

DEPARTMENT OF DEFENSE

FISCAL YEAR 2003 ANNUAL ENERGY MANAGEMENT REPORT

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Executive Summary of Energy Efficiency Progress

The Department of Defense (DoD) is making steady progress toward meeting the goals of the Energy Policy Act and Executive Order (EO) 13123 *Greening the Government Through Efficient Energy Management*. In FY 2003, we achieved a 26.1 percent decrease in standard building and facility energy consumption (as measured on a British Thermal Units (Btu) per gross square foot (GSF) basis) as compared to a FY1985 baseline. This is a 1.0 percent reduction in consumption per gross square foot from the previous year. The goals are a 30 percent decrease by 2005 and a 35 percent decrease by 2010.

In FY 2003, DoD industrial and laboratory facilities consumed 28.6 TBtu. These energy intensive facilities have reduced consumption per gross square foot by 19.6 percent since the FY 1990 baseline year but have experienced a 5.9 percent increase compared to FY 2002. While these facilities have experienced an increase over last year, we have no indication that this is a trend that will continue. Rather, we believe it is a spike due to several factors explained in more detail in section II.2. Despite the increase over last year, we are still well below the glideslope required to meet reduction goals. The goals are a 20 percent decrease by 2005 (compared to 1990) and a 25 percent decrease by 2010.

The DoD Energy Program initiatives include facility equipment retrofits (particularly using UESCs and ESPCs), energy awareness efforts, energy manager training, audit programs, procuring energy efficient products and the use of sustainable design in new construction. Other contributing factors include integrated energy planning, source energy considerations when fuel switching, taking maximum advantage of electrical market transformation, enhanced use of renewable energy and demonstration of innovative technologies.

DoD has approximately 2.17 billion square feet of facilities. The annual energy bill in FY 2003 for military installations exceeded \$2.56 billion, a decrease of about \$49 million compared to FY 2002. Additionally, DoD consumed \$4.16 billion worth of mobility fuels in FY 2003 —mostly diesel and jet fuel, a decrease of approximately \$0.3 million from FY 2002. Electricity use decreased 7.2 percent from FY 2002.

The Department has made significant progress in installing renewable energy technologies and purchasing electricity generated from renewable sources (solar, wind, geothermal, and biomass) when life cycle cost-effective. The total renewable energy usage, both in generation and purchases, was 3.27 trillion Btus in FY 2003. The Department continues to emphasize the use of passive solar designs, such as building orientation and window placement and sizing in a variety of building types and new facility construction.

I Management and Administration

Energy management at DoD installations is focused on improving efficiency, reducing demand, eliminating waste, and enhancing the quality of life while meeting mission requirements. Accomplishing these objectives will reduce costs and ensure that the program goals are achieved.

The facilities energy program is decentralized, with Defense Component headquarters providing guidance and funding, and installations managing site-specific energy and water conservation programs. Energy project funding comes from a combination of government and alternative financing initiatives. Military installations are responsible for maintaining awareness, developing and implementing projects, and ensuring that new construction meets sustainable design criteria.

A. Energy Management Infrastructure

1. Senior Agency Official

The Principal Deputy Under Secretary of Defense (Acquisition, Technology and Logistics) is the DoD Senior Agency Official responsible for meeting the goals of EO 13123.

2. Agency Energy Team

The existing DoD Installations Policy Board (IPB), chaired by the Deputy Under Secretary of Defense (Installations & Environment) and chartered to address a broad spectrum of installation issues, has been designated as the DoD Agency Energy Team. The membership of the IPB contains the cross-section of DoD senior leadership necessary to make decisions needed to remove obstacles hindering compliance with EO 13123.

B. Management Tools

1. Awards (Employee Incentive Programs)

Energy conservation awards are presented to individuals, organizations, and installations in recognition of their energy-savings efforts. In addition to recognition, these awards provide the motivation for continued energy-reduction achievements.

In the Army, the installations and regions participate in two energy awards programs--*the Secretary of the Army Energy and Water Management Awards, and the Department of Energy Federal Energy and Water Management Awards*. Both programs recognize individuals and organizations for exceptional performance in implementing energy efficiency achievements.

The *Secretary of the Army Energy and Water Management Awards* were presented to:

Jeffrey K. Munekata (HQ ATEC) Wiesbaden Germany - Energy Management
U.S. Army Intelligence Center, Fort Huachuca, AZ - Renewable Energy
Billy B. Dancy, Jr U.S. Army Garrison, TACOM ARDEC, Picatinny Arsenal, NJ -
Alternative Financing
Headquarters, 7th Infantry Division and Fort Carson, CO - Special Achievement
Award
Major Duane P. Covino, NGB Headquarters, Army National Guard Award
Headquarters, U.S. Army Fort Dix, NJ - United States Army Reserve Award

The ***Federal Energy and Water Management Awards*** were presented to:

Fort Carson, Colorado - Energy Efficiency/Energy Management
Morgan Benson, Energy Coordinator, U.S. Army Dugway Proving Ground, Utah
Todd Lindquist, U.S. Army Garrison, Project Manager Corps of Engineers
U.S. Army Corps of Engineers, Walla Walla District - Innovative and New
Technology
James B. Paton, Program Energy Manager, Installation Management Agency, Europe
- Exceptional Service

The ***2003 Presidential Award for Leadership*** in Federal Energy Management was awarded to the *Army Garrison at Fort Carson, CO* for their comprehensive energy program.

The Department of the Navy (DON) annually holds a ***Secretary of the Navy Energy Awards*** ceremony to recognize outstanding achievement in the efficient use of energy. This year, eight awards were presented to Navy and Marine Corps winners in the categories of facilities, ships, and air squadrons. The awards program was expanded to increase participation and provide more levels of recognition. Installations with an aggressive and successful program, however not winning in its particular category, were recognized as achieving a Platinum (highest) or Gold (second highest) level rating on their energy program.

Additionally, DON installations, ships, squadrons and individuals received a ***Presidential Energy Award for Leadership in Federal Energy Management*** and twelve Federal Energy and Water Management Awards, including the Director's award, at White House and ***Federal Energy Management Program*** awards ceremonies.

The non-profit Alliance to Save Energy awarded the Department of Navy its ***Star of Energy Efficiency*** award. This marked only the second time that a government agency was recognized by the Alliance.

All Air Force major commands participated in the 2003 Federal Energy and Water Management Awards; 17 award candidates were submitted, with seven awards received. Additionally, five agencies were chosen to receive the Presidential Award, and *Dyess*

AFB was selected for Leadership in Federal Energy Management in the results category. Examples of other individual programs include:

Pacific Air Forces (PACAF) has a \$225,000 annual award program recognizing long-term and short-term energy reduction projects at their installations.

Air Education and Training Command (AETC) has an Energy Management Incentive Award program that is grouped by large base and small base. The winning base for each group receives \$50,000.

Air Combat Command (ACC) has a base energy award program that awards up to a total of \$1.0 million to ACC bases that exceeded the FY03 27% milestone goal and/or improved over last year's performance.

The Colorado Springs City Council and the Colorado Springs Utilities Company nominated and awarded the *USAF Academy* with a 2003 Water Saver Champion award for reducing water consumption by 36% from the growth-adjusted, 2000 base year use. This represented a savings of 260 million gallons of water and an avoided cost of over \$350,000.

Several major commands have developed energy award programs that distribute funds to their base winners each year

2. Performance Evaluations

Energy and water management provisions are included in performance plans of the DoD Energy Chain of Command, including major command, base and site energy managers. For example, AR 11-27, *Army Energy Program*, requires inclusion of energy and water conservation responsibilities in the position descriptions of members of the Army's energy team, principal program managers, heads of field offices, facility managers, designers, energy managers, and their superiors. The Army's regional offices conduct scheduled assistance visits to their respective installations and verify that installations are in compliance with the provisions of E.O. 13123 and AR 11-27. These visits include verification of Energy Manager position descriptions and evaluations of personnel responsible for the energy program. In addition, the Army centrally funds Installation Awareness Seminars to assist in the identification of Energy Conservation Measures. During FY 2003, these seminars identified low cost-no cost energy conservation opportunities in excess of \$2 million.

Within the Department of the Navy, draft guidance for specifying energy manager required skills, knowledge, abilities, roles and responsibilities were prepared.

For the Air Force, all base energy managers and each major command energy manager have performance statements that include ratings on implementing energy conservation measures to meet federal goals and Executive Orders for their installations and commands.

3. Training and Education

Awareness and training programs are a critical part of DoD's efforts to achieve and sustain energy-efficient operations at the installation level. A total of 26 Army energy managers took the training and subsequent examination to become Certified Energy Managers. An additional 381 personnel were trained under the Energy Awareness Seminars program. The Army provides assistance to installation staffs by providing energy awareness seminars at 20 to 25 installations. These seminars identify low cost/no cost opportunities, help to heighten the awareness of installation personnel, and assist the installation in identifying new and improved technologies and energy-saving projects.

The Army also uses energy management training courses available from commercial sources, such as the Association of Energy Engineers. The Army has published an Army Energy Program interactive compact disk (CD) to serve as a resource for region and installation level energy coordinators. The CD contains tools, ideas, examples, and information for use in implementing energy projects and other program initiatives. The DoD Energy Manager's Handbook is distributed on the Construction Criteria Base CD. An Army Energy Program Home Page has been established to provide current information and reference materials applicable to the energy program.

In the Department of Navy, 358 personnel received training in areas specified in the Energy Policy Act. These personnel consist of: Energy Managers, Energy Conservation Officers, Maintenance Mechanics, Planners, Equipment Mechanics, Facilities Supervisors, Accountants, Admin. Officers, Project Managers, Activity Public Works Officers (APWO), Architects, Environmental Engineers, Electrical Engineers, Division Directors, Controls Mechanics, Civil Engineers, Budget Analysts, Boiler Plant Personnel, ROICC, Zone Managers, and Utility Engineers. To date, 1,963 personnel have been trained. The training consists of 306 specific training opportunities in 11 general categories. These categories all fall under the specified areas of the Energy Policy Act, namely: Operations and Maintenance, Controls, Design, Lighting, Electric Codes, Water Resource Management, Renewable Energy, Energy Accounting, Energy Savings Performance Contracting, Measurement and Verification, Training on Equipment and Certified Energy Managers (CEM) Training. The Navy held a special "Tri-Service" certification offering for CEM training. The Navy now has 85 registered "Certified Energy Managers". The sources of training include in-house and commercially available sources such as: North Carolina University, Dept. of Energy, Association of Energy Engineers, Johnson Controls, Redvector Online Courses, Northwest Energy Efficiency Council, Sandia National Laboratories, American Institute of Architecture, National Technology Transfer, Inc, Navy Civil Engineers Officer School, Naval Facilities Engineering Service Center, American Solar Energy Society, University of Wisconsin, Federal Energy Management Program, the U.S. Green Building Council, American Water Works Assoc., Florida Solar Center, and GSA.

The Navy continued and expanded its energy awareness program to train all personnel to be aware of and influence energy consumption. The program includes compact disks that

provide policy, publications and program execution tips for energy managers, as well as materials targeted to educate and involve military youth. In a continuing effort to foster strengthened community relations, Naval bases sponsored coloring and poster contests that raise the awareness and importance of energy conservation to preschool/ kindergarten/first to fourth grades school children. A display providing a summary of program accomplishments is set up annually at the Pentagon during energy awareness week. Distribution of a monthly newsletter titled *Energized*, and flash emails to energy managers, claimants, and headquarters, quickly disseminate key information. Promotional materials are distributed to personnel to involve all in energy management practices without impacting productivity.

The Air Force Institute of Technology (AFIT) Civil Engineer and Services School at Wright-Patterson AFB OH conducts an Energy Management Training (EMT) course. This two-week course was given once this year. AFIT has also included the energy course material in an on-line computer-training program. Additionally, a one-hour energy briefing is provided in the Civil Engineer programmer's course. The Air Force Civil Engineer Support Agency (AFCESA), through an Air Force Regional ESPC program, trained 129 personnel (from engineering, contracting, legal and comptroller areas) from 31 locations via satellite down link. The Air National Guard (ANG) at base level promotes energy conservation awareness through building manager training/meetings, semiannual state employee awareness training, drill weekend assemblies and base newspaper articles. An energy briefing was provided to 731 base facility managers at the annual Real Property update. Another 347 individuals received energy training from numerous training programs.

All DeCA employees are required to view a 12-minute, commissary energy awareness video, "Put Yourself in the DeCA Energy Efficiency Picture," within 30 days of hire. The topic is also presented to commissary officers and managers as a part of the Commissary Operations Basic and Advanced Courses. These courses are in a formal, classroom format.

4. Showcase Facilities

DoD continues to participate in DOE-designated showcase facilities demonstrating new and innovative energy saving technologies. Three Army facilities were designated Federal Energy Saver Showcases in 2003.

Coleman Barracks #57, Mannheim, Germany - This project capitalized on the need to repair a damaged roof by simultaneously installing photovoltaic panels and conducting roof repairs, thus saving manpower, money, and ultimately saving energy and reducing emissions.

Fort Carson Green Training Building, Fort Carson, Colorado – This 2,800-square-foot sustainable training facility incorporated natural day lighting and high-efficiency windows to reduce energy use for heating and cooling and a natural cooling cupola that eliminates the need for air conditioning. The building also utilizes recycled

content construction materials, an exterior PV security light and PV walkway lights, low-flow and metered faucets, and xeriscaping for a total estimated savings of 9,000 kilowatt-hours per year. This building design will be used in future facilities.

Watervliet Arsenal, Buildings 19, 110, and 115, Watervliet Arsenal, New York – This project involved the implementation of an emerging technology, proton exchange membrane (PEM) fuel cells. Ten PEM fuel cells have been installed at three separate sites within the arsenal. This cutting-edge technology is expected to save the site 37.5 mega-watt-hours per year.

Within the Department of Navy, one Navy and two Marine Corps showcases were designated:

Naval Surface Warfare Center, Dahlgren VA is showcasing an installation-wide direct digital controls (DDC) system. The DDC system monitors and controls HVAC in 108 buildings with 80% of installation square footage controlled by a single manufacturer's DDC system. Service calls have been reduced and \$7M in avoided energy costs realized since the project's first installed system was completed in 1991. The DDC system is being integrated with the Emergency Operations Center to link with security systems, fire protection and chemical and biological sensors, so that the DDC system can be used in conjunction with Homeland Security initiatives.

MCAS Beaufort SC was designated a showcase to highlight its Energy Monitoring and Control System (EMCS). The system is installed in 49 buildings and is producing avoided cost savings of \$642K/yr and 34,000 Mbtu savings annually. Technicians can monitor and control HVAC from a single location, use automated diagnostic tools to assess operating conditions, make timely repairs and control energy consumption. The installation's vision is to eventually have all buildings controlled by the same EMCS.

Marine Corps Air Ground Combat Center, Twenty-nine Palms CA is showcasing the 7 MW cogeneration plant commissioned this year. This plant will reduce grid purchases of electricity by two thirds, avoiding \$5.8M annually, and provide improved energy security to the installation. Savings from the project will be leveraged to add absorption cooling to the plant and help pay for a 1 MW photovoltaic system.

Naval Base Ventura County, Port Hueneme CA and the *U.S Naval Academy, Annapolis MD* continue as on-going DON showcase activities due to the large numbers of Civil Engineer Corps officers and Academy cadets who receive facilities and operations training there.

The 750 kW photovoltaic system at *Naval Base Coronado CA*, the ground source heat pumps at *MCAS Beaufort, SC*, and the BOQ at *NTC Great Lakes IL*, also continue as showcases, designated in previous years.

The Air Force received six (6) Federal Energy Saver Showcase Awards in 2003: *Dyess AFB TX; Laughlin AFB TX; Columbus AFB MS, Grand Forks AFB ND; McConnell AFB KS; and Travis AFB CA.*

The new commissary design at *Grand Forks AFB ND* is a showcase facility. This is a design-build project and contract that was awarded in September 2003 with construction completion scheduled for Nov 04. The project implements heat reclaim from the refrigeration systems to provide space heating and water heating.

The *Pentagon Building* has previously been designated as an “Energy Showcase.”

II. Energy Efficiency Performance

A. Energy Reduction Performance

1. Standard Buildings

The Department reduced energy consumption per gross square foot by 26.1 percent relative to the FY 1985 baseline of 136,916 Btu/ft². In FY 2003, after applying renewable energy purchase credits of 705.5 billion Btu, DoD's standard building energy consumption was 101,171 Btu/ft². This energy consumption is 1.0 percent below the 102,241 Btu/ft² in FY 2002, and continues to keep DoD on track to meet the President's goal. The EO 13123 goal is to achieve a 30 percent reduction in energy consumption (measured in Btu/ft²) by 2005 and a 35 percent improvement by 2010, relative to a 1985 baseline of 136,916 Btu/ft².

2. Industrial and Laboratory Facilities

The industrial, laboratory, research and energy intensive facilities consumption in FY 2003, after applying renewable energy purchase credits of 1.098 billion Btu was 171,636 Btu/GSF, a 19.6 percent reduction as compared to the 1990 baseline of 213,349 Btu/ft², which puts DoD ahead of a straight line projection of 17.3 percent reduction. Consumption was up 5.9 percent compared to FY 2002. The EO 13123 goal is to reduce energy consumption by 20 percent (considering 1990 as the base year). The following are some reasons for the increasing industrial energy use in FY 2003:

Many of the Army's industrial facilities have been in various stages of reduced production and the transferring of services from governmental to private sector. One significant example was the standup of the Scranton Army Ammunition Plant to meet impending mission needs.

DON reduced energy consumption per gross square foot by 19.6% relative to the 1990 baseline. Baseline consumption was 166,221 Btu/ft² and current consumption is 133,612 Btu/ft², after accounting for renewable energy credits. The Department's goal for FY03 was a 17.3% reduction relative to the 1990 baseline. Although DON is ahead of the FY03 target for industrial energy reduction, progress toward the goal decreased this year. Energy consumption declined slightly from FY02 to FY03, but industrial square footage decreased dramatically, raising the Btu/ft².

The Air Force industrial and laboratory facilities consumed 9.6 TBtus in its buildings and facilities during FY2003. The Air Force energy intensive facilities consumed 0.4 percent less than they did in FY 1990, the baseline year. Energy usage for industrial/intensive facilities was 209,550 Btu/ft² in FY 1990. This has been reduced to 208,773 Btu/ft² by the close of FY 2003, a decrease from last year's consumption. *Tinker AFB, OK and Robbins AFB, GA* both went backwards in reducing their energy consumption compared to last year due to the increased activity to retrofit/refurbish cargo aircraft such as the C-5, KC-10 tankers, C-141 and C-17. Both of those bases

have used the ESPC and UESC programs to get energy conservation projects in place. At Tinker, seven UESCs have been awarded. The rest are in design with an estimated completion date of early FY05. For Robins, they have completed two more modifications to their existing ESPC contracts to reduce energy consumption. These efforts will help them continue to strive to meet the energy goals. *Arnold AFB TN* and *Hill AFB UT* both actually improved their reduction by over 3% compared to last year. They too continue to use the various energy programs to reduce energy consumption.

A list of industrial and laboratory facilities is provided in part IVD.

3. Exempt Facilities

The Navy has most of the DoD exempt facilities. The Navy exempts mission critical, concentrated energy use transmitters, simulators, cold iron support to ships, and some private party facilities. A list of exempt facilities is provided in Appendix IVE.

4. Tactical Vehicle and Equipment Fuel Use

Total tactical vehicle fuel usage was 649,165 billion Btu (BBtu) in FY 2003, increasing 10.3 percent from FY 2002. Jet fuel dominates this category, reflecting the needs associated with the war in Iraq. However, the cost decreased by \$276 million. A major reason for this was the decrease in cost of jet fuel per gallon from FY 2002 to FY 2003 -- \$1.01 to \$0.85.

B. Renewable Energy

DoD continues to install renewable energy technologies and purchase electricity generated from renewable sources when life cycle cost-effective. The Department continues to emphasize the use of solar and other renewable energy sources where it is cost-effective. Passive solar designs, such as building orientation and window placement and sizing, are already being implemented in a variety of building types and new facility construction. The Department anticipates more growth in the implementation of renewable energy and active solar technologies due to the recently implemented Sustainable Design and Development guidance.

1. Self-Generated Renewable Energy

DoD has integrated photovoltaic power systems, solar water heating systems, and transpired solar collectors (solar walls) into its facilities. Active solar heating applications have included maintenance facility solar walls, swimming pool heating, and hot water heating. In FY 2003 the Department generated an estimated 45,650 MWH in self-generated electrical power, 280 BBtu in thermal energy, 294 MMBtu of energy from biomass and 1,164 BBtu in power generated from refuse-derived fuel and wood. Some illustrative examples:

Fort Stewart GA generates high-pressure steam using wood chips at the central energy plant.

Fort Gillem GA - photovoltaic powered street lights

Fort Bragg NC - photovoltaic powered parking lot lights

Fort Buchanan PR - photovoltaic powered traffic lights

Fort Irwin CA - generated a total of 15,613 MMBtu from renewable energy sources, 2.7 percent of the total energy consumed at Fort Irwin

Rock Island Arsenal IL - generated electricity from hydropower

McAlester Army Depo OK, Fort Hood TX and Yuma Proving Grounds AZ use photovoltaics to generate a small portion of their total energy consumed.

Fort Huachuca, Arizona and at the Headquarters for the Arizona National Guard - 10 kW wind turbines

MAGTFTC 29 Palms CA - 1.2 MW photovoltaic system

MCB Quantico VA - Solar Domestic Hot Water

NAES Lakehurst NJ - Photovoltaic System

NAS Kingsville TX - System Photovoltaic

MCAS - Cherry Point NC - Ground Source Heat Pumps

MCB - Camp Lejeune NC - Ground Source Heat Pumps

MAGTFTC 29 Palms CA - Daylighting

Altus AFB OK - photovoltaic systems at remote locations

Air Force Academy CO - generated and captured 3,534,122 cubic feet of digester gas on-site that was used in lieu of natural gas to fire a process hot water boiler for the Waste Water Treatment Plant (WWTP). At approximately 65% pure methane content, this on-site biomass energy application replaced 2,825.5 (2,941 adjusted for altitude) Million Btu's of fossil derived fuel use while simultaneously reducing environmental emissions.

Los Angeles AFB CA - installed 10 solar powered streetlights at one parking lot

Eielson AFB AK - refuse-derived fuels recycled over 24K tons of paper products for use in the base's central heat and power plant saving \$117K in disposal costs and over \$8K in coal cost

In addition to these projects, DON facilitates the production of 180 MW of electricity from geothermal energy at *NAWC China Lake CA*. This facility has fed over 18,000 gigawatt-hours of electricity into the western power grid since its inception.

The Army is also developing portable photovoltaic (PV) technology to serve as the primary power source of a battalion size *Tactical Operations Center (TOC)*. The current units under field test will meet 80 percent of the TOC's power requirements. The units are tactically quiet, reduce the logistic footprint, and prevent pollution.

Currently, *the Pentagon Heating and Refrigeration Plant (H&RP) Complex* has a 108-kW photovoltaic array installed on site. Renewable projects awarded in FY03 include a solar lighting slug line and solar lighting at the *Pentagon Heating and Refrigeration Plant (H&RP)*.

2. Purchase of Renewable Energy

In FY 2003 the Department purchased 426,435 MWH of renewable electricity and 348 BBtu of renewable thermal energy. Of this amount, 705 BBtu was credited to Standard Buildings and 1098 BBtu was credited to Industrial & Laboratory Facilities when determining the consumption per gross square rates reported on the scorecard at attachment IV.B. Since renewable sources of electricity generation generally have higher capital equipment costs, they usually do not compete well with the conventional utility supplier of electricity. Despite this barrier, the DoD has made significant progress in the purchase of renewable energy generated from solar, wind, geothermal, and biomass sources when cost-effective. For example, the Army has entered into a contract with Washington Gas Energy Services to purchase 5 million kWh of wind power and 14 million kWh of landfill gas annually through December 2004. The wind farm (located in West Virginia) delivers 5 million kWh of renewable power annually to *Walter Reed Army Medical Center DC, Adelphi Labs MD, and Fort McNair DC*. The Army receives environmental credits for this purchase. *Fort Carson CO* is purchasing 6,650 MWH of electrical power generated from renewable sources from Colorado Springs Utility. Within Germany, 7.87 percent of the total electric energy supplied to the grid comes from renewable sources of wind, hydro, biomass, and photovoltaic. Applied to total energy consumption of installations located in Germany, USAREUR purchases approximately 63,000 MWH of electricity generated from renewable sources.

The Navy purchased 135,824 MWH of renewable electricity and 336.6 MBtu of renewable thermal energy. Portsmouth Naval Shipyard (industrial consumption), Norfolk, VA purchases electricity and steam from a privatized waste-to-energy plant.

The following Air Force bases purchased electricity from renewable resources:

Dyess AFB TX - 78,000 MWH
Edwards AFB CA - 74,760 MWH
Spangdahlem AB, Germany - 8,950 MWH
Ramstein AB, Germany - 8,152 MWH
Fairchild AFB WA - 7,818 MWH
Sheppard AFB TX - 6,300 MWH
Laughlin AFB TX - 4,200 MWH
Minot AFB ND - 4,000 MWH
Ellsworth AFB SD - 2,200 MWH
FE Warren AFB WY - 2,160 MWH
Goodfellow AFB TX - 2,100 MWH
Cannon AFB NM - 1,800 MWH
Grand Forks AFB ND - 1,800 MWH
Schriever AFB CO - 1,800 MWH
Lackland AFB TX - 1,800 MWH
Randolph AFB TX - 487 MWH
Columbus AFB MS - 131 MWH
USAF Academy CO - 45 MWH of wind energy.

The Army has approximately 3,800 photovoltaic systems in use at its installations, and has requested assistance from the Department of Energy's Sandia National Laboratories to assist in the maintenance and repair of several photovoltaic systems. This partnership provides the Army with the technical expertise needed to bring aging, failing systems back to operational status. Active solar heating applications have been expanded to include maintenance facility solar walls, swimming pool heating, and hot water heating in Army family housing.

Following are some of the photovoltaic systems at Army installations:

Fort Carson CO - Water pumping, off-grid lighting, telecomm-30 kW
Fort Huachuca AZ - Grid-connected, off-grid lighting-55 kW
Fort Dix NJ - Grid-connected, off-grid lighting-20 kW
Yuma Proving Ground AZ - Grid-connected, off-grid lighting, remote facility-900 kW
Yuma Proving Ground AZ - Off-grid lighting, remote off-grid facility-225 kW
Pohakuloa Training Area HI - Range targets, control towers, airstrip lighting-50 kW
Fort Irwin CA-Remote off - grid facility, stand-alone lighting-20 kW
Fort Polk LA-Training range field instrumentation-10 kW
White Sands Missile Range NM - Grid-connected, weather data equip, telecomm-60 kW
Fort Greely, AK - Training range field instrumentation-10 kW
Fort Dix NJ - Administrative Building-18 kW
Fort Bragg NC - Special ops. power supply (20-kW panels)-200 kW
Yakima Firing Range WA - Water pumping, off-grid lighting, telecomm-18 kW

The Army has also implemented storage cooling systems projects at:

Fort Jackson SC - Chilled Water - Central Energy Plant (CEP) #2
Fort Huachuca AZ - Chilled Water - Barrack Complex
Fort Gordon GA - Chilled Water - Office Buildings
Fort Jackson SC - Chilled Water - Barrack Complex
CERL, Champaign IL - Ice - Laboratory Complex
Yuma Proving Ground AZ - Ice - Single Barrack
Fort Bliss TX - Ice - Dental Clinic
Fort Stewart GA - Ice - PX Building
Fort Eustis VA - Ice - Office Building
Fort Myer VA - Ice - Commissary and Office Building

C. Petroleum

Petroleum-based fuel (fuel oil, LPG/propane) use in facilities has decreased 66.4 percent from the FY 1985 baseline. Facility consumption was 101.4 TBtu in FY 1985 (Buildings/Facilities and Excluded Buildings/Industrial/) and 34.0 TBtu in FY 20023 (Standard Buildings/Facilities, Industrial/Laboratory/Research/Other Energy-Intensive Facilities, and Exempt Facilities). Fuel oil

use stabilized in FY 2003 from previous years. Fuel oil use in facilities increased 678 Bbtu compared to FY 2002, while natural gas consumption increased 677 BBtu.

D. Water Conservation

In FY 2003, DoD consumed 162,096 million gallons of potable water and spent \$223 million on water related services. This represents a 24 percent decrease in cost compared to \$292 million in FY 2002.

The Services are striving to increase water conservation awareness and reduce water use—particularly where tight water supplies may potentially impact mission accomplishment and personnel morale. Water conservation measures not only reduce water use and cost, but also reduce energy consumption (for pumping) and sewage treatment costs. Additionally, water conservation helps to reduce the quantities of wastewater treatment chemicals (most notably chlorine) being released into the environment, and reduces the risk of drawing down aquifers or saltwater intrusion into aquifers. Thus, water conservation efforts, in addition to being environmentally responsible, can help installations stretch dwindling Operation and Maintenance (O&M) dollars.

In the Department of Navy, 36 installations have water management plans and have implemented at least 4 best management practices in water efficiency. Water conservation projects implemented in FY2003 will reduce annual water consumption by 140 million gallons. Projects implemented include irrigation controls and low flow fixtures. DoN is making water conservation a standard feature in most of our alternatively financed projects, bundling those savings with other infrastructure improvements to maximize the benefits to all our activities.

III. Implementation Strategies

DoD's philosophy is to give the Defense Components the flexibility to manage their own energy programs to meet the goals of Energy Policy Act (EPAAct) and EO 13123. DoD's primary objectives in implementing strategies are to improve energy efficiency, eliminate energy waste and reduce costs. For instance, the Army is investing in energy efficient technologies, such as high efficiency lighting and ballasts, energy efficient motors, and packaged heating and cooling equipment with energy efficiency ratios (EER) that meet or exceed Federal criteria for retrofitting existing buildings.

A. Life-Cycle Cost Analysis

DoD facilities utilize life-cycle cost analysis in making decisions about their investment in products, services, construction, and other projects to lower costs and to reduce energy and water consumption. DoD considers the life-cycle costs of combining projects, and encourages bundling of energy efficiency projects with renewable energy projects, where appropriate. Projects are generally prioritized for capital funding and execution is based upon the greatest life-cycle savings to investment ratio. The use of passive solar design and active solar technologies are recommended where cost-effective over the life of the project. Sustainable development projects use life-cycle costing methodology and follow the Whole Building Design Guide. All DON energy projects (centrally funded and financed) are required to evaluate savings on a life cycle basis. Projects submitted utilize the National Institute of Standards and Technology (NIST) publication handbook 135 and DOE energy discount factors as guidance. In FY03, the DON energy projects team adopted use of DOE's Building Life Cycle Costing software as a standard for determining project economics. Projects are prioritized for capital funding and execution based upon the greatest life cycle savings to investment ratio. Sustainable development projects use life cycle costing methodology and follow the whole building design guide. DOE guidance on purchasing energy efficient products continues to be distributed in order to educate purchasers of the life cycle costing requirement and provide them assistance making purchasing decisions.

In the Air Force, Life Cycle Cost Analysis was used on all new construction projects and retrofit projects, including ESPC, UESC, and ECIP programs. Examples include a \$48.8M decentralization of the power/heat plant at *Elmendorf AFB AK* and a \$17M Harmon Hall renovation project at the *Air Force Academy CO*.

The Defense Commissary Agency (DeCA) used life cycle cost analysis in designs of items such as:

- Occupancy sensors in offices, restrooms and break areas
- Energy efficient lamps and ballasts
- LED exit signs
- High efficiency motors on air handling units and display cases
- Use of glass door refrigerated cases instead of open cases
- Use of Refrigeration Monitoring and Control Systems for the most efficient
- Operation of Refrigeration Systems and HVAC

- Automatic water controls for restroom fixtures for efficient use of water
- Use of Dual Path and Desiccant Air Handling Units
- Use of wall and roof insulation
- Implementation of energy efficient doors and windows, plastic curtains

B. Facility Energy Audits

DoD wide, comprehensive audits were conducted on 221,386 thousand square feet (ksf) (10.2 percent of facility square footage) in FY 2003. Since 1992, comprehensive audits were completed on a total of 2,601,374 ksf (113.8 percent of facility square footage). Some audits were repeat audits, several years apart, or to investigate additional conservation measures not cost effective previously.

Two energy audits were performed at NSA in FY 2003. The first audit determined savings by “right sizing” a large compressed air system. The second audit will determine savings by correcting campus-wide parking lot lighting levels and lighting technology being used. To date 33% of NSA buildings have been audited.

C. Financing Mechanisms

Utility Energy Service Contracts (UESC) and Energy Savings Performance Contracts (ESPC) are crucial tools for financing energy efficiency measures that allow installations to improve their infrastructure and pay for the energy efficiency measures through the savings generated by the project over time (10-25 years). ESPCs are partnerships with private sector companies, known as Energy Savings Companies (or ESCOs). UESCs are similar to ESPCs, with the most notable difference being that the projects are financed and implemented through utility companies. In FY 2003, Defense Components through a decentralized approach awarded 30 UESC and 34 ESPC task orders/contracts producing an estimated total life-cycle savings of \$826 million and an annual energy savings of 4.17 TBtu. These contracts include many infrastructure upgrades and new equipment to help the installations reduce energy and water consumption. Examples include new thermal storage systems, chillers, boilers, lights, motors, peak shaving, Energy Monitoring and Control Systems (EMCS) and water reducing devices. For example, using the FORSCOM Expanded Utilities Modernization Program (EUMP), Fort Hood was funded \$3.6 to upgrade old and failing wash racks, thus reducing water consumption.

Naval Facilities Engineering Command (NAVFAC) utilizing Utility, Department of Energy, Department of Army and Department of Navy contracts executes both UESC and ESPC contract vehicles. During FY03, DON awarded \$206.7M (capital cost) in alternatively financed contracts. These projects include another \$25M in contracted O&M and repair services over the life of the contract. The following is a list of UESC delivery orders awarded in FY 2003, all using Basic Ordering Agreements or GSA Area-wide contracts awarded through NAVFACENGCOM Engineering Field Divisions.

Location	Number of UESC Delivery Orders
NSB Bangor	1
MCB Camp Pendleton	1
NSA Philadelphia	1
NUWC Keyport	4
NAVSTA Newport	1
NTC Great Lakes	2
MCAS Yuma	2
NMC San Diego	1
NAS North Island	1
NAVBASE Coronado	2
NAVBASE San Diego	2
NH Oak Harbor	1

The following is a listing of DON ESPC delivery orders

Location	Contract Vehicle	#Delivery Orders
NRSW/PWC San Diego	DOE Super ESPC	1
NAS Corpus Christi	CoE Huntsville	1
NS Ingleside	CoE Huntsville	1
NAS Oceana	DOE Tech Specific	1
NAVSTA GTMO	DON Caribbean Area	2
NAVHOSP Camp Lejeune	DOE Super ESPC	1
MCB Camp Lejeune	CoE Huntsville	1
MCAS Camp Pendleton	DOE Super ESPC	1
Washington Navy Yard	CoE Huntsville	1
NAS Sigonella	DoN European Area	1
JRB Fort Worth	Air Force	2
MCLB Albany	DOE Super ESPC	1
NAB Little Creek	DOE Super ESPC	1
MCAS Beaufort	DOE Tech Specific	1

The Air Force awarded seven new ESPCs and four new UESC task orders for this fiscal year (see tables below). These task orders include energy infrastructure upgrades and new equipment to help the installations reduce energy and water consumption. Examples include new thermal storage systems, decentralized heating plants, chillers, boilers, lights, motors, EMCS systems and water reducing devices.

ESPC

BASE	Award Date	Awarded - \$	Contracting Agent
Ramstein AB	31 Jul 03	1,623,074	AF
Nellis AFB	26 Sep 03	4,201,696	AF
Dyess AFB	24 Sep 03	2,651,456	AF
Kirtland AFB	26 Mar 03	2,195,000	AF
Elmendorf AFB	29 Sep 03	48,841,031	Army
Hill AFB	30 Sep 03	2,769,750	DOE
Hill AFB	30 Sep 03	4,610,585	DOE
Total		66,874,592	

UESC

BASE	Award Date	Awarded - \$	Contracting Agent
Tyndall AFB	18 Oct 02	2,320,000	AF
Tyndall AFB	18 Oct 02	567,000	AF
Arnold AFB	25 Sep 02	404,200	AF
Offutt AFB	26 Feb 03	5,192,000	AF
Total		8,363,200	

The Army is using the Energy Conservation Investment Program (ECIP) and ESPC projects to install Energy Management Control Systems (EMCS) on several installations, as well as upgrade and expand existing systems at installations. The Army awarded 12 ESPC contracts in FY2003.

Location	Project Scope
Picatinny Arsenal, NJ	Decentralized heating systems & Energy Usage Measurement and Verification
Fort Monmouth, NJ	GHP Systems, Building Envelope Modifications, Building Automation Systems/EMCS, Lighting
Fort Drum, NY (3 task orders)	Building Envelope Modifications, Building Automation Systems/EMCS, Lighting, Electric Motors and Drives, HVAC controls, Heat recovery, Gas conversions
Fort Hood, TX	Building Automation Systems/EMCS, Lighting, HVAC
Yongsan Garrison	GHP Systems, Building Automation Systems/EMCS
Letterkenny Army Depot	Lighting retrofits
Fort Hamilton, NY	Geothermal, Lighting, Hydroelectric upgrades, and Peak Shaving
Adelphi Labs, Adelphi, MD	Lighting, EMCS improvements
Fort Bragg, NC	Cogeneration Project (Chiller) MOD to task order 12.10
Aberdeen Proving Grounds MD	Geothermal Heat Pumps, 634 AFH units

The Army awarded seven Utility Energy Service Contracts (UESC) in FY 2003 with an annual savings of 128,204 MMBtu.

Location	Project Scope
Fort Knox, KY – 2 Contracts	HVAC Improvement
Fort Rucker, AL – 3 Contracts	Lighting (phase III, phase IV, and steam system decentralization, new chillers/controls)
Aberdeen PG, MD – 2 Contracts	Distributed Generation

DeCA has one ESPC contract issued for *the Fort Lee VA Commissary* and the DeCA Headquarters Building, also at Fort Lee.

National Geospatial-Intelligence Agency (NGA) – An ESPC has been in place at the St. Louis Facility for two years and is saving about 10,450 MMBtu/year.

D. ENERGY STAR® and Other Energy-Efficient Products

When life cycle cost-effective, DoD organizations select Energy Star® and other energy-efficient products when acquiring energy-consuming products. Guidance generated by DOE, GSA and DLA for energy-efficient products is being incorporated into the sustainable design and development of new and renovated facilities. The components are procuring energy-consuming products that are in the upper 25 percent of energy efficiency as designated by the Federal Energy and Management Program. Energy efficient technologies include high-efficiency lighting and ballasts, exit signs, energy efficient motors, low-voltage distribution transformers, and the use of packaged heating and cooling equipment with energy efficiency ratios that meet or exceed Federal criteria for retrofitting existing buildings. Information technology hardware, computers and copying equipment are acquired under the Energy Star® program using GSA Schedules and either Government-wide or Service contracts. Examples are:

The NAVFAC design-build request for proposal web-based application is consistent with guidance contained in the Whole Building Design Guide web site at <http://www.wbdg.org/ndbm>, and requires the use of Energy Star® products.

Revised Uniform Guide Specs (UFGS) 15741N Water Source Heat Pumps, UFGS 15602N Refrigeration Equipment for Cold Storage, and UFGS 15601N Central Refrigeration Equipment for Air Conditioning include the requirement that the equipment meet Energy Star performance standards.

All Family Housing Appliances, HVAC and domestic hot water (DHW) equipment, and building lighting fixtures comply with Energy Star® product standards. For example, *MCAS Beaufort SC* is utilizing an energy management and control system (EMCS) to save 34,000 MBtu annually. The system controls heating, cooling, and lighting as well as managing peak loads.

Purchasing Energy Star® products is a section of DON's in-house energy training course. DON is exploring Energy Star® training opportunities for purchase cardholders.

The Air Force continues to pursue a policy that all purchases of computers, printers and copiers will be specified as Energy Star® compliant. Design specifications for new and retrofitted equipment are reviewed to ensure they are in the upper 25% or Energy Star® compliant. Examples of some AF base initiatives:

Eielson AFB AK requires in their military family housing maintenance contract that all future replacement of appliances use Energy Star® products and in addition, through coordination with the Engineering Flight, requires that all new construction install energy efficient products.

Hickam AFB HI criteria for energy consuming products outlines minimal efficiency requirements for lighting, appliances, air conditioners, pumps, and motors and requires organizations to stock high efficiency items. The criteria also requires that all electrical equipment (PCs, monitors, laser printers, copy machines, etc.) be Energy Star® compliant and that power management features be enabled at all times.

When life cycle cost-effective, the Army requires the use of Energy Star® and other energy-efficient products. Army procurement regulations are now in compliance with the President's May 3, 2001 directive and require that Army installations procure only the upper 25 percent or Energy Star® compliant products. One example of the Army using Energy Star® equipment is at *Fort Irwin CA* which is currently testing LightStat® automatic set-back thermostats with built-in temperature limits to prevent over-heating or over-cooling in 200 modular office buildings.

The *DeCA's Contracting Business Unit* procures energy efficient products such as paper and plastic grocery bags made up of minimum 35% pre-consumer or post-consumer recycled products. New or replacement cardboard balers are purchased for our commissaries in consideration of efficient disposal of cardboard products.

E. ENERGY STAR® Buildings

This program, developed by the U.S. Environmental Protection Agency (EPA) to promote energy efficiency in buildings, requires measured building data and a comparison with archetypes in various regions of the country. Energy Star® Building criteria are based on a five-stage implementation strategy consisting of lighting upgrades, building tune-up, load reductions, fan system upgrades, and heating and cooling system upgrades. The Army's new Sustainable Design and Development Criteria will ensure that its facilities when constructed or upgraded meet or exceed Energy Star® criteria.

The Navy has surveyed approximately 93% of its square footage or 95,850 buildings and attempted to identify and implement all projects with paybacks of 10 years or less. Some buildings had multiple projects identified and some buildings had no cost effective projects identified. DON estimates that 50% of the surveyed buildings are Energy Star®. This equates to approximately 48,000 buildings.

NAVFACINST 12271.1 Total Building Commissioning Policy, dated October 23, 2003, requires Total Building Commissioning (TBC) to be incorporated into "... all phases of the acquisition process." The instruction includes requirements to comply with ASHRAE STD 90.1, NAVFACINST 9830.1 Sustainable Development Policy, Leadership in Energy and Environmental Design (LEED)TM Rating System (Version 2.1), and NAVFACINST 11013.39B Operation and Maintenance requirements. TBC will insure that the Navy realizes all of the energy savings designed into our facilities, by measurement and validation of the facility systems performance. Establishing the initial performance will enable continued energy conservation to be ascertained by means of repeating the tests, comparing the results, and making corrective adjustments, over the life of the facility.

As an initiative of incorporating commissioning concepts into standard business practices, the Navy has improved the Operation & Maintenance (O&M) training requirements on all projects. Currently O&M training requirements are contained throughout the technical Guide Specs. In the latest update of the Quality Control Program Specification (UFGS 01450N), the QC Manager is required to provide a comprehensive project-specific training program with written outlines, attendance records, and content summaries to ensure better quality training. Recording of all training sessions in either VHS or DVD format that will ensure future building maintenance personnel will be afforded the same information as the original maintenance staffs. Better-trained maintenance workers create facilities operating at higher efficiencies thereby creating energy and cost savings over the entire life cycle of the facility.

No Air Force facilities have been designated as Energy Star® for FY 2003, however, at *Columbus AFB MS*, the Corrosion Control facility and the RAPCON facility meet the Energy Star® rating in design.

F. Sustainable Building Design

Sustainability initiatives require an integrated design approach to the life cycle of buildings and infrastructure. The concepts of sustainable development as applied to DoD installations have been incorporated into the master planning process of each of the Services. Installations are encouraged to approach land use planning and urban design in a holistic manner and integrate it with energy planning. NAVFAC Instruction 9830.1, Sustainable Development Policy, was signed 9 June 2003. The purpose of the Instruction is to reduce the total cost of ownership of shore facilities by implementing sustainable development concepts and principles. NAVFAC uses the U. S. Green Building Council's LEED Green Building Rating System as a planning and design tool and a metric to measure the sustainability achieved. All applicable projects shall meet the LEED Certified level, unless justifiable conditions exist that limit LEED credits.

Criteria developed in this process will improve new building construction. A Memorandum of Agreement between the National Institute of Building Sciences (NIBS)

and the three services, will result in NIBS publishing all service design criteria on the Whole Building Design Guide (WBDG) website. Access to the WBDG will be free.

Unified Facilities Criteria (UFC) for Sustainable Development was initiated. Subjects to be addressed include: project processes, design and construction cost data, planning and programming (DD Form 1391), tools, training, barriers and how to overcome, case studies, lessons learned, green specifications, LEED and Sustainable Project Rating Tool (SPiRiT) rating systems project certification (3rd party and self-certification), business case, examples of language to use in solicitations, and scopes of work.

NAVFAC developed the design-build request for proposal web-based application on the Whole Building Design Guide web site at <http://www.wbdg.org/ndbm>. These guides provide a source of requirements for the preparation of Design-Build and Design-Bid-Build Construction Contract Documents. It requires the use of UFC 3-400-01 Design: Energy Conservation”, requires verification of compliance with ASHRAE STD 90.1 for plumbing fixtures, and HVAC.

The Whole Building Design Guide (WBDG) Resource Page will be modified to integrate the Leadership in Energy & Environmental Design (LEED) Green Building Rating System with Unified Facilities Criteria (UFC) 4-010-01, DOD Minimum Antiterrorism Standards for Buildings.

Progress was made on acceptance of the Navy Pad-mount Transformer and Unit Substation Guide Specs as UFGS. This would implement our higher efficiency transformers throughout DoD. Progress was also made on a Tri-service UFC on Lighting with latest energy saving design guidance. This includes day lighting and other sustainability issues, incorporation of latest lamp types (i.e. compact fluorescent, linear fluorescent, and induction), and a greater use of electronic ballasts and lighting controls.

The Navy-Marine Corps Internet contractor for Information Technology Services, has established server farms with energy intensive requirements for mechanical and electrical rooms. NAVFAC is developing UFC 3-580-10, NMCI Standard Construction Practices, incorporating energy efficient mechanical and electrical requirements into telecommunication control room designs.

The Army issued a policy requiring all projects to be scored against the SpiRiT and require all project designs to achieve the Bronze level. The Army hopes to engage the perspectives and expertise of its personnel throughout the plan, design, build and commissioning process and to establish sustainable goals.

The Air Force Civil Engineer established an AF Sustainable Development Policy on December 19, 2001. All facility and infrastructure projects must apply sustainability development concepts in the planning, design, construction, environmental management, operation, maintenance and disposal process. The following are examples of using sustainable design concepts:

Lackland AFB TX - Student Dorm, \$20.96M

Laughlin AFB TX Wing Consolidated Wing Support Facility

Air Force Academy CO - \$19 million MFH Replacement project (Phase I) that includes sustainable design for: Landscape (hardscape, recreation and xeriscape planting principles), Architecture (site adaptation to provide weather and solar shading), Envelope Materials (low emission glass and thermal panes, additional insulation, and sustainable cladding) Energy Star rated or equivalent appliances, HVAC and lighting. Possible use of renewable, ground-source heat pumps and hot water heat recovery systems.

Hickam AFB HI - sustainable design criteria requires that all contracted A&E construction designs will incorporate Leadership in Energy & Environmental Design (LEED) criteria templates/checklists and rating systems and requires A&E firms to evaluate sustainable design features and report their findings at each stage in the design review process. Examples include the C-17 complex: efficient lighting, R-19 insulation, low flow aerators, low flush toilets, and spectrally selective glass. NCO Club: Efficient lighting, delighting, R-19 insulation, low flow aerators, and low flush toilets. Hickam Hotel: Efficient lighting, R-19 insulation, spectrally selective glass, and central chilled water system.

G. Energy Efficiency in Lease Provisions

DoD emphasizes energy and water conservation in leased facilities and each Service has issued guidance directing that all leased spaces comply with the energy and water efficiency requirements of the Energy Policy Act of 1992. It is DoD's intent to have the landlord make appropriate investments in energy efficiency which can be amortized in the lease, provided the new total cost (energy costs plus lease cost) does not exceed total costs without improvements. These leases should amortize the investments over the economic life of the improvements. Build-to-lease solicitations for DoD facilities will contain criteria encouraging sustainable design and development, energy efficiency, and verification of building performance. DoD relies upon the General Services Administration (GSA) to ensure the above provisions are included in buildings that they lease for DoD.

The Department of Navy currently leases 57.5 million square feet of building facilities.

The Air Force evaluates all leased properties for location, cost/square foot, availability and energy efficiency. All these factors are reviewed before accepting a lease.

The Army emphasizes that energy and water conservation be included in all facility leases and requires these leased facilities to meet energy and water goals. The intent is to have the landlord make appropriate investments in energy efficiency, which can be amortized in the lease, provided the new total cost (energy costs plus lease cost) does not exceed total costs without improvements. Leases should amortize the investments over the economic life of the improvements. Build-to-lease solicitations for Army facilities contain criteria encouraging sustainable design and development, energy efficiency, and verification of building performance.

H. Industrial Facility Efficiency Improvements

Several major initiatives for industrial facility efficiency improvements are under way:

NADEP North Island CA implemented a number of industrial process improvements for a cost of \$3.9M and a simple payback of 4.5 years, including: Hard chrome ventilation elimination/reduction; plating/cleaning tank temperature control/agitation/filtering/level control; replacement of heat treat shop furnace, oven, parts washer, load car conveyer; premium-efficiency motors and applicable notched belts and sprockets for all motors >19 HP.

NSY Puget Sound WA commissioned a compressed air energy consultant to review the shipyard's compressed air performance and the design/build specification concept of a planned major compressed air repair project. The detailed energy analysis and design concept review resulted in a design revision and contract award at \$1.2M lower cost with an energy savings of 9700 MWH/yr over the original project. The addition of a dynamic microprocessor control package, flow/pressure control valve, and receiver volume, reduced the overall project cost. Using the new controls to monitor and optimize compressed air standard operating procedures is expected to save an additional 3320 MWH/yr.

Hill AFB UT is installing the following retrofits in 2 particular "high energy" buildings: cooling towers and controls, process ventilation, compressed air, lighting controls, steam condensate return line, and steam distribution improvements.

DeCA conducts remote diagnostic monitoring of Refrigeration Monitoring and Control Systems (RMCS) at approximately 191 individual commissaries to assure that refrigeration and lighting systems are being operated and maintained at their design specification. Discrepancies are forwarded to our maintenance contractors on a daily basis for correction. Lighting controls were monitored and adjusted by this same method in FY 2003. This surveillance resulted in improved contractor maintenance and improved equipment operation and less energy consumed. Web-based energy-monitoring control systems using cellular technology are being evaluated for DeCA wide use at the *Oceana NAS VA* commissary.

I. Highly Efficient Systems

DoD encourages the components to combine cooling, heating, and power systems in new construction and/or retrofit projects when cost effective

In the Army, FY 2002 was the final year of a 5-year, \$300 million central heating systems modernization program. The goals of this program were to update the aging central heating systems infrastructure at select, large installations. Central heating systems at 14 major installations were modernized under this initiative in FY1998-2002. In addition to the centrally funded program, the installations also used their O&M funds to implement energy saving projects such as - upgrade boilers and distribution systems, improved high efficiency pumps and motors, and updated system controls. Army

regions and installations, along with the Army Corps of Engineers, evaluate the deployment of highly efficient energy systems for all new construction and major retrofit projects and incorporate these systems where cost-effective.

DON continued life cycle cost effective investment in cogeneration systems, bringing the total installed cogeneration capacity in DON to 38 MW. The latest project improves the efficiency and reliability of the central utility plant for *Great Lakes Naval Training Center IL*. The project removes three existing boilers and installs two gas turbines and two heat recovery boilers to provide 10 megawatts of power and 100,000 lbs/hr of superheated steam. The total cost for the project is \$35M and yields a total savings of \$3.5M/yr, resulting in just under a 10-year simple payback.

At MAGTFTC Twentynine Palms CA, a 7 MW natural gas-fired turbine, simple-cycle cogeneration system kicked-off operations in February 2003 to support electric and thermal loads. The cogeneration plant is expected to provide 68% of base's current electricity requirement. In addition, the system will provide uninterrupted power supply of the critical base loads in the event of utility interruptions, ability to isolate critical load when power from the utility is available, and peak power demand relief to the California grid. Waste-heat steam from the cogeneration plant will provide thermal energy for absorption chillers to support operation of a new chilled water distribution system. Future centralized chilled water loop at MAGTFTC Twentynine Palms will replace current cooling operations that relied on package units and evaporative cooling. New system will dramatically improve reliability and cooling quality. New chiller plants will operate both electrical centrifugal and absorption chillers.

Naval Station San Diego CA is installing a 5 MW steam turbine to take advantage of low cost steam produced from an existing cogeneration plant. The available steam was no longer needed for heating purposes, and instead will be used to reduce grid demand.

Tyndall AFB FL is installing Ground Source Heat Pumps (GSHP) and high efficient motors at the base library, bowling alley and education center. *Vance AFB OK* is installing a Thermal Storage System using a 600,000-gallon tank and two 500-ton centrifugal chillers.

J. Off-Grid Generation

DoD is pursuing off-grid generation where it is life cycle cost-effective to provide peak shaving opportunities and energy security. Typical applications include micro-turbines, fuel cells, cogeneration plants, fly wheels and back-up generators.

The Army installed three off-grid generation systems in FY 2003:

Ft. Bragg NC installed a 5 kW proton exchange membrane (PEM) fuel cell manufactured by Plug Power in their Environmental Center facility. This fuel cell was awarded under the ERDC/CERL Residential Proton Exchange Membrane Fuel

Cell (PEMFC) Demonstration program, and is one of the first PEM fuel cells to be installed at an Army facility. The fuel cell operates at a nominal 2.5 kW and is interfaced to an electrical panel inside the building (approximately 25 feet). A new isolation transformer and protective relay were installed between the fuel cell and the panel to prevent the fuel cell from delivering electrical output to the building during a utility outage. A natural gas line extends from the existing gas meter to the fuel cell located on the opposite side of the building (approximately 50 feet).

Ft. Bragg NC awarded a task order modification for a cogeneration project that will provide chilled water, hot water and steam for the 82nd Airborne Area at Fort Bragg. It will also provide electricity to the post electric grid. This project consists of a 5 MW dual-fuel turbine-generator and integral heat recovery steam generator. The turbine will be fueled by natural gas and utilize #2 diesel oil for backup. The exhaust gases from the turbines will be used to feed a 1000-ton absorption chiller and a heat recovery steam generator sized to handle the entire heating load of the 82nd Heating Plant that includes the Faith Barracks Complex. This project, which replaces faulty equipment, will save energy costs and is one piece of Fort Bragg's overall energy security plan.

Ft. McPherson GA installed a flywheel system as part of the uninterruptible power supply (UPS) for Marshall Hall, the FORSCOM Headquarters building. The UPS serves as temporary bridge power (required to be ~ 6 seconds) for critical systems in the building until the building diesel generators come on line. The flywheel system replaced approximately 750 heavy-duty lead-acid batteries that took up 2,400 sq. ft. in the building basement.

Department of Navy

Navy Region Southwest, San Diego CA generated 1,228 MWH from its 750kW photovoltaic system.

MAGTFTC 29 Palms CA completed construction of a 1.2 MW photovoltaic system. It became operational in November 2003. The system is expected to generate 2,300 MWH/yr.

Naval Base Guantanamo Bay is increasing energy security and power reliability by installing a 3.8 MW wind farm, and upgrading their diesel generators with two energy efficient generators totaling 7.2 MW capacity. The project includes a Supervisory Control and Data Acquisition (SCADA) system to control the wind farm, and the SCADA system could expand to control the diesel power plant as well. Total project cost is \$19.4M and will save an average of \$2.4M/yr.

DON is validating the performance and cost of microturbines and Proton Exchange Membrane (PEM) fuel cells. Microturbines were installed and instrumented at NAB Coronado, CA. (2-60kW units) and are scheduled to be installed at SUBASE New

London, CT (1-30 kW) in FY04. DON is fostering development of heat recovery and use of liquid fuel sources.

Nine 5kW PEM fuel cells were installed at Navy sites. These fuel cells are combined heat and power, grid parallel, natural gas-fueled units. They were installed at *NAS North Island CA* (three at the laundry and two at the fitness center), *SUBASE Point Loma CA* (three at the BOQ), and *NAWS China Lake CA* (one at the indoor swimming pool). The intent of all of these demonstrations is to assess the performance, operations, maintenance, and repair requirements of the PEM fuel cells. The fuel cell systems will operate for one year under this program. Although PEM technology has made progress toward viable commercial products, there are still substantial durability, reliability, and availability issues that remain (e.g., a PEM fuel stack lasts about six months under continuous operation).

DON is constructing a 20 kW wave power buoy at *MCAS Kaneohe Bay HI*. The pilot project, a phase three Small Business Innovative Research (SBIR) effort, will demonstrate the capability of harnessing wave power to drive an off shore generator and transmit the power on shore where it can be fed to the base grid. If successful, additional buoys will be installed to bring the capacity to 100 kW. A phase I SBIR project is computer modeling the performance of Ocean Thermal Energy Conversion at various sites. Both ocean power technologies are being investigated to generate power at remote island locations.

The National Security Agency (NSA) participates in Baltimore Gas & Electric's (BGE) Rider 24 load reduction program. This new program allows NSA to make decisions on load reductions by utilizing on-site generation in the real-time market with notification to BGE. If the current daily market value (electricity rate) during a planned generator load reduction run is more than the average cost of electricity for NSA, then a credit will be applied to NSA's utility bill. Participation is voluntary with no penalties assessed for not meeting load reduction requirements.

K. Electrical Load Reduction Measures

Below are several examples:

Each of the DoD Components responded to the President's Memorandum of May 3, 2001 and reduced its summer peak demand in the Western United States.

Specifically, *Fort Lewis WA* installed over 100 Vending Misers - a new technology designed to efficiently manage energy use of refrigerated vending machines and adjusted their set points on the installation's energy management control system to achieve maximum energy conservation. *Fort Irwin CA* instituted an aggressive campaign to encourage soldiers' energy awareness, reduce peak demand usage of electricity and implemented a monitoring program to identify and shut off unoccupied building loads. In addition, Fort Irwin installed over 50,000 feet of solar reflective window film throughout the commercial buildings and barracks on the main post to

reduce air conditioning loads. At *Dugway Proving Grounds UT*, the Army completed installation of a 6 MWH generator and has the capability of utilizing the generator to significantly reduce their peak load. *Fort Gordon GA* and *Fort Rucker AL* employ diesel generators to manage the peak load at their installations. *Fort Gordon* leases 13.5 MW of diesel generator assets from the 249th Prime Power Program. The generators allow *Fort Gordon* to peak shave the electrical load to shape, which amounts to a minimum of \$300k in annual savings or credits. *Fort Rucker* has 4 MW of generation capacity used for peak shaving. Alabama Power allowed *Fort Rucker* to switch to a more advantageous rate structure after they installed these generators.

DON projects awarded in FY03 will reduce load on the national electric grid by 117,505 MWH, once all projects are operational.

DOE's Pacific Northwest National Laboratory (PNNL) is wrapping up implementation of a \$2.6 million project at *MCAS Beaufort, SC* and a \$5.0 million project at *MCRD Parris Island, SC* to evaluate, design, procure, and install Energy Management & Control System (EMCS) hardware and software. This effort will be used to schedule building occupancy, set HVAC temperature levels, control lighting usage, and manage peak electrical loads.

DON is validating the performance of cool roof coatings to reduce air conditioning loads in Hawaii. Several different roof coatings will be compared for cost, and performance.

Altus AFB OK implements load reduction measures in conjunction with Western Farmers Electric Cooperative Peak Day notices. During periods of peak demand backup generators are operated to shed the electrical load experienced by Altus AFB

Randolph AFB TX has the capability to operate diesel load generators capable of relieving 2.4 MW of electrical demand. We also have in place a 1,031,066-gallon chilled water storage tank used to shed 790 kW of electrical power from the daily peak load.

The *Air Force Academy's* automated Demand Side Management (DSM) program duty-cycled non-critical fan and pump motor loads to achieve approximately 4% reduction in peak power demand during the scheduled periods. At \$0.1781 per KWH of on-super peak energy and \$0.1941 per KW/DAY of on-peak demand, this resulted in approximately \$30,030.00 in savings for reduced demand and energy use during the (77) hours of super-peak operation in FY03.

IV. Data Tables and Inventories

- A. FY 2003 Annual Energy Management Data Report**
- B. Energy Scorecard for FY 2003**
- C. Goals of Executive Order 13123 and NECPA/EPACT**
- D. Industrial and Laboratory Facility Inventory**
- E. Exempt Facilities Inventory**
- F. Exhibit A - Reporting Green Energy Purchases**

A. FY 2003 Annual Energy Management Data Report

B. Energy Scorecard for FY 2003

Previously submitted to OMB and DoE on 21 January, 2004

C. Goals of Executive Order 13123 and NECPA/EPACT

Executive Order 13123

Category	Goal	Comments
Greenhouse Gas Emissions	30% reduction by 2010	Base year is 1990. DOE will calculate agencies' progress toward this goal and report it on agencies' annual energy scorecards
Energy Efficiency		
Standard Buildings	30% improvement by 2005 35% improvement by 2010	Base year is 1985
Industrial and Laboratory Facilities	20% improvement by 2005 25% improvement by 2010	Base year is 1990
Exempt Facilities	N/A	Despite lack of quantitative goal, agencies should implement strategies to improve energy efficiency at these facilities.
Renewable Energy	Implement renewable energy projects Purchase electricity from renewable energy sources Install 2,000 solar energy systems at Federal facilities by 2000 Install 20,000 solar energy systems at Federal facilities by 2010	Installation of Federal solar energy systems will help support the Million Solar Roofs initiative
Petroleum	Reduce petroleum use	Switches to alternative energy sources should be life-cycle cost effective
Source Energy	Reduce use of source energy	Accomplish by undertaking projects that are life-cycle cost effective
Water Conservation	Reduce water consumption*	Accomplish via life-cycle cost effective measures, energy-savings performance contracts, or other financing mechanism

NECPA/EPACT

Energy Efficiency	20% improvement by 2000	Base year is 1985
Financing	Undertake all energy efficiency improvement projects that have a simple payback period of 10 years or less by 2005	E.O. 13123 expands this goal by mandating that any energy efficiency project that is life-cycle cost effective be undertaken
Audits	Conduct audits for energy efficiency on 10% of facilities annually	E.O. 13123 includes language supporting this goal

* FEMP has established water efficiency improvement goals as directed by the Executive Order. Agencies must implement Water Management Plans and Best Management Practices according to the following schedule:

05% of facilities by 2002

15% of facilities by 2004

30% of facilities by 2006

50% of facilities by 2008

80% of facilities by 2010

For more detail, see the FEMP guidance document Water Efficiency Improvement Goal for Federal Agencies.

D. Industrial and Laboratory Facility Inventory

The following buildings/facilities were classified as process buildings.

Army Industrial and Laboratory Facilities

Holston Army Ammunition Plant, Kingsport, TN
Radford Army Ammunition Plant, Radford, VA
AAFES Food Processing Plant, Grünstadt, Germany
Ft. Leonard Wood, MO Laundry Facility
Scranton Army Ammunition Plant, Scranton, PA

The following entire bases were designated as industrial, based on 60% or more of the base-wide energy use being for industrial purposes.

Department of Navy Installations/Facilities

NIROP PITTSFIELD MA	SIMA PASCAGOULA MS
NIROP MINNEAPOLIS MN	NSWC LCC DET MEMPHIS TN
NIROP SUNNYVALE CA	INACTSHIPFAC PHILA PA
WV ABL MINERAL CO	WPNSTA CONCORD CA
NWIRP DALLAS TX	WPNSTA EARLE COLTS NECK NJ
NWIRP BLOOMFIELD CT	WPNSTA SEAL BEACH CA
NSY PORTSMOUTH NH	NAVORDMISTESTSTA WHITESANDS NM
WPNSTA YORKTOWN VA	NSWC DET BAYVIEW ID
NSWC DIV CRANE IN	FISC YOKOSUKA JA
NSWC DIV CARDEROCK BETHESDA MD	NSWC DET FT. LAUDERDALE FL
NSWC DIV INDIAN HEAD MD	NAVSHIPPREPFAC YOKOSUKA JA
NSWC DIV DAHLGREN VA	NSWC DIV PT HUENEME CA
NSY NORFOLK VA	SWFPAC BANGOR WA
NWS YORKTOWN SJC ANNEX	NSWC NWS CORONA
NSC NORFOLK VA	NAVAVNDEPOT JACKSONVILLE FL
WPNSTA CHARLESTON SC	NAVAVNDEPOT NORTH ISLAND CA
NSY PUGET SOUND BREMERTON WA	NAVAVNDEPOT CHERRY POINT NC
NUWC DIV KEYPORT WA	NAVSPASURFLDSTA MARICOPA AZ
NSY PEARL HARBOR HI	NUWC DIV NEWPORT RI
NOC PAC DET FALLBROOK CA	UNISERUOFHEASCN BETHESDA MD
NSC PUGET SOUND BREMERTON WA	SWFLANT KINGS BAY GA
AMFORRDRESINS BETHESDA MD	NSC JACKSONVILLE FL
NAVXDIVINGU PANAMA CITY FL	NUWC DET NEW LONDON CT
EODT DIV INDIAN HEAD MD	NIROP PITTSFIELD MA
NOCPACDIV DET PORT HADLOCK WA	NIROP MINNEAPOLIS MN
INTCOMBATSYSTESTFAC SANDIEGO CA	MCLB ALBANY GA
TRIREFFAC KINGS BAY GA	MCLB BARSTOW CA

Air Force Industrial and Laboratory Facilities

Hill AFB UT - Industrial/Process
Tinker AFB OK - Industrial/Process
Robins AFB GA - Industrial/Process
Arnold AFB TN - Industrial/Process/Laboratory

The following Commissary Stores were designated as industrial facilities.

LOCATION	City	State	Country
ABERDEEN	Baltimore	MD	U.S.A.
ALBANY MCLB	Albany	GA	U.S.A.
ALTUS	Altus	OK	U.S.A.
ANCHORAGE	Anchorage	AK	U.S.A.
ANDERSEN AFB	Yigo	-	Guam
ANDREWS AFB	Camp Springs	MD	U.S.A.
ANNAPOLIS	Annapolis	MD	U.S.A.
ANSBACH	Katterbach	-	Germany
ARDEC	Patterson	NJ	U.S.A.
ARNOLD AFB	Tulahoma	TN	U.S.A.
ASCHAFFENBURG	Aschaffenburg	-	Germany
ATHENS NSCS	Athens	GA	U.S.A.
ATSUGI	Yokohama	-	Japan
AVIANO	Pordenone	-	Italy
BABENHAUSEN	Babenhausen	-	Germany
BAD AIBLING	Bad Aibling	-	Germany
BAD KISSINGEN	Bad Kissengen	-	Germany
BAD NAUHEIM	Bad Nauheim	-	Germany
BAMBERG	Bamberg	-	Germany
BANGOR ANGB	Bangor	ME	U.S.A.
BANGOR NSB	Silverdale	WA	U.S.A.
BARBERS POINT	Pearl City	HI	U.S.A.
BARKSDALE AFB	Bossier City	LA	U.S.A.
BARSTOW MCLB	Barstow	CA	U.S.A.
BAUMHOLDER	Baumholder	-	Germany
BEALE AFB	Marysville	CA	U.S.A.
BITBURG	Bitburg/Trier	-	Germany
BOLLING AFB	Washington	DC	U.S.A.
BREMERTON	Bremerton	WA	U.S.A.
BRUNSWICK NAS	Portland	ME	U.S.A.
BUCKLEY AFB	Aurora	CO	U.S.A.
BUEDINGEN	Buedingen	-	Germany
C. E. KELLY	Pittsburgh	PA	U.S.A.
CAMP CARROLL	Taegu	-	South Korea
CAMP CASEY	Tongduchon	-	South Korea
CAMP COURTNEY	Gushikawa	-	Japan
CAMP FOSTER	Naha	-	Japan
CAMP HOWZE	Munson	-	South Korea
CAMP HUMPHREYS	Pyongtaek	-	South Korea
CAMP KINSER	Naha	-	Japan
CAMP KURE	Hiroshima	-	Japan
CAMP LEJEUNE	Jacksonville	NC	U.S.A.
CAMP MERRILL	Dahlonga	GA	U.S.A.
CAMP PAGE	Taegu	-	South Korea
CAMP PENDLETON	Oceanside	CA	U.S.A.
CAMP RED CLOUD	Uijonbu	-	South Korea
CAMP STANLEY	Uijongbu	-	South Korea
CAMP ZAMA	Tokyo	-	Japan

LOCATION	City	State	Country
CANNON AFB	Clovis	NM	U.S.A.
CARLISLE BARRACKS	Carlisle	PA	U.S.A.
CHARLESTON AFB	Charleston	SC	U.S.A.
CHARLESTON NWS	Charleston	SC	U.S.A.
CHERRY POINT	Havelock	NC	U.S.A.
CHIEVRES	Chievres	-	Belgium
CHINA LAKE	Ridgecrest	CA	U.S.A.
CHINHAE NAS	Chinhae	-	South Korea
COLUMBUS AFB	Columbus	MS	U.S.A.
CORPUS CHRISTI	Corpus Christi	TX	U.S.A.
CRANE NWSC	Crane	IN	U.S.A.
DAHLGREN	Fredericksburg	VA	U.S.A.
DARMSTADT	Darmstadt	-	Germany
DAVIS-MONTHAN	Tucson	AZ	U.S.A.
DEXHEIM	Dexheim	-	Germany
DOVER AFB	Dover	DE	U.S.A.
DUGWAY	Dugway	UT	U.S.A.
DYESS AFB	Abilene	TX	U.S.A.
EDWARDS	Rosamond	CA	U.S.A.
EGLIN AFB	Niceville	FL	U.S.A.
EIELSON AFB	Fairbanks	AK	U.S.A.
EL CENTRO	El Centro	CA	U.S.A.
ELLSWORTH AFB	Rapid City	SD	U.S.A.
F. E. WARREN	Cheyenne	WY	U.S.A.
FAIRCHILD	Spokane	WA	U.S.A.
FALLON	Fallon	NV	U.S.A.
FORT BELVOIR	Alexandria	VA	U.S.A.
FORT BENNING	Columbus	GA	U.S.A.
FORT BLISS	El Paso	TX	U.S.A.
FORT BRAGG - NORTH	Fayetteville	NC	U.S.A.
FORT BRAGG SOUTH POST	Fayetteville	NC	U.S.A.
FORT BUCHANAN	San Juan	-	Puerto Rico
FORT CAMPBELL	Clarksville	TN	U.S.A.
FORT CARSON	Colorado Springs	CO	U.S.A.
FORT DETRICK	Frederick	MD	U.S.A.
FORT DRUM	Watertown	NJ	U.S.A.
FORT EUSTIS	Newport News	VA	U.S.A.
FORT GILLEM	Atlanta	GA	U.S.A.
FORT GORDON	Augusta	GA	U.S.A.
FORT GREELY	Delta Junction	AK	U.S.A.
FORT HAMILTON	New York	NY	U.S.A.
FORT HOOD I	Killeen	TX	U.S.A.
FORT HOOD II	Killeen	TX	U.S.A.
FORT HUACHUCA	Sierra Vista	AZ	U.S.A.
FORT HUNTER-LIGGETT	King City	CA	U.S.A.
FORT IRWIN	Fort Irwin	CA	U.S.A.
FORT JACKSON	Columbia	SC	U.S.A.
FORT KNOX	Louisville	KY	U.S.A.
FORT LEAVENWORTH	Leavenworth	KS	U.S.A.
FORT LEE	Petersburg	VA	U.S.A.
FORT LEONARD WOOD	Waynesville	MO	U.S.A.

LOCATION	City	State	Country
FORT LEWIS	Tacoma	WA	U.S.A.
FORT MCCOY	La Crosse	WI	U.S.A.
FORT MCPHERSON	Atlanta	GA	U.S.A.
FORT MEADE	Laurel	MD	U.S.A.
FORT MONMOUTH	Eatontown	NJ	U.S.A.
FORT MONROE	Hampton	VA	U.S.A.
FORT MYER	Arlington	VA	U.S.A.
FORT POLK	Leesville	LA	U.S.A.
FORT RILEY	Junction City	KS	U.S.A.
FORT RUCKER	Daleville	AL	U.S.A.
FORT SAM HOUSTON	San Antonio	TX	U.S.A.
FORT SILL	Lawton	OK	U.S.A.
FORT STEWART	Hinesville	GA	U.S.A.
FORT WAINWRIGHT	Fairbanks	AK	U.S.A.
GARMISCH	Garmisch	-	Germany
GELNHAUSEN	Gelnhausen	-	Germany
GIEBELSTADT	Giebelstadt	-	Germany
GIESSEN	Giessen	-	Germany
GOODFELLOW	San Angelo	TX	U.S.A.
GRAFENWOEHR	Grafenwoehr	-	Germany
GRAND FORKS AFB	Grand Forks	ND	U.S.A.
GREAT LAKES NTC	Waukegan	IL	U.S.A.
GRICIGNANO	Grigignano	-	Italy
GUAM CDC	Yigo	-	Guam
GULFPORT NCBC	Gulfport	MS	U.S.A.
GUNTER AFB	Montgomery	AL	U.S.A.
HANAU	Hanau	-	Germany
HANNAM VILLAGE	Seoul	-	South Korea
HANSCOM	Bedford	MA	U.S.A.
HARIO HOUSING	Hario	-	Japan
HARRISON VILLAGE	Indianapolis	IN	U.S.A.
HEIDELBERG	Heidelberg	-	Germany
HICKAM AFB	Honolulu	HI	U.S.A.
HILL AFB	Ogden	UT	U.S.A.
HOHENFELS	Hohenfels	-	Germany
HOLLOMAN AFB	Alamogordo	NM	U.S.A.
HUNTER AAF	Savannah	GA	U.S.A.
HURLBURT FIELD	Fort Walton Beach	FL	U.S.A.
IDAR OBERSTEIN	Idar Oberstein	-	Germany
ILLESHEIM	Illesheim	-	Germany
IMPERIAL BEACH	Imperial Beach	CA	U.S.A.
INCIRLIK	Incirlik	-	Turkey
IWAKUNI MCAS	Iwakuni	-	Japan
IZMIR	Izmir	-	Turkey
JACKSONVILLE	Jacksonville	FL	U.S.A.
KADENA AFB	Naha	-	Japan
KANEOHE BAY	Kaneohe Bay	HI	U.S.A.
KEESLER AFB	Biloxi	MS	U.S.A.
KEFLAVIK	Keflavik	-	Iceland
KELLEY BARRACKS	Stuttgart	-	Germany
KEY WEST NAS	Key West	FL	U.S.A.

LOCATION	City	State	Country
KINGS BAY NSB	St. Marys	GA	U.S.A.
KINGSVILLE	Kingsville	TX	U.S.A.
KIRTLAND AFB	Albuquerque	NM	U.S.A.
KITZINGEN	Kitzingen	-	Germany
KUNSAN AFB	Kunsan City	-	South Korea
LACKLAND AFB	San Antonio	TX	U.S.A.
LAJES FIELD	Terceira Island	-	Azores
LAKEHURST	Toms River	NJ	U.S.A.
LANGLEY AFB	Hampton	VA	U.S.A.
LAUGHLIN AFB	San Antonio	TX	U.S.A.
LEMOORE	Fresno	CA	U.S.A.
LITTLE CREEK NAB	Virginia Beach	VA	U.S.A.
LITTLE ROCK AFB	Jacksonville	AR	U.S.A.
LIVORNO	Pisa	-	Italy
LOS ANGELES AFB	Los Angeles	CA	U.S.A.
LUKE AFB	Phoenix	AZ	U.S.A.
MACDILL AFB	Tampa	FL	U.S.A.
MALMSTROM AFB	Great Falls	MT	U.S.A.
MANNHEIM	Mannheim	-	Germany
MARCH AFB	Riverside	CA	U.S.A.
MAXWELL AFB	Montgomery	AL	U.S.A.
MAYPORT NS	Atlantic Beach	FL	U.S.A.
MC CULLY BARRACKS	Wackenheim	-	Germany
MCCHORD AFB	Tacoma	WA	U.S.A.
MCCLELLAN AFB	North Highlands	CA	U.S.A.
MCCONNELL AFB	Wichita	KS	U.S.A.
MCGUIRE AFB	Wrighttown	NJ	U.S.A.
MEMPHIS NAS	Memphis	TN	U.S.A.
MERIDIAN NAS	Meridian	MS	U.S.A.
MINEO	Catania	-	Sicily
MINOT AFB	Minot	ND	U.S.A.
MIRAMAR NAS	San Diego	CA	U.S.A.
MISAWA AFB	Misawa	-	Japan
MITCHEL FIELD	Garden City	NY	U.S.A.
MOFFETT FIELD	Mountain View	CA	U.S.A.
MOODY AFB	Valdosta	GA	U.S.A.
MOUNTAIN HOME AFB	Mountain Home	ID	U.S.A.
MW REGION HQ	San Antonio	TX	U.S.A.
NAPLES	Naples	-	Italy
NELLIS AFB	Las Vegas	NV	U.S.A.
NEUBRUECKE	Neubreucke	-	Germany
NEW LONDON	Groton	CT	U.S.A.
NEW ORLEANS NSA	New Orleans	LA	U.S.A.
NEW RIVER MCAS	Jacksonville	NC	U.S.A.
NEWPORT	Newport	RI	U.S.A.
NORFOLK NB	Norfolk	VA	U.S.A.
NORTH ISLAND	San Diego	CA	U.S.A.
OCEANA NAS	Virginia Beach	VA	U.S.A.
OFFUTT AFB	Bellevue	NE	U.S.A.
ORD COMMUNITY	Monterey	CA	U.S.A.
OROTE (GUAM)	Agat	-	Guam

LOCATION	City	State	Country
OSAN AFB	Osan	-	South Korea
PANZER BARRACKS	Boeblingen	-	Germany
PARRIS ISLAND	Beaufort	SC	U.S.A.
PATCH BARRACKS	Stuttgart	-	Germany
PATRICK AFB	Cocoa Beach	FL	U.S.A.
PATUXENT RIVER	Lexington Park	MD	U.S.A.
PEARL HARBOR	Honolulu	HI	U.S.A.
PENSACOLA	Pensacola	FL	U.S.A.
PETERSON	Colorado Springs	CO	U.S.A.
PORT HUENEME	Port Hueneme	CA	U.S.A.
PORTSMOUTH NAS	Portsmouth	NH	U.S.A.
PORTSMOUTH NNSY	Portsmouth	VA	U.S.A.
PUSAN	Pusan	-	South Korea
QUANTICO	Woodbridge	VA	U.S.A.
RAF ALCONBURY	Peterborough	-	England
RAF CROUGHTON	Bicester	-	England
RAF FAIRFORD	Fairford	-	England
RAF LAKENHEATH	St. Edmunds	-	England
RAF MENWITH HILL	Harrogate	-	England
RAF MILDENHALL	Newmarket	-	England
RAMSTEIN AFB	Ramstein	-	Germany
RAMSTEIN CMPP	Ramstein	-	Germany
RANDOLPH AFB	San Antonio	TX	U.S.A.
REDSTONE ARSENAL	Huntsville	AL	U.S.A.
RHEIN MAIN AB	Frankfurt	-	Germany
ROBINS AFB	Macon	GA	U.S.A.
ROCK ISLAND AR.	Rock Island	IL	U.S.A.
ROOSEVELT ROADS	Ceiba	-	Puerto Rico
ROTA	Jerez	-	Spain
SAGAMI DEPOT	Tokyo	-	Japan
SAGAMIHARA	Tokyo	-	Japan
SAN DIEGO NS	San Diego	CA	U.S.A.
SAN ONOFRE	San Clemente	CA	U.S.A.
SASEBO	Sasebo	-	Japan
SCHINNEN	Heerlen	-	Netherlands
SCHOFIELD BARRACKS	Wahiawa	HI	U.S.A.
SCHWEINFURT	Schweinfurt	-	Germany
SCOTIA	Schenectady	NY	U.S.A.
SCOTT AFB	Belleville	IL	U.S.A.
SELFRIDGE ANG	Mt Clemens	MI	U.S.A.
SEMBACH	Kaiserslautern	-	Germany
SEYMOUR JOHNSON	Goldsboro	NC	U.S.A.
SHAW AFB	Sumter	SC	U.S.A.
SHEPPARD AFB	Wichita Falls	TX	U.S.A.
SIGONELLA	Catania	-	Sicily
SMOKEY POINT NS	Marysville	WA	U.S.A.
SPANGDAHLEM	Bitburg	-	Germany
SUGAR GROVE NSGA	Sugar Grove	VA	U.S.A.
TAEGU	Taegu	-	South Korea
TINKER AFB	Oklahoma City	OK	U.S.A.
TOBYHANNA	Scranton	PA	U.S.A.

LOCATION	City	State	Country
TRAVIS AFB	Fairfield	CA	U.S.A.
TWENTYNINE PALMS	Twentynine Palms	CA	U.S.A.
TYNDALL AFB	Panama City	FL	U.S.A.
USAF ACADEMY	Colorado Springs	CO	U.S.A.
VANCE AFB	Enid	OK	U.S.A.
VANDENBERG AFB	Lompoc	CA	U.S.A.
VICENZA	Vicenza	-	Italy
VILSECK	Vilseck	-	Germany
VOGELWEH	Kaiserslautern	-	Germany
WALTER REED	Washington	DC	U.S.A.
WEST POINT	Highland Falls	NY	U.S.A.
WHIDBEY ISLAND NAS	Oak Harbor	WA	U.S.A.
WHITE SANDS MR	Las Cruces	NM	U.S.A.
WHITEMAN AFB	Knob Noster	MO	U.S.A.
WHITING FIELD	Pensacola	FL	U.S.A.
WIESBADEN	Wiesbaden	-	Germany
WRIGHT-PATTERSON	Dayton	OH	U.S.A.
WUERZBURG	Wuerzburg	-	Germany
YOKOSUKA NESC	Yokosuka	-	Japan
YOKOTA AB	Tokyo	-	Japan
YONGSAN	Seoul	-	South Korea
YUMA MCAS	Yuma	AZ	U.S.A.
YUMA PG	Yuma	AZ	U.S.A.

E. Exempt Facilities Inventory

Facility	Function/Location
Cold Iron	SUBASE NEW LONDON CT
Cold Iron	NSY NORFOLK VA
Cold Iron	PWC NORFOLK VA
Cold Iron	WPNSTA CHARLESTON SC
Cold Iron	NAS PENSACOLA FL
Cold Iron	NAS KEY WEST FL
Cold Iron	NAVSTA ROOSEVELT ROADS PR
Cold Iron	SUBASE KINGS BAY GA
Cold Iron	NAVSTA MAYPORT FL
Cold Iron	WPNSTA EARLE COLTS NECK NJ
Cold Iron	NAVSTA GUANTANAMO CUBA
Cold Iron	NSWC COASTSYSTA PANAMA CITY FL
Cold Iron	NAVPHIBASE LITTLE CREEK VA
Cold Iron	NETC NEWPORT RI
Cold Iron	NAVSTA ROTA SP
Cold Iron	NAVSTA PASCAGOULA
Cold Iron	NAVSTA INGLESIDE TX
Cold Iron	NUSC NEW LONDON LABORATORY
Cold Iron	NAVBASE SAN DIEGO CA
Cold Iron	NAVBASE CORONADO SAN DIEGO CA
Cold Iron	NSY PUGET SOUND BREMERTON WA
Cold Iron	NSY PEARL HARBOR HI
Cold Iron	SUBASE PEARL HARBOR HI
Cold Iron	FLEASWTRACENPAC SAN DIEGO CA
Cold Iron	FLEET ACTIVITIES CHINHAE SK
Cold Iron	COMFLEACT YOKOSUKA JA
Cold Iron	COMNAVMAR GUAM GQ
Cold Iron	NAVBASE VENTURA, PORT HUENEME CA
Cold Iron	COMFLEACT SASEBO JA
Cold Iron	PWC PEARL HARBOR HI
Cold Iron	NAVSTA PEARL HARBOR HI
Cold Iron	SUBASE SAN DIEGO CA
Cold Iron	NAVRESREDCOMNW SEATTLE WA

Facility	Function/Location
Cold Iron	SUBASE BANGOR WA
Cold Iron	NAVSTA EVERETT WA
Simulator	WPNSTA CHARLESTON SC
Simulator	NAS PENSACOLA FL
Simulator	NAS JACKSONVILLE FL
Simulator	NAS DALLAS TX
Simulator	NAS KINGSVILLE TX
Simulator	NAS LEMOORE CA
Simulator	NSWC DIV PT HUENEME CA
Simulator	MCAS MIRAMAR CA
Transmitter	NAS JACKSONVILLE FL
Transmitter	NAVSECGRUACT WINTER HARBOR ME
Transmitter	RADTRANF ANNAPOLIS MD
Transmitter	NAVRADTRANFAC SADDLEBUNCH KEYS
Transmitter	NAVCOMMSTA JACKSONVILLE FL
Transmitter	NAVRADSTA /T/ JIM CREEK WA
Private Party	NAS DALLAS TX
Private Party	NAVCOMMU WASHINGTON DC
Private Party	NAF EL CENTRO CA
Private Party	NSWC COASTSYSTA PANAMA CITY FL
Private Party	COMFLEACT YOKOSUKA JA
Private Party	NAVOBSY WASHINGTON DC
Private Party	NAF ATSUGI JA
Private Party	CBC PORT HUENEME CA
Private Party	CBC GULFPORT MS
Private Party	MCAS IWAKUNI JA
Private Party	PWC PEARL HARBOR HI
Private Party	NAVSTA ROTA SP
Private Party	NAS KEFLAVIK IC
Private Party	NAVCOMMSTA KEFLAVIK IC
Private Party	HDQTRS 4TH MARDIV NEW ORLEANS
Private Party	NAVSTA PASCAGOULA MS

F. Exhibit A Reporting Green Energy Purchases