Services should: better integrate climate change and disaster risk reduction consideration into exercise, training, and educational materials; establish metrics focused on risk reduction to minimize the impact of climate change on military and support operations, forces, programs, and facilities; ensure climate change resilience by incorporating climate change risk in design standards for facilities and installations, with an emphasis related to energy- and water-intensive uses.

— Defense Science Board "Trends and Implications of Climate Change for National and International Security," Oct 2011

The advisory committee, once established, will:

- Optimize use of existing plans and processes and identify gaps where new policies could be developed;
- Stress the importance of the science-policy interface;
- Foster sound vulnerability and impact assessment;
- Emphasize iterative and adaptive policy and planning approaches; and
- Monitor assessment and adaptation implementation effectiveness, learn from these experiences, and adjust action when needed.

Goal 2: Utilize a robust decision making approach based on the best available science.

Assessing climate change vulnerabilities, impacts, and adaptive responses requires a deliberative and iterative approach. The Department intends to develop appropriate assessment tools for use across all affected DoD Components. In developing its approach to assessment, adaptation planning, and implementation, the Department will strive to:

- Establish a process to obtain updated scientific data on potential future climate conditions and potential impacts;
- Use commonly accepted future climate scenarios that are based on the best available science, recognize uncertainties, and updated as the science changes;
- Provide guidance so that assessments consistently apply science that is appropriate in terms of location, resolution, and timeframe; and
- Use pilot approaches to develop decision frameworks for assessment and adaptation planning that attempt to match decisions to available and appropriately down-scaled climate information and other data.

Goal 3: Integrate climate change considerations into existing processes.

Climate change and climate variability will affect many of the Department’s activities and decisions related to future operating environments, military readiness, stationing, environmental compliance and stewardship, and infrastructure planning and maintenance. Climate change also will interact with other stressors that the Department now considers and manages. As a result, adaptation to climate change and variability should not be a separate decision-making process, but rather an aspect of overall management. DoD intends to fully integrate climate change considerations into its extant policies, planning, practices, and programs. Some stand-alone policy and guidance may be needed to help direct specific assessment activities and adaptation implementation; however, by and large the Department will use existing mechanisms to implement policy and guidance and to ensure mission and environmental sustainability.

Goal 4: Partner with Federal agencies and allies on the challenges of climate change.

Partnerships will be needed to fully ensure DoD’s mission is sustainable under climate change. The Department cannot assess its vulnerabilities and implement adaptive responses at its installations if its neighbors and stakeholders are not part of the process. Decisions made by outside communities will affect DoD and DoD’s decisions will also affect outside communities. Moreover, aspects of our mission such as force deployment may be affected by assets outside DoD control, such as transportation infrastructure.

The requisite scientific and practical understanding needs to be obtained in concert with the rest of the Federal community. This can occur through partnerships with individual agencies such as the National Oceanic and Atmospheric Administration or through the Department’s continued participation in forums such as the National Climate Assessment and informal forums such as the Interagency Forum on Climate Change Impacts and Adaptations.

“In combination with U.S. diplomatic and development efforts, we will leverage our convening power to foster regional and international cooperation in addressing transnational security challenges.” (p. 15)
— 2011 National Military Strategy

Internationally, the Department will continue its collaboration with the State Department and foreign militaries on vulnerability assessment and adaptation efforts. The Department has already started to assess potential climate change impacts and begin initial adaptation planning. Efforts to partner with foreign defense force counterparts are coordinated through existing planning processes. Climate change presents a unique opportunity to work collaboratively in multilateral forums, promoting a balanced approach that will improve human and environmental security in the region. The Department’s disaster response programs will continue to provide domestic and international response, but should adapt its response planning based on plausible climate change scenarios.

4. Actions to Better Understand Climate Change Risks and Opportunities

DoD is already working to foster efforts to assess, adapt to, and mitigate the impacts of climate change. The Military Services are considering potential climate change vulnerabilities and impacts to their activities and infrastructure in light of their Service-specific missions and plans.

The Department looks to the Strategic Environmental Research and Development Program (SERDP), a joint effort among DoD, the Department of Energy, and the Environmental Protection Agency, to develop

climate change assessment tools for DoD’s installations. The DoD Legacy program can be used in transitioning these tools for natural and cultural resources management applications. The Navy’s Arctic and Climate Change Roadmaps also outline specific action items which contribute to DoD’s understanding of how a changing climate can pose risks and opportunities to its mission and operations. The Air Force 2010-2030 Strategic Environmental Assessment includes discussion of climate change as a strategic consideration for Air Force strategic planners. The Army is investigating climate risks to installation lands and facilities in its Environmental Quality Technology research program, and the Army Climate Change Workgroup is developing a framework for integrating climate change considerations into existing planning processes. The Sustainable Ranges Integrated Product Team, led by an Office of the Secretary of Defense and tasked to address test and training encroachment and sustainability issues, also includes consideration of climate change as an emerging encroachment issue. As discussed earlier in this roadmap, such nascent DoD initiatives will benefit significantly when an overarching DoD policy framework can be put in place to help guide and focus such efforts.

The sections that follow summarize activities currently underway to understand the risks and opportunities to DoD operations. Some of these assessments are general and high-level, while others are specific to certain subject matter areas and/or locations.

“Our diplomacy and development capabilities must help prevent conflict, strengthen weak and failing states, lift people out of poverty, combat climate change and epidemic disease ...” (p. 11)
— 2010 National Security Strategy

4.A General Assessments

DoD is working to overlay regional climate models with installation locations, in order to appropriately downscale climate variables for individual locations and develop an analytical tool that can be used to generate climate projections at the regional level. DoD is involved in high-level climate and weather data gathering efforts. The 14 Weather Squadron at the Air Force Weather Agency collects, stores, and characterizes earth-space environmental data, receiving nearly 500,000 weather observations and satellite-derived wind profiles each day and sharing these data with the National Climatic Data Center and the Navy’s Fleet Numerical Meteorological and Oceanographic Detachment. DoD collaborates with the National Oceanic and Atmospheric Administration on the development and operational implementation of a national Earth System Prediction Capability.

4.B Coastal Risks and Opportunities

Many of DoD’s military installations are concentrated in coastal regions of the continental United States. As a result, DoD is undertaking multiple projects to assess climate change impacts to these installations and areas. Several of these projects focus specifically on sea level rise and storm surge, developing the necessary methodologies and/or tools that might inform decision making processes, including where to build and how to update coastal installations. Other projects deal with climate impacts on coastal ecosystems, as the military’s long-term use of coastal installations is, in part, dependent on the ability to maintain the continued functioning of coastal ecosystems. Projects that specifically address coastal ecosystems can help educate natural resource managers and enhance their decision making processes related to managing these ecosystems for their training/testing value, storm protective functions, and species diversity. The Department, drawing on the lessons learned from the preceding studies, has identified the key technical considerations to consider when conducting assessments of climate change impacts on coastal military installations. This effort will assist the Department in developing its approach to coastal assessment.

4.C Arctic Risks and Opportunities

The Department has also begun to assess and plan for changes to our operating environment. For example, preliminary assessments have been conducted for the Arctic where measurable climate change impacts are already occurring. These efforts have focused on assessing the Department's Arctic observing, mapping, and environmental prediction capabilities, as well as identifying science and technology needs. The Department has completed two Capabilities Based Assessments for Arctic surface and environmental prediction capabilities and a Fleet Readiness Assessment. The Department is developing cooperative partnerships with interagency and international Arctic stakeholders to collaboratively address future opportunities and potential challenges inherent in the projected opening of the Arctic.

4.D Permafrost in Alaska

The change in permafrost in Alaska is impacting both the built and natural infrastructure. The Department held, as early as 2009, workshops to better understand affected defense assets and military missions in Alaska. The thawing permafrost will impact foundations, utilities, runways and roads. This is a challenge for operation and maintenance especially when considering 80% of the infrastructure that will exist in 2050 is already in place today. The impact of thawing permafrost on training lands and natural ecosystems can significantly affect the types and timing of training activities. The potential ecosystem responses in interior Alaska to climate change could have severe ramifications on how, where, and when the DoD can train in Alaska. To address concerns related to climate change's impact on permafrost freeze and thaw processes and other ecological factors in interior Alaska, DoD initiated a suite of projects in FY 2011 focused on understanding and predicting these changes and the implications for Alaskan training land sustainability. These efforts will fill knowledge gaps relative to how climate change is affecting permafrost and the overall system dynamics, informing decisions on the development of future training and installation management plans.

4.E Arid Ecosystems

Long-term use of military installations and ranges in the southwestern United States depends, in part, on the condition of local ecosystems. Changes to local ecosystems can adversely impact natural resources and affect the use of certain locations for training, and/or increase the possibility of wildfires. DoD has initiated several projects to assess changes to ecosystems in the southwestern United States, including the intermittent and ephemeral stream systems that harbor much of the region's biological diversity, and the interaction of land-use activity, altered water sources, the introduction of invasive species, and altered fire regimes.

4.F Pacific Islands

In FY 2013, DoD anticipates initiating climate change studies to assess the impacts on DoD facilities in the Pacific. Changes in sea level, precipitation, and storm patterns can have significant impact on the island infrastructure that supports DoD missions in the region.

5. Actions to Address Climate Change Risks and Opportunities

In addition to the activities outlined in Section 3, DoD's current efforts to integrate, partner, and undertake pilot activities to address climate change risks and opportunities include the following.

DoD is already beginning to incorporate climate considerations into installation-level planning, as well as training plans. The Department is starting to incorporate climate change science and strategic considerations into formal training and education. The Military Services are beginning to explore incorporating climate risk/vulnerability factors into installation development planning processes. At the DoD level, Unified Facilities Criteria (UFC) 2-100-01, paragraph 3-5.6.2.3 requires master planners to consider climatic changes (including but not limited to: changes in land use and population density in the vicinity of installations; changes in climatic conditions such as temperature, rainfall patterns, storm frequency and intensity and water levels) when crafting long-range installation infrastructure master plans. UFC 2-100-01, paragraph 3-5.6.2.3 specifically calls out the National Climate Assessment as a source for reliable and authorized climate change scenarios. The Department's Natural Resources Conservation Program Instruction (DoDI 4715.03) requires installation natural resources management plans (INRMP) to assess the potential impacts of climate change on natural resources and to adaptively manage such resources to minimize adverse mission impacts.

As part of its Sustainable Ranges Initiative, DoD has conducted research and completed an initial study of potential climate change vulnerabilities affecting DoD training and potential adaptive measures. Additional research and coordination is ongoing, and several workshops have been held to engage with DoD offices and Federal agencies on possible avenues to foster a more adaptive individual and organizational culture that is better prepared to respond to mission stressors such as climate change. DoD is also actively engaged with regional partnerships in the Southeastern and the Southwestern U.S. Both regions are very significant to DoD, and host a number of major military installations and ranges. The aim of both the Southeast Regional

Partnership for Planning and Sustainability and the Western Regional Partnership is to strengthen regional coordination and advance the missions and land use objectives of DoD and the other state and Federal agencies involved. Both partnerships are actively assessing the climate change challenge, along with a number of other often interrelated issues (habitat and species protection, land use planning, energy development, coastal zone management, fire management and disaster preparedness, and sustainable land use) as they work on cooperative policy and planning initiatives. DoD expects cooperation on climate change issues to continue and likely grow in importance within both partnerships in coming years.

Through SERDP, DoD has initiated pilot projects intended to develop and test assessment approaches and decision-making frameworks for climate adaptation appropriate for military installations. These pilot efforts will help DoD identify appropriate processes for matching climate information with DoD decision processes, understanding data needs for vulnerability assessments, and developing adaptation tools with installations across the country.

"We must, therefore...design structures and systems that can withstand disruptions and mitigate associated consequences, ensure redundant systems where necessary to maintain the ability to operate, decentralize critical operations to reduce our vulnerability to single points of disruption, develop and test continuity plans to ensure the ability to restore critical capabilities, and invest in improvements and maintenance of existing infrastructure." (p. 27)
— 2010 National Security Strategy

Filename: DoD SSPP-FY13-Final.docx
Directory: C:\Users\m29368\Documents
Template: C:\Users\m29368\AppData\Roaming\Microsoft\Templates\Normal.dotm
Title:
Subject:
Author: JB
Keywords:
Comments:
Creation Date: 8/8/2013 6:14:00 AM
Change Number: 8
Last Saved On: 10/29/2013 7:02:00 AM
Last Saved By: JB
Total Editing Time: 43 Minutes
Last Printed On: 12/5/2013 7:03:00 AM
As of Last Complete Printing
Number of Pages: 111
Number of Words: 51,210 (approx.)
Number of Characters: 293,950 (approx.)