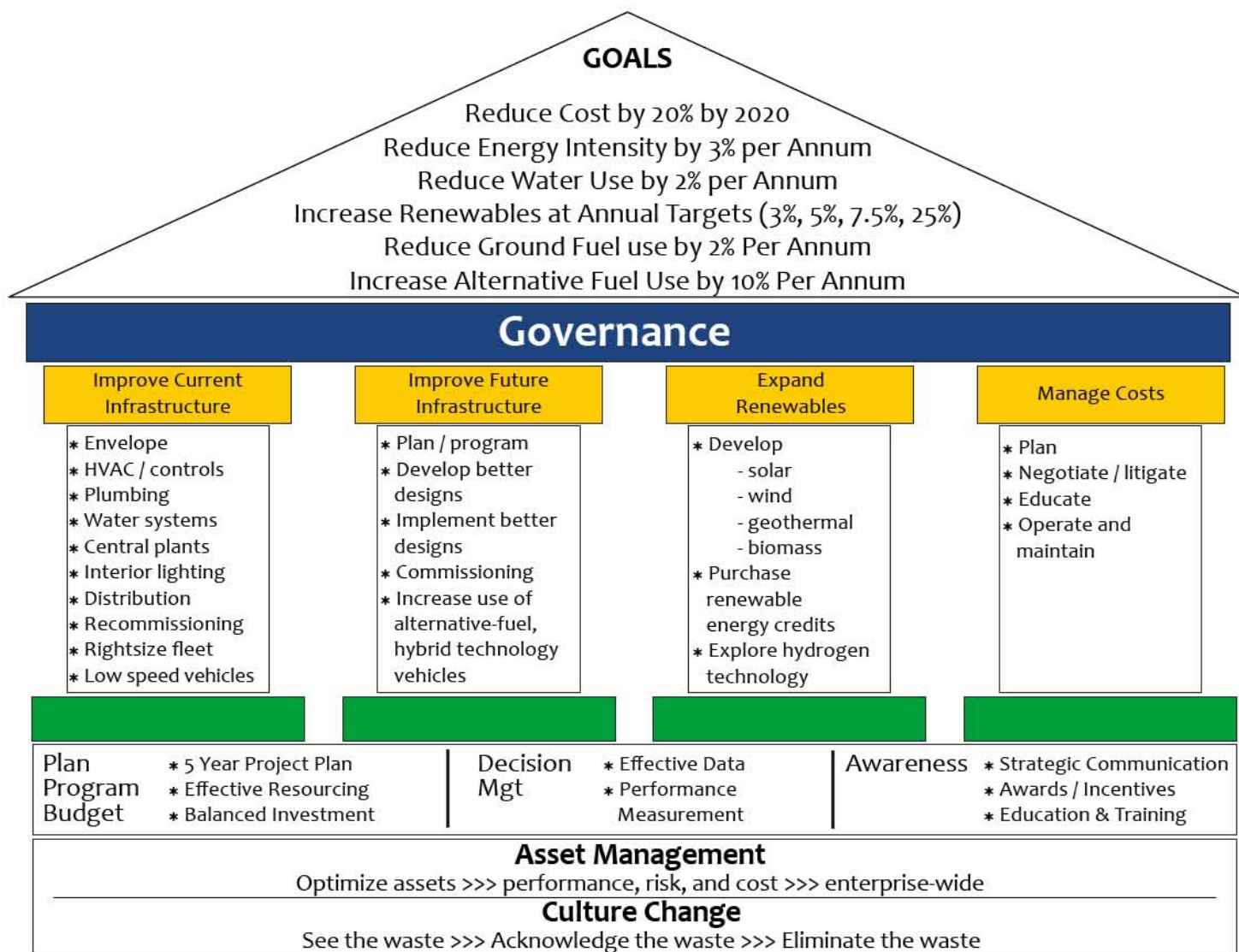


United States Air Force 2008

Infrastructure Energy Strategic Plan



Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE 01 SEP 2008		2. REPORT TYPE		3. DATES COVERED 00-00-2008 to 00-00-2008	
4. TITLE AND SUBTITLE United States Air Force 2008 Infrastructure Energy Strategic Plan				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) U.S. Air Force,Deputy Chief of Staff/Logistics, Installations and Mission Support,Washington,DC				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 68	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			



On the cover:

Front (clockwise from top right): The Combined Support Facility at Edwards AFB employs innovative, energy-saving technology and recycled materials. E-85 fuel is one alternative fuel currently in use in the Air Force. Luke AFB's LED taxiway lighting saves energy and dollars. Low-speed electric vehicles are a viable alternative for on-base use. The solar panels on the BX roof at Luke AFB generate electricity that can be used to power the facility.

Back: Wind turbines at F.E. Warren AFB supply part of the base's electrical power.

Inside back: The solar array at Nellis AFB is one of the largest in the Americas. It supplies the base with more than 30 million kilowatt-hours of electricity per year.

Foreword

The Air Force needs a purposeful campaign that builds upon our long history of energy conservation and leadership to create an enduring and viable energy strategy that meets conservation mandates, establishes energy independence, and provides the pathway to acquire the resources necessary to make our installations energy efficient. The Air Force infrastructure energy strategy melds with the Air Force's core competencies and capabilities; it complements what the Air Force does and how the Air Force employs energy resources.



There must be a realistic assessment of the current energy situation and environment to develop flexible options and make choices and investments that will yield a balanced energy implementation plan. Success needs to be measured with accurate data and analysis and by constant monitoring and evaluation of the execution of the strategy's objectives. Leadership and communication are central to the success of the strategy.

At the core of this energy strategy is the recognition that the Air Force needs industry and federal partnerships to meet or exceed our energy goals. Industry brings innovation, engineering and technology, financial savvy, venture capital, and a successful track record of managed risk to a multi-faceted energy management partnership. The Air Force seeks energy independence and managed conservation knowing that private sector leadership is assisting all military services and federal agencies to meet their energy goals. Every federal agency is a test bed for energy innovation and all agencies should benefit from the lessons learned in those endeavors and investments in solar, wind, geothermal, biomass, and alternative fuels in facility and ground transportation energy conservation measures.

While pursuing energy savings to meet federal mandates, we can simultaneously reduce costs of operating Air Force installations by understanding the business case for our initiatives and by creating a culture that recognizes and eliminates waste in all areas of our operations. Asset Management — the application of life-cycle-based decision making and smart operations practices in managing Air Force assets — will drive this cultural change. Energy management is central to this business makeover and will ensure the Air Force meets energy conservation and renewable goals.

Kevin J. Sullivan
Lieutenant General, United States Air Force
DCS/Logistics, Installations & Mission Support

Executive Summary

The case for action to reduce our energy consumption and diversify our energy sources is more compelling than ever. Military forces will always be dependent on energy, but we must dramatically reduce the risk to national security associated with our current energy posture. Energy prices fluctuate tremendously and the cost of crude oil crested near \$150 per barrel in 2008. Major oil reserves are in countries or regions with governments or regimes that are at times unfriendly to U.S. and other Western interests. Our fragile energy infrastructure, such as the national electrical grid and the country's crude oil refining capacity, may hinder our ability to reliably deliver energy during times of crisis. Lastly, there is persuasive evidence that human activity is contributing to global warming. Together, these circumstances have awakened our nation, requiring a call for action that America is answering. Congress and the president have established mandates in law and executive orders. State governments are setting minimum "green" energy requirements for producers and consumers. Emerging technology and growing markets in renewable energy are diversifying our supply.

It is within this context that the Air Force Infrastructure Energy Strategic Plan was developed. This plan explains why the Air Force needs an energy strategy, where the Air Force is headed with its strategy, and the difference an energy strategy will make as the Air Force prioritizes and allocates its resources. This strategic plan guides the Air Force toward higher energy efficiency by understanding the environment in which we operate. This environment includes several major statutory and policy mandates:

- ◆ Reduce facility energy intensity by 3 percent per annum
- ◆ Reduce base water use by 2 percent per annum
- ◆ Increase use of renewable energy at annual targets (3%, 5%, 7.5%, 25%)
- ◆ Reduce ground vehicle fossil fuel use by 2 percent per annum
- ◆ Increase alternative fuel use by 10 percent per annum

The operational environment also includes our energy consumption, fiscal challenges, evolving technology, and the opportunity to not only reduce consumption, but to diversify supply through renewable energy alternatives. The Air Force is engaged with other federal entities and industry to adopt best business practices and technologies for conservation and renewable power development.

The Air Force's strategic plan is built on four pillars: 1) Improve Current Infrastructure; 2) Improve Future Infrastructure; 3) Expand Renewables; and 4) Manage Cost. The pillars rest on "enablers" such as our planning, programming, and budgeting processes; our data systems that guide our investments and decisions; and energy awareness to ensure that improvements in technology are integrated with a meaningful change in our Air Force culture.

The Air Force has a solid record of successes and strengths in energy management, but more must be done, and done today. A cogent, requirements-driven, business case-derived Air Force corporate strategy is required. This plan maps the way toward a 30 percent reduction in energy intensity by Fiscal Year 2015, primarily through improving the efficiency of the existing physical plant. The key to successful execution is aligning resources to the goals and creating accountability through effective governance. The Air Force Infrastructure Energy Strategic Plan will deliver a positive return on investment and sustain our leadership in energy conservation and alternative energy.



Contents

Introduction 1

Scanning The Environment 4

Strategic Approach 11

Governance 34

Conclusion 37

Appendices

Appendix A: Statutory and Policy Mandates and Drivers A-1

Appendix B: Funding Sources / Programming Avenues B-1

Appendix C: Energy Metrics C-1

Appendix D: Communication Methods with Target Audiences D-1

Appendix E: Roles and Responsibilities E-1

Appendix F: Abbreviations and Acronyms F-1

Appendix G: References G-1



High-efficiency windows in the gym at Barksdale AFB provide natural light while preventing heat transfer, helping to save electricity on both lighting and air conditioning.

Introduction

The Air Force energy strategy is comprehensive and includes the full spectrum of energy activities across all operational and support areas, whether developing new weapons systems and fuel-efficient aircraft engines or responsibly operating bases and flying aircraft. This Infrastructure Energy Strategic Plan is one part of that strategy, with specific activities in infrastructure, including facilities, ground fuels, and ground vehicles and equipment.

Major commands are required to defend the business case and prove the return on investment through life-cycle cost analysis in order to receive energy project funding.

The plan maps the “way ahead” for meeting energy mandates from now until Fiscal Year (FY) 2015 and requires accountability for success. The plan will be updated every three to five years or as conditions warrant, such as major changes to statute, executive order, Department of Defense or Air Force policy, or a national crisis.

Setting the Context

Air Force Mission and Core Values

The mission of the United States Air Force — to fly, fight, and win in Air, Space, and Cyberspace — is both highly technical and energy-intensive. Energy uses of the Air Force include facility energy to power installations around the world, jet fuel for transport aircraft that carry our Airmen to destinations both at home and abroad, and fuel for ground vehicle fleets.

“The strategic goal is to develop an enterprise solution to minimize, transform, and validate Air Force ground transportation and support equipment while continuing fossil fuel reductions and promoting use of sustainable alternative energy sources. Combat-focused, lean, and highly expeditionary vehicle and fuel platforms for now and the future are critical in eliminating our dependency on fossil fuel.”

Major General Gary T. McCoy
The Air Force Logistics Readiness Officer

Rigorously implementing the plan expands our strategic and tactical opportunities to improve the energy portfolio to meet Air Force missions, both today and in the future.

Our core values, Integrity First, Service Before Self, and Excellence in All We Do, set the standard for conduct across the Air Force as well as in our energy program. Integrity embraces the courage to act responsibly to make energy conservation our duty. Service Before Self means there are policies to which we will hold ourselves accountable. Excellence in All We Do directs us to develop a sustained passion for continuous improvement and innovation that will propel us to accomplish our energy goals today and tomorrow. We have inherited a history of excellence and courage that we must live up to, become part of, and pass on.

Air Force Energy Vision

Our Air Force vision is to reduce demand through conservation and efficiency; increase supply through alternative energy sources; and create a culture where all Airmen make energy a consideration in everything we do. Implementing this Infrastructure Energy Strategic Plan will achieve presidential goals within congressional law and guidelines. In pursuit of this vision, we will continue to be a federal energy leader by advancing energy independence through coordinated efforts aimed at minimizing energy costs and leveraging technology in conservation measures and renewable energy development, while matching system reliability and

Nellis AFB is home to one of the largest photovoltaic systems in the Americas. It supplies the base with over 30 million kilowatt-hours of electricity per year, more than 25% of the base's total power needs.



critical asset security with Air Force mission requirements. These efforts effectively reduce dependence on commercial supply and delivery systems and enhance energy security for the Air Force. The Air Force is committed to reducing its greenhouse gas emissions and carbon footprint through the reduced use of fossil fuels consumed directly through vehicles and facilities or indirectly through the consumption of fossil fuel-generated electricity from the national electrical grids.

What the Plan Delivers and Why

This infrastructure energy strategy suggests we invest almost \$1.7 billion in facility and vehicle conservation measures through FY 2015 to meet a 30-percent energy intensity reduction (measured in millions of British thermal units per square foot, or MBTU/SF), a 16-percent water conservation goal (in gallons/SF), and a vehicle fleet that is right-sized and efficient to operate. Investing \$185 million in flex-fueled, hybrid, and low speed vehicles and rightsizing the vehicle fleet increases our ability to reduce fossil fuel consumption and maximize alternative and renewable energy sources to meet — and exceed — our mandates. Facility investments of \$1.5 billion provide an opportunity for a \$2.2 billion return through FY 2015, or about \$1.50 returned for every \$1.00 invested. These investments focus on controlling cost growth through efficiency and conservation to mitigate the effect of rising unit costs. Energy costs have outpaced the rate of reduced consumption. For example, from September 11th, 2001 through 2007, the Air Force reduced overall energy consumption by 11 percent, but utilities costs rose by 49 percent (\$10.02/MBTU to \$14.90/MBTU). This plan will ensure that we narrow the gap between rising costs and predictable future budgets.

“Our goal is to reduce the portion of the Air Force budget used for installation support by 20 percent and reduce the size of the Air Force physical plant by 20 percent, by the year 2020. Collectively, our transformation efforts will enhance support for the warfighter, reduce the cost of installation engineering activities, and free resources for the recapitalization of Air Force weapons systems.”

Major General Del Eulberg
The Air Force Civil Engineer

Scanning The Environment

The environment in which the Air Force operates shapes its infrastructure energy program. This environment is defined by both internal and external factors. Internal factors include the Air Force's policies and transformation initiatives, consumption and acquisition profiles, and energy security requirements. External factors, such as policies and statutes, technological changes, and economic realities, are not only key to understanding our operational environment, but can also affect the Air Force's internal programs, policies, and initiatives. A brief review follows of some of the internal and external factors that shape our operational environment and energy program.

Policies and Statutes

The energy goals continue to evolve as federal mandates and Department of the Air Force programs mature. We will also adjust our strategic plan as DoD finalizes the overarching energy strategy for the military departments. An overview of current mandates is provided in Appendix A. Here is a list of the major statutory and policy drivers.

- ◆ Energy Policy Act (EPAct) of 2005
- ◆ National Defense Authorization Acts (NDAA) of 2007 and 2008
- ◆ Executive Order (EO) 13221, Energy Efficient Standby Power Devices (2 Aug 01)
- ◆ EO 13423, Strengthening Federal Environmental, Energy, and Transportation Management (24 Jan 07)
- ◆ Energy Independence and Security Act (EISA) of 2007

Energy Security

Privately and publicly operated commercial distribution systems like the national electric grids and commercial fuel pipeline systems have always been vulnerable to a loss of service from natural disasters, aging infrastructure, human error, or a physical or cyber attack from inside or outside the system. Short-term outages (minutes or hours) of these systems have well-exercised workarounds or methods for risk mitigation. However, the potential for long-term outages (i.e., months of loss of service) exists, and consequence management during a long-term outage is not well understood and certainly not exercised at our installations in a meaningful way.

At some key combatant command installations, homeland defense mission execution is critically dependent upon uninterrupted commercial power and fuel distribution systems.

Risk to critical missions at installations is a site-specific problem that is being studied within the Air Force in concert with DoD, the Department of Homeland Security (DHS), and the Department of Energy (DOE), but the different parts of the problem are not yet integrated into a comprehensive “get well” plan. We can reduce some of this mission risk through conservation and expanded site-generated renewable energy. A number of steps are required to ensure more resilient electrical and logistics fuel systems support at Air Force installations: Energy must be included in Air Force Critical Infrastructure Program plans, studied during Vulnerability Assessments, exercised during base response activities, and, ultimately, incorporated into full-spectrum operational planning to fully observe and consider the potential deleterious affects.

The actors and owners of commercial distribution systems operate outside of the Air Force sphere of influence, which impacts our direct ability to influence in a manner that eliminates our risks. As such, the focus of the Air Force Infrastructure Energy Strategic Plan is areas of energy management where we directly establish the priorities, control the actions, and benefit from the outcomes. When a federally coordinated or DoD energy security comprehensive plan becomes policy, we will incorporate the goals and objectives into this strategy.

Consumption and Costs

The Air Force builds on a history of past success, having met every federal mandate related to facility energy use since 1975. Most recently the Air Force reduced its facility energy intensity by over 30 percent in a 20-year period ending in 2005, surpassing 1999’s E.O. 13123, Greening the Government through Efficient Energy Management, requirement. However, it will be harder to achieve the current 30 percent reduction goal from 2005-2015, so we need to get more aggressive. When new mandates are considered with previous mandates, the result attained will be an over 60 percent reduction in facility energy intensity from 1975 to 2015.



Two wind turbines at F.E. Warren AFB provide about 10% of the base's electricity. In FY06, that equated to a savings of more than \$150,000.

FY2007 Consumption and Costs

Infrastructure energy is only a portion of the overall Air Force energy consumption (Figure 1). Aviation fuel use, which comprises 81 percent of the Air Force's energy budget, is aggressively being addressed in the comprehensive strategic approach. Infrastructure energy accounts for another 19 percent of consumption: facilities represent 15 percent and ground fuels 4 percent.

Total energy cost = \$7 billion

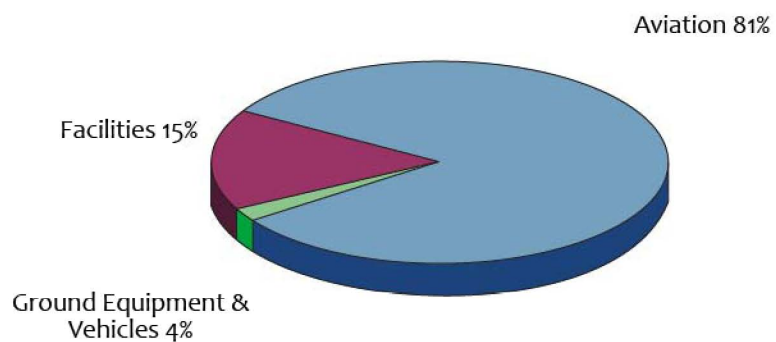


Figure 1. Air Force energy consumption

In FY 2007, the vehicle fleet had a 0.04 percent reduction in fossil fuel consumption in comparison to FY 2006, which did not meet the EO 13423 mandate to reduce vehicular petroleum consumption by 2 percent a year through FY 2015. The Air Force also did not meet the goal of increasing alternative fuel consumption by 10 percent due to significant decreases in reported B20 (biodiesel) consumption. Reported B20 consumption was lower due to the EPA-mandated conversion from low-sulfur diesel (LSD) fuel to ultra-low sulfur diesel (ULSD) fuel throughout the Air Force. As bases converted from LSD to ULSD, B20 tracking had to be reestablished for accounting purposes. Vehicle fleet consumption of 85-percent ethanol fuel (E85) did increase by 61 percent in comparison to the FY05 baseline; E85 consumption is expected to continue to increase because of ongoing efforts to identify off-base availability.

For the past five years, the Air Force has exceeded its EPCa 2005 requirements for alternative fuel vehicle (AFV) acquisitions. As a result of its aggressive AFV acquisition policy and biodiesel fuel use, the Air Force in FY 2007 earned AFV acquisition credits amounting to 119 percent of its EPCa-reportable vehicle acquisitions, which is 44 percent higher than the 75 percent AFV acquisition requirement.

Within facilities, electricity is expensive: It accounts for 48 percent of total facility energy used, but disproportionately represents more than 66 percent of utility cost (Figure 2). By comparison, natural gas represents 33.7 percent of consumption, but only 19 percent of cost. The remainder of facility energy comprises fuel oil, coal, steam, hot water, and miscellaneous energy types. These consumption and cost charts indicate that different strategies will be necessary within facility operations to achieve the energy reduction and cost savings goals.

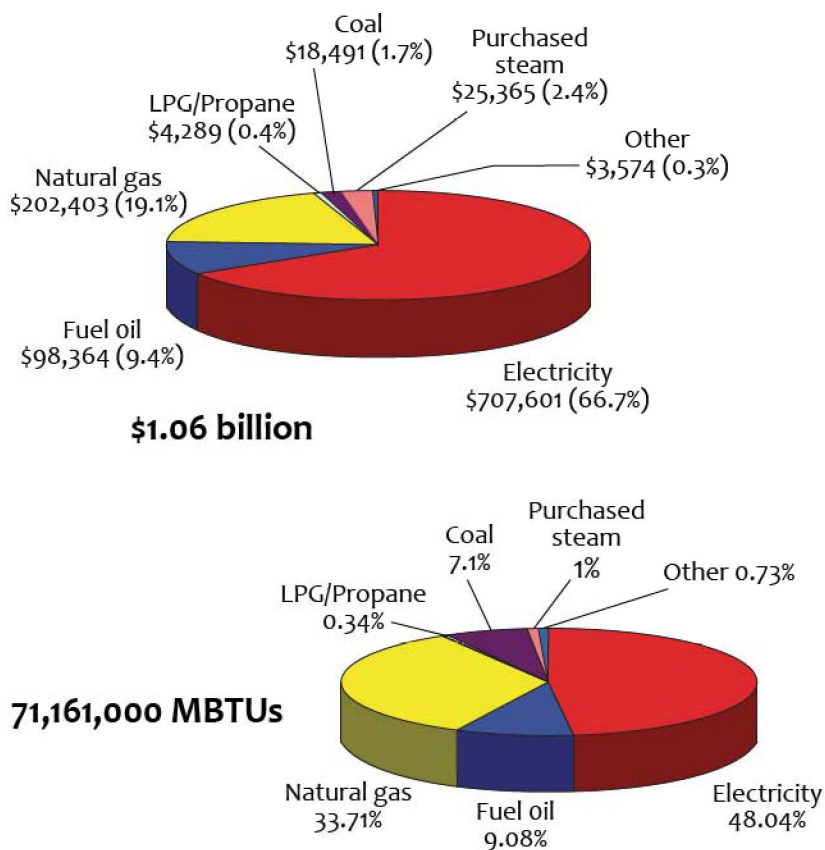


Figure 2. Facility energy costs (top, in 1000s) and usage (bottom). Source: FY07 Annual Energy Management Report to Congress.

In contrast, the percentages for ground fuel use and ground fuel costs were approximately equal (Figure 3). For example, in 2007, for ground vehicles, diesel accounted for 61 percent of total fuels used and almost 60 percent of the total costs for fuel. Ratios of consumption to cost were similar for other fuel types: unleaded gasoline, compressed natural gas, biodiesel, and E-85.

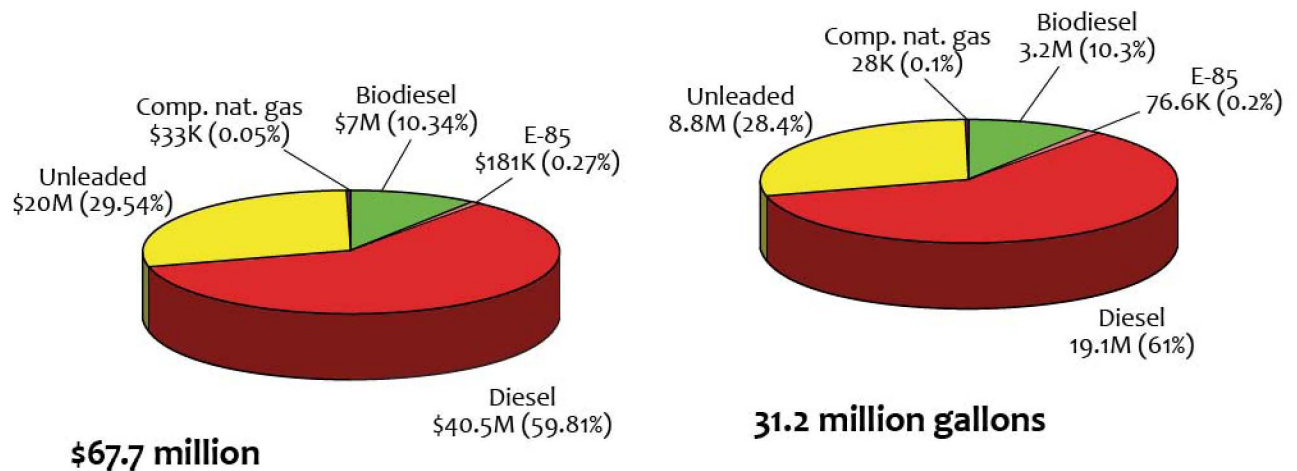


Figure 3. Air Force ground fuel costs (left) and usage (right). Source: Air Force Total Operating Cost (AFTOC)

Consumption and Cost Trends

From FY 2002 to FY 2007 annual utility costs have risen by 35 percent despite an 11 percent reduction in total consumption (Figure 4). This has occurred as a result of a 49-percent increase in the average unit price of energy.

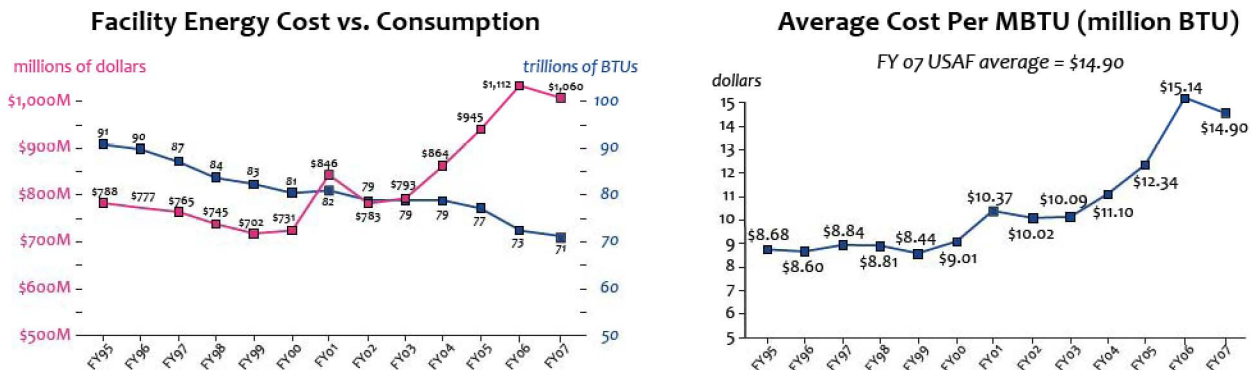
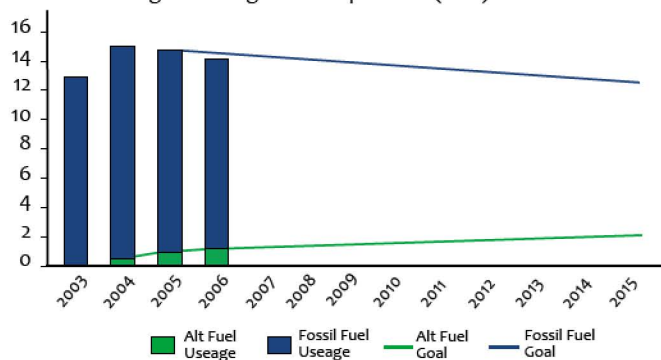


Figure 4. Utility costs

Fuel costs have also dramatically increased since FY 2003 (Figure 5). Since this time, total Air Force ground fuel cost has increased 173 percent despite a 9 percent decrease in total ground fuel consumption over the same period. Both figures demonstrate the effect Hurricane Katrina had on prices in 2006.

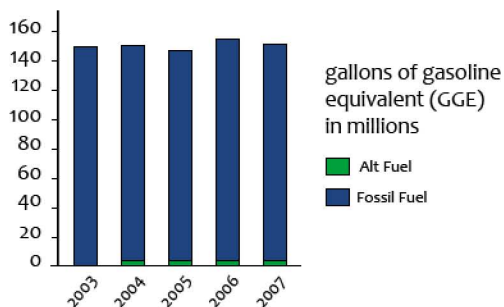
EPAct-Reportable Ground Fuel Consumption

gallons of gasoline equivalent (GGE) in millions

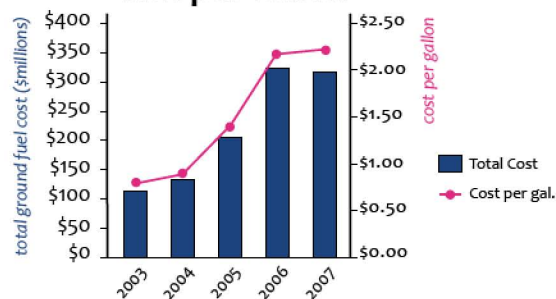


Total Fuel Consumption

gallons of gasoline equivalent (GGE) in millions



Ground Fuel Cost & Cost per Gallon



Economic Pressure

The financial resources available to the Air Force in the next two decades will be considerably less than those of past decades. The pressures of maintaining a high readiness posture during budget and force reductions make further conservation of energy a necessity. Furthermore, escalating unit commodity costs represent a risk to Air Force missions by diverting resources from other mission areas. The Air Force fuel bill (including aviation) exceeds \$10M per day and every \$10/barrel increase drives up

Figure 5. Air Force ground fuel costs and consumption

costs \$600M per year. Our challenge is to use the available funding wisely to support initiatives that both improve energy efficiency and reduce consumption.

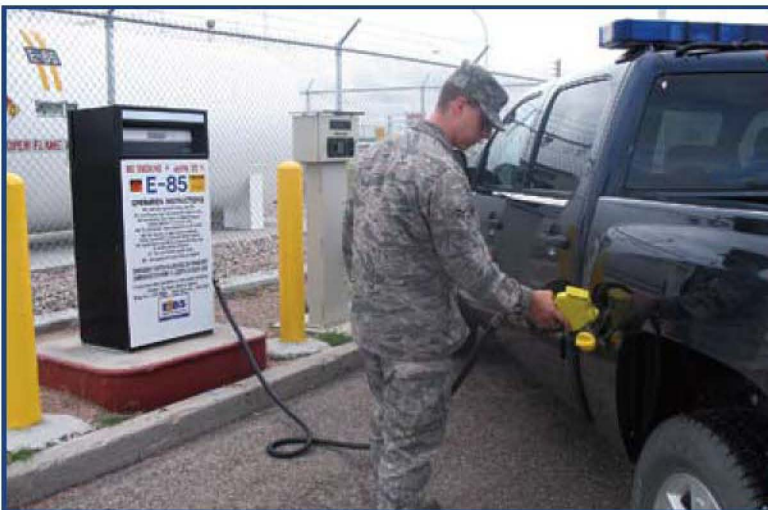
Technological Change

As technology changes, new opportunities to save energy and energy costs are created. Ethanol, biodiesel, hydrogen fuel cells, plasma waste-to-energy systems, and lithium-ion batteries are some of the technologies starting to evolve in the open market that will transform our vehicles, equipment, and facilities. The market price of these and other alternative and renewable energy technologies, such as solar photovoltaic, wind, and geothermal, will continue to drop. The Air Force will aggressively seek ways to use new and improved technologies to meet its strategic energy goals, while reducing its carbon footprint and our vulnerabilities to commercial sources of supply.

Renewable Energy and Market Forces

Opportunities to develop renewable and alternative energy in any given locale are driven by four primary factors:

- ◆ Availability of renewable resources
- ◆ Utility and commodity cost
- ◆ Federal, state and local tax incentives, rebates, and mandates
- ◆ Deployment and sustainability



Capitalizing on development opportunities will require leadership, partnering with industry, and a cogent strategic approach. Commercialization and adoption of alternative energy and infrastructure in transportation and facilities is essential to transformation in a global market. However, as the Air Force transforms, we must ensure that our requirements for global reach capability (i.e., deployment and sustainability) are also met.

The Air Force is committed to reducing the use of fossil fuels by shifting to renewable fuels such as E-85.

Asset Management Transformation

The Air Force is undergoing a fundamental transformation in installation management under a concept called “Asset Management.” Asset Management is the use of systematic and integrated practices through which the Air Force optimally manages its natural and built assets and the associated performances, risks, and expenditures over the life cycle to a level of service to support missions and organizational goals. In essence, it is a structured, standardized approach that strives to make better-informed management decisions through business case analysis of risk, cost, and benefits. Energy management is leading the way in this transformation through a structured approach to understanding life-cycle cost.

Strategic Approach

Overview

The broad objectives of the Air Force energy program are to increase supply, reduce demand, and increase awareness. Meeting these objectives requires defining and meeting more specific objectives — goals generated from federal mandates, from Air Force initiatives and requirements, and from the need to save money and resources. Some of the more important goals are listed below; an expanded summary of the goals is further provided in Appendix A.

- ◆ Reduce infrastructure costs by 20 percent by 2020
- ◆ Reduce facility energy intensity by 3 percent per annum through 2015
- ◆ Reduce base water use by 2 percent per annum through 2015
- ◆ Increase use of renewable energy at annual targets (3%, 5%, 7.5%, 25%) through 2025
- ◆ Reduce ground vehicle fuel use by 2 percent per annum through 2015
- ◆ Increase alternative fuel use by 10 percent per annum through 2015

Meeting these goals requires a strategy that combines many diversified elements — leadership, program development, investment, technology, supply, demand, and individual efforts — into a cohesive plan that ensures the Air Force remains a leader in energy management. It requires recognizing or creating opportunities to conserve energy and being prepared to exploit them.



Even something as simple as switching to compact fluorescent light bulbs can save a surprising amount of energy — and money.

The Strategy

The Air Force Infrastructure Energy Strategy comprises four “Pillars” supported by key enablers and a foundation of transformational concepts (Figure 6).

- ◆ Pillar 1 – Improve Current Infrastructure
- ◆ Pillar 2 – Improve Future Infrastructure
- ◆ Pillar 3 – Expand Renewables
- ◆ Pillar 4 – Manage Cost

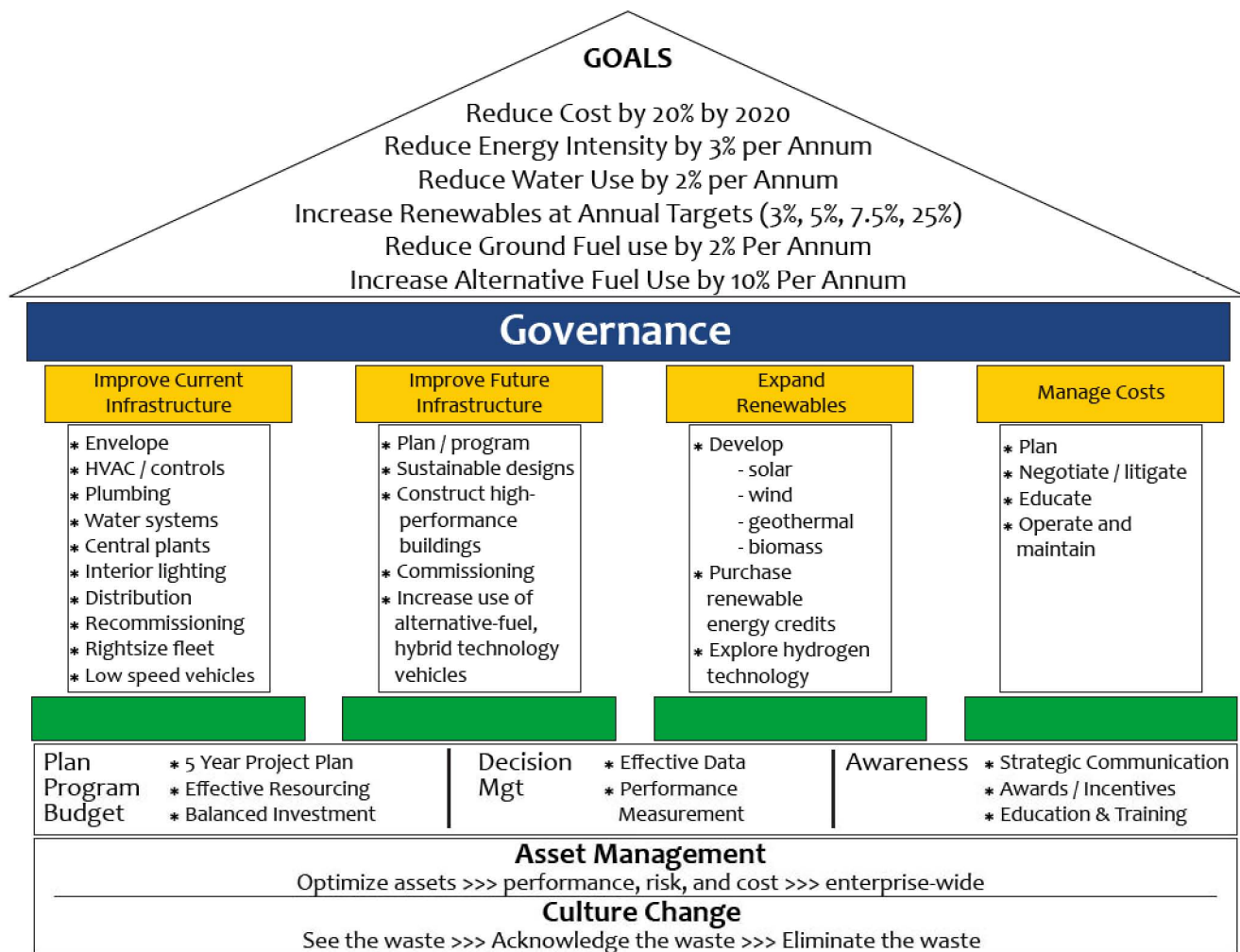


Figure 6. The pillars of the infrastructure energy strategic plan

These four Strategic Pillars provide specific “levers” that identify opportunities for reducing energy intensity, expanding renewable energy usage, and controlling costs. For example, returning building mechanical systems to optimal operating conditions through a program of recommissioning or “tuning up” is a specific action or lever that improves the energy performance of our existing physical plant. Rightsizing the vehicle fleet improves efficiency by adding more cost-effective and energy-saving assets to the inventory. Eliminating vehicle authorizations built on justifications that are no longer applicable saves energy and vehicle infrastructure. These are all examples of levers — specific actions that create positive change with verifiable results.

Supporting these pillars are enablers: Planning, Programming, and Budgeting; Decision Management; and Energy Awareness. These enablers are the keys to the organizational transformation that will enable us to reach or exceed our energy goals. The Pillars and Enablers sit atop a foundation of Asset Management and cultural change — concepts which are central to the Air Force’s installation management transformation. The business processes embodied in Asset Management maximize the value and utility of natural and built infrastructure, supporting the Air Force’s ability to deliver sovereign options anywhere anytime. Together, the Pillars and Enablers form a conceptual framework for identifying specific initiatives and grouping related activities. They also provide a means for synchronizing planning and execution throughout the Air Force at all organizational levels. Overseeing the energy program is a governance structure that includes Energy Management Steering Groups at base, MAJCOM and Headquarters Air Force levels (See Governance, p. 34).

This strategic plan is built upon a framework of specific objectives with estimated completion dates (ECDs), offices of primary responsibility (OPRs), and in some cases, offices of collateral responsibility (OCRs). In many

Model Energy Base Initiative

To further synchronize efforts, the Air Force established the Model Energy Base Initiative (MEBI). The MEBI was introduced during the March 2007 Energy Forum, an event hosted by the Air Force to advance partnerships with industry and other federal agencies on alternative energy and conservation in infrastructure, vehicles, and aircraft. The MEBI will initially focus on energy projects at Barksdale AFB in Louisiana, and McGuire AFB in New Jersey, allowing us to “test drive” our strategic approach, develop scalable solutions, energize cultural change, and promote successes across all Air Force operations.

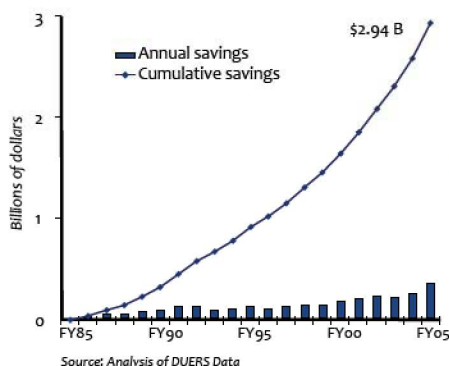


Figure 7. Twenty years of cost avoidance

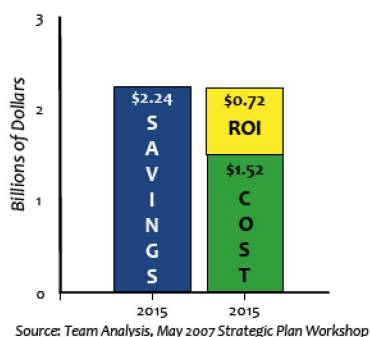


Figure 8. Return on investment in energy initiatives

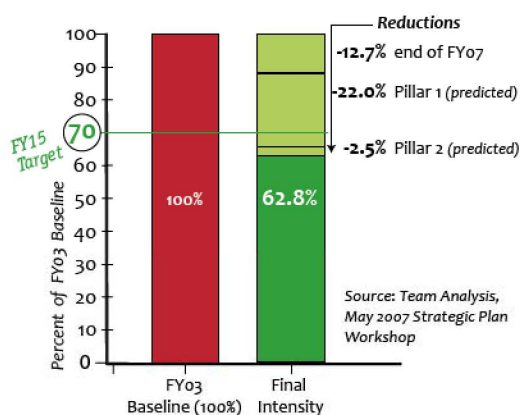


Figure 9. How the plan's pillars help achieve the Air Force's energy goals

cases, our energy objectives are linked to specific Civil Engineer Strategic Plan objectives; these are noted where applicable (e.g., CE Strat Plan 3.1J; 3.6A, etc.). The objectives are listed in this document under the element they address: Pillars, Enablers, and Governance.

Opportunity Assessment

Understanding our conservation and renewable energy development opportunities frames the discussion for investment. Over the 20-year period ending in FY 2005, the Air Force avoided over \$2.9 billion in utility costs as a direct result of facility energy conservation measures (Figure 7). The projected opportunity to avoid an additional \$2.2 billion in gross utility costs (Figure 8) in the period 2005 to 2015 underscores the strong business case behind energy efficiency as a means to address broader economic pressures. Facility energy conservation investments of \$1.5 billion provide an opportunity for a \$2.2 billion cost avoidance through year 2015 with a \$0.72 billion return on investment. A portfolio approach to energy management will ensure that the Air Force meets all federal infrastructure energy mandates.

Energy Intensity Reduction Opportunity Assessment: Energy intensity is a measure of how efficiently we use energy. From the 2003 baseline established by the EAct, the Air Force reduced facility energy intensity by 12.7 percent by the end of FY 2007, putting us well on our way to meeting the EISA goal of 30 percent by 2015 (Figure 9). The majority (22 percent) of the energy intensity reductions leading to the 30-percent goal will come from efficiency improvements to existing Air Force infrastructure — Pillar 1. These reductions will actually help the Air Force exceed the mandated goal.

The opportunity to reduce energy intensity through new construction — Pillar 2 — is more limited, constrained by the very slow infrastructure recapitalization rates (over 100 years) which result from undersized MILCON and O&M restoration and modernization budgets. However, there is a \$250 million per year energy project initiative in the FY 2010-15 POM. Major Commands (MAJCOMs) and installations will be tasked to provide viable, executable projects each year to ensure the best investment opportunities are identified. Projects must have detailed programming documentation (DD Form 1391s), Building Life Cycle Cost (BLCC) data with a Savings-to-Investment Ratio (SIR) greater than 1.2, a simple payback of less than 10 years, and show significant energy or water reduction in order to be considered valid.

Between FY 2008 and FY 2015, the number of new high performance buildings projected (through the MILCON and BRAC appropriations) is approximately three to four percent of our physical plant (700 million square feet). There must be a sequential removal of five to 10 percent of our worst energy-performing infrastructure through optimal space utilization and demolition.

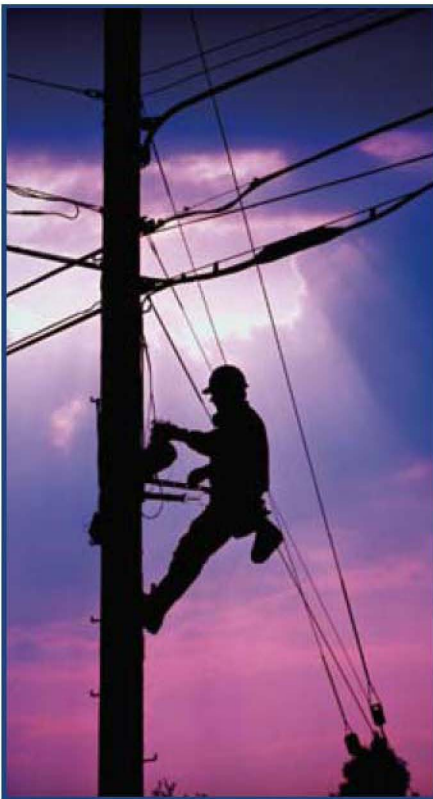
Building new facilities that include durable, low maintenance, sustainable products with high efficiency heating, cooling, and ventilation equipment will identify best practices and point the way forward for upgrades to existing infrastructure. The good news is that, when properly resourced and given the proper leadership emphasis, there are abundant opportunities to achieve these results.

Renewable Energy Opportunity Assessment: The Air Force is the largest federal purchaser of renewable energy in the United States. Annually we acquire nine to 11 percent of our total electrical power through the purchase of renewable energy credits (RECs) — certificates that attest to the renewable origin of the power source. In the coming years, we will focus on developing additional renewable energy on Air Force installations. Current projections indicate the Air Force will be able to meet up to 11 percent of its future energy needs through focused development of on-base renewable power that is cost-competitive. The renewable energy market will continue to be constrained for the foreseeable future not only by the limited local availability of renewable resources, but by prevailing utility commodity costs and the availability of economic incentives, such as federal, state, and local tax incentives and rebates.

Pillar 1 – Improve Current Infrastructure

This pillar focuses on increasing energy efficiency in our current facilities, vehicles, and equipment as well as actively conserving water through a variety of specific actions such as improving building envelope thermal resistance; installing energy-efficient lighting; recommissioning (tuning up) building systems; maximizing space utilization; rightsizing the vehicle fleet; and replacing inefficient system components with high-efficiency ones. In Air Force energy management, these actions are basic and common to all installations.

- Objective 1.1:** Meet or exceed mandated annual and FY 2015 energy and water intensity reduction goals for current infrastructure. (ECD: Annually / OPR: MAJCOM A4s and A7s / CE Strat Plan 3.6)
- Objective 1.2:** Develop a validation mechanism through major renovation and MILCON programs to ensure 15 percent of existing building inventory will meet or exceed the Federal High Performance Building Memorandum of Understanding (MOU) for energy efficient sustainable buildings by FY 2015. (ECD: Mar 2009 / OPR: AFCEE and AFCESA / OCR: MAJCOM A7s / CE Strat Plan 3.6)
- Objective 1.3:** Develop a policy and a mechanism for life-cycle cost considerations for purchases of bench stock consumables and replacement parts that relate to water and energy consumption. (ECD: Dec 2008 / OPR: AFCESA/CENF / CE Strat Plan 3.1I, 3.6C-D)
- Objective 1.4:** Develop installation-level consolidation and demolition plans that include resource requirements, utility savings, and financial savings analyses that target facilities with poor energy performance. (ECD: Dec 2008 / OPR: MAJCOM A7s, Installations / OCR: AF/A7CA / CE Strat Plan 3.3A-D; 3.6D)
- Objective 1.5:** Increase use of water meters by issuing a water meter specification and policy. At a minimum meters should be installed at facilities where usage is estimated to be 100,000 gals/yr or greater. (ECD: Dec 2008 / OPR: AFCESA / OCR: AFCEE / CE Strat Plan 3.6D)
- Objective 1.6:** Publicize the effectiveness and expand the use of water distribution system leak detection and repair. Provide a statement-of-work template to implement similar projects. (ECD: Dec 2008 / OPR: AFCESA / OCR: AFCEE / CE Strat Plan 3.6D)



Properly maintaining existing infrastructure ensures that energy isn't wasted through system losses.

- Objective 1.7:** Develop a program to rightsize the fleet through a series of 30 installation vehicle validation visits while creating a new baseline for each functional community to follow as a model for requirements. (ECD: FY 2009 / OPR: VEMSO or AFVESA)
- Objective 1.8:** Convert 30 percent of the light-duty vehicle fleet authorizations to low-speed vehicles (LSVs). (ECD: FY 2012 / OPR: VEMSO and MAJCOMs)
- Objective 1.9:** Purchase 100 percent of light-duty alternative or flex-fuel vehicle acquisitions where commercially available. *(Note: This is 25 percent above the mandated requirement in EAct 2005.)* (ECD: Annually / OPR: VEMSO/WR-ALC)
- Objective 1.10:** Reduce overall fossil fuel consumption in vehicles by 2 percent annually (2005 baseline) until 2015, and steadily increase the overall fleet average miles per gallon (MPG). (ECD: Annually / OPR: MAJCOMs / OCR: A4RE)
- Objective 1.11:** Catalog LSVs available on the market for replacing vehicles above the light-duty category of 8,500 lbs and over. Consider viability of LSVs in 5 passenger pickup truck, telephone maintenance utility trucks, and multi-stop maintenance vans. (ECD: FY 2009 / OPR: VEMSO and MAJCOMs/Installations)
- Objective 1.12:** Continue testing hydrogen vehicles and infrastructure at Selfridge ANGB, Mich., Robins AFB, Ga., and Hickam AFB, Hawaii, and report results in Dec 2010. (ECD: FY 2009 / OPR: APTO, Installations)

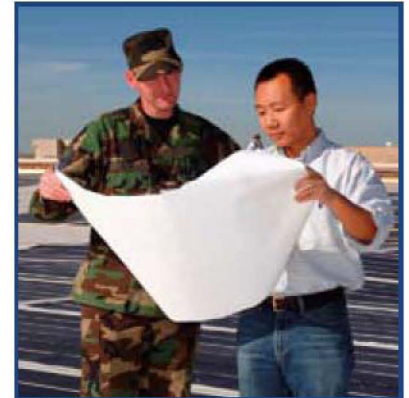
Pillar 2 – Improve Future Infrastructure

This pillar focuses on improving processes and applying sustainable energy-efficiency standards to accelerate the delivery of high-performance buildings, alternative-fuel vehicles, and supporting infrastructure into the Air Force inventory. The facilities initiative centers on planning, programming, design, construction, and commissioning new and renovated facilities through MILCON and Operations and Maintenance appropriations.

The vehicles and ground fuels initiatives focus on recapitalization of the fleet and sustaining the most cost-effective vehicles while using hybrid technology and E85 (85 percent ethanol), B20 (20 percent biomass), solar, electric, and hydrogen fuel sources. We will link enhanced standards with best practices to secure future operational results.

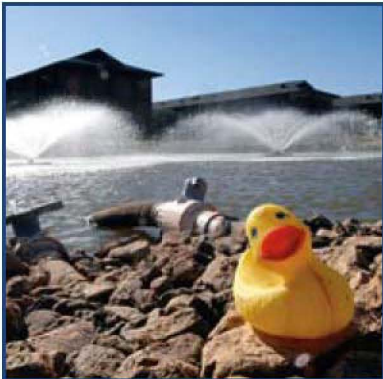
- Objective 2.1:** Meet or exceed mandated annual and FY 2015 energy and water intensity reduction goals for future infrastructure. (ECD: Annually / OPR: MAJCOM A4s and A7s / CE Strat Plan 3.5C, 3.6)
- Objective 2.2:** For all major renovation and MILCON projects, eliminate roadblocks in the planning/programming/design/construction/ commissioning processes that inhibit delivery of high-performance and sustainable buildings. (ECD: Continuous improvement process / OPR: AFCEE / CE Strat Plan 3.1G, 3.5C, 3.6)
- Objective 2.3:** Starting with the FY 2009 MILCON program, maximize Leadership in Energy and Environmental Design (LEED) project points through meeting criteria established by LEED, the Federal High Performance Building MOU, and other applicable federal building efficiency mandates. Ensure that 1) 100 percent of new construction is capable of achieving LEED Silver certification; 2) 5 percent of the program is certified LEED Silver; and 3) 10 percent is certified LEED Silver in FY 2010 and thereafter. (ECD: 30 Sep 2009 and annually thereafter / OPR: AFCEE / OCRs: AFCEA, MAJCOM A7s, A7CP / CE Strat Plan 3.1G, 3.5C, 3.6)
- Objective 2.4:** Develop metrics and measurement capabilities to track execution and energy performance of facilities constructed through the major renovation and MILCON programs. (ECD: Mar 2009 / OPR: AFCEE and AFCEA / CE Strat Plan 3.5C, 3.6)

- Objective 2.5:** Create a baseline inventory of buildings that currently meet or exceed the Federal High Performance Building MOU for use in identifying the gap for investment toward meeting the 15 percent target in FY 2015 (EO 13423, Section 2). (ECD: Sep 2010 / OPR: AFCEE and AFCEA / OCR: A7CP, A7CI / CE Strat Plan 3.6)
- Objective 2.6:** Procure/construct/sustain alternate fuel stations and vehicles while modernizing the fleet by converting 30 percent of it to low-speed vehicles. (ECD: FY 2012 / OPR: A4RE / OCR: DESC, A7C)
- Objective 2.7:** Reduce overall fuel consumption by 2 percent annually and increase the fleet's average MPG performance. (ECD: Annually / OPR: VEMSO, AFVESA)
- Objective 2.8:** Continue developing a program to rightsize the fleet through a series of 30 vehicle validation reviews while creating a baseline for each functional community to follow as a model for requirements. (ECD: FY 2009 / OPR: VEMSO, AFVESA)
- Objective 2.9:** Install at least 1 renewable fuel pump at each federal fleet refueling center at each installation that issues more than 100 thousand gallons of ground fuel annually. (ECD: Jan 2010 / OPR: DESC, AFPA, Installations)
- Objective 2.10:** Continue testing hydrogen vehicles and infrastructure at Selfridge ANGB, Mich., Robins AFB, Ga., and Hickam AFB, Hawaii. Expand testing of hydrogen vehicles at McGuire AFB, N.J. (an MEBI base) beginning in FY 2009. (ECD: FY 2009 / OPR: APT0, Installations)
- Objective 2.11:** Procure/construct/sustain alternate fuel stations and vehicles while continuing to modernize the fleet by fielding 30 percent of the light-duty fleet as LSVs. (ECD: FY 2012 / OPR: VEMSO, AFVESA, WR-ALC / OCR: A7C)
- Objective 2.12:** Catalog LSVs available on the market for replacing vehicles above the light-duty category of 8,500 lbs and over. Consider the viability of LSVs in five-passenger



Top: The BX roof at Luke AFB was retrofitted with solar technology that can generate up to 370 kilowatts.

Bottom: At Lackland AFB, Global Electric Motorcars help conserve fuel. The GEM seats four people and can travel at 25 mph.



Top: Dyess AFB uses an effluent pond as a cooling tower for the base ice plant, which provides cooling for 14 buildings.



Bottom: Robins AFB tested fuel cell technology for generating electricity to meet a portion of the base's power needs.

pickup trucks, telephone maintenance/utility trucks, and multi-stop maintenance vans. (ECD: FY 2009 / OPR: WR-ALC, VEMSO, AFVESA, and MAJCOMs/Installations)

Pillar 3 – Expand Renewables

This pillar promotes the development of renewable and alternative energy for use in facilities and ground vehicles and equipment. Examples of renewable and alternative energy include solar, wind, biomass, and geothermal for use in facilities and biofuel, hydrogen, and solar-charging for use in vehicles. Renewable electrical energy is purchased directly from the local utility provider in its generation mix, through RECs (most common), or through direct purchase. At times it is generated on base through either government-owned or third-party-financed or -owned capacity. For the Air Force, on-base generation is the preferred approach, to increase supply security and decrease stress on the national electrical grid.

Today, the Air Force is engaged with DoD and DoE to define, develop, and implement net-zero energy installations — bases that produce more energy (on-site from renewable sources) than they consume. DoD is establishing goals for on-base generated renewable energy to be 25 percent of base consumption in the year 2025 and for “islanding” bases and nearby communities from the national energy supply through plans to generate in excess of 100 percent of base requirements with renewable energy.

- Objective 3.1:** Meet all federal renewable energy mandates. (ECD: See specific goal / OPR: MAJCOMs / OCR: A4R, A7C / CE Strat Plan 3.6E)
- Objective 3.2:** Construct on-base renewable energy production to achieve one percent of Air Force consumption by FY 2012 and three percent by FY 2015. (ECD: FY 2012 and FY 2015 / OPR: AFCEA / OCR: AFCEE, MAJCOM A7s, and A7CA / CE Strat Plan 3.1A, C; 3.6E)
- Objective 3.3:** Identify renewable energy project candidates for feasibility studies at all Air Force bases. Recommended course of action is by contract. (ECD: Jan 2009 / OPR: AFCEA / OCR: MAJCOM A7s / CE Strat Plan 3.1M, 3.6E)

- Objective 3.4:** Complete reviews of hydrogen testing and deploy in vehicles and fuel infrastructure where cost-effective.
(ECD: FY 2009 / OPR: APTO / OCR: A4R)

Pillar 4 – Manage Cost

This pillar focuses on methods to significantly reduce or stabilize utility cost through favorable terms, service, and rates. Purchased utilities include electricity, natural gas, fuel oil, liquid propane, coal, steam, and hot water. Water and sanitary sewer are two additional non-energy utility categories that are managed under this pillar. Utility bills must be examined across all cost components, including commodity purchases, fees, demand charges, and late payments. Capturing this opportunity requires additional resources, removal of roadblocks, a robust review process, and data transparency. The key actions in this pillar include cost planning, negotiation and litigation of utility rates, accounting management, prompt bill paying, and cost-avoidance education.

- Objective 4.1:** Identify installations that paid late fees and determine root causes. Present findings and course of action to Provide Infrastructure Working Group (PIWG) (See Governance section on p. 34). (ECD: Dec 2008 / OPR: MAJCOM A7s / OCR: AFCESA / CE Strat Plan 3.7A)
- Objective 4.2:** Perform utility acquisition evaluations at 10 Air Force bases annually by contract to determine the best rate schedule and most favorable contract terms.
(ECD: Annually / OPR: AFCESA / CE Strat Plan 3.3B)
- Objective 4.3:** Develop and implement a utility contract training program for contracting and engineering personnel. (ECD: FY 2009 / OPR: AFCESA / OCR: MAJCOMs)
- Objective 4.4:** Develop a plan to update policies and guidance to reflect changes in energy markets and requirements.
(ECD: Jan 2009 / OPR: AFCESA / CE Strat Plan 3.6F)
- Objective 4.5:** Evaluate on-base utility system inefficiencies from distribution losses and quality issues (e.g., power factor, harmonics, water quality, etc.) and determine corrective actions. (ECD: Annually / OPR: Installations and MAJCOM A7s / CE Strat Plan 3.6C-D)



An Energy Management Control System (EMCS) technician at Tyndall AFB configures a Direct Digital Control (DDC) panel to communicate with the EMCS central server. EMCS operators monitor and control building HVAC systems from the server front end.

Objective 4.6: Partner with DoE to advertise current rebates, incentives, and credits for utilities and renewable energy to maximize their use on Air Force bases. (ECD: Dec 2009 / OPR: AFCESA, VEMSO, AFVESA / CE Strat Plan 3.6E)

Objective 4.7: Centralize purchasing of natural gas based on buying recommendation performed at AFCESA or by contract to purchase natural gas on a hedging basis. (ECD: Sep 2008 / OPR: AFCESA, MAJCOM A7s / CE Strat Plan 3.1J, 3.6F)

Enablers

The Energy Strategy Pillars are supported by three enablers, which sit atop the foundational concepts of Asset Management and cultural change: Planning, Programming, and Budgeting; Decision Management; and Energy Awareness.

Planning, Programming and Budgeting

A fully supported program is the result of requirements identification, programming, and effective resource advocacy. Planning, Programming, and Budgeting (PPB) is the process for identifying requirements and resources required to meet or exceed our energy mandates and optimize available sources of funds. Facility energy requirements are identified at base level through energy audits, as prescribed by EISA 2007 (Sec 432).

The Air Force Civil Engineer has adopted the DoE-developed Building Life Cycle Cost (BLCC) software as our standard tool for financial analysis and prioritization based on return on investment. The BLCC software has historically been used to produce simple payback calculations for the Energy Conservation Investment Program, but we will expand its use for prioritization of projects for Air Force direct investment. All projects should be entered into the Automated Civil Engineer System's Project Management (ACES-PM) module using the energy project categories established in 2008. The PIWG (see Governance section on p. 34) is the primary forum for requirements advocacy and provides oversight of the business case for investment through the Air Force Corporate Structure, the Energy Senior Focus Group, and the Air Force Smart Operations for the Twenty-First Century (AFS021) Process Council.

To optimize return on investment and program outcomes, our financial portfolio will include requirements identification, self-investment through Air Force appropriations (public sector) and third-party (private sector) financing. Manpower requirements must be clearly articulated at all functional levels to ensure energy risk is properly valued and energy becomes a managed asset.

Requirements Identification: We will establish requirements through energy and water audits and infrastructure assessments.

Objective PPB 1: Establish Air Force comprehensive energy and water audit program policy and guidelines to address all Pillars of the strategy and meet the EISA 2007 requirement to audit 25 percent of installation “covered” facilities. (ECD: Mar 2009 / OPR: AFCESA / OCR: MAJCOM A7s / CE Strat Plan 3.5, 3.6C-E)

Objective PPB 2: Develop, schedule, and identify required resources to execute energy and water audits (EISA Sec 432). (ECD: Mar 2009 / OPR: MAJCOM A7s / OCR: Installations / CE Strat Plan 3.5, 3.6C-E)

Objective PPB 3: Integrate the findings from all MAJCOM annual infrastructure assessment team visits into energy requirements and opportunities supporting all Pillars of the strategy. (ECD: Nov 2008 / OPR: AFCESA / OCR: MAJCOM A7s / CE Strat Plan 3.5, 3.6C-D)



On Ascension Island, wind turbines provide power in tandem with a diesel generator system. The first four wind turbines helped save more than 1.4 million gallons of diesel fuel in a six-year period. Two more wind turbines were later installed to provide additional power for a desalination plant.

Self Investment: The Air Force established a modest Headquarters Air Force (HAF) facility energy fund, starting with FY08, used to enhance energy management at HAF, MAJCOM, and base levels and to initiate a strategic investment program. Principle avenues for funding energy initiatives are new construction via the MILCON (3300) appropriation and the Sustainment, Restoration, and Modernization accounts (S/R&M) and the Facilities Operations account in the Operations and Maintenance (3400) appropriation (see Appendix B for others). MAJCOMs are required to defend the business case and prove the return on investment through building life-cycle cost analysis in order to receive funding.

Objective PPB 4: Develop and annually review a requirements-based 5-Year plan to strategically invest in energy initiatives that maximize resources through multiple appropriations (Appendix B) and third-party financing ready for the FY 2012-17 POM. Develop sequel plans at AFCESA, AFCEE, MAJCOMs, and all bases. Involve stakeholders through a governance board for funding, programming, and execution decisions. (ECD: Mar 2009 / OPR: AFCESA / OCRs: MAJCOM A7s, AFCEE, and AF/A7CAE / CE Strat Plan 3.5, 3.6C-D)

Objective PPB 5: Report actual execution and returns from funding applied in all appropriations towards energy requirements to the PIWG and relate to the energy metrics (Appendix C) through a program management review. (ECD: Twice each FY / OPR: MAJCOM A4s and A7s / CE Strat Plan 3.5, 3.6C-D)

Objective PPB 6: Brief the Energy Senior Focus Group (see Governance Section on p. 34) and Air Force Corporate Structure annually on return on investment and program results for program advocacy. Adjust investment approach as required. (ECD: Annually / OPR: A7CAE, A7CI / CE Strat Plan 3.5, 3.6C-D)

Objective PPB 7: Establish policy and procedures to capture energy savings from conservation measures for reinvestment at base level in accordance with NDAA 2007 language. (ECD: May 2009 / OPR: SAF/FM / OCR: A7C / CE Strat Plan 3.5, 3.6C-D)



Third-Party Financed Projects: Budgetary pressures have expanded the use of third-party financing such as Energy Savings Performance Contracts (ESPCs), Utility Energy Service Contracts (UESCs), Enhanced Use Leases (EULs), and Standard Leases. The Air Force can use third-party financing of projects to meet federal mandates rather than rely on military appropriations or other traditional forms of federal financing. The idea behind third-party financing is that an intermediary, other than the U.S. Treasury, can raise money in private capital markets to fund energy projects. ESPCs, UESCs, and EULs remain vital tools for the Air Force to achieve our goals and mandates. However, we will enhance our management of third-party financed projects through expanded services at Air Force centers of expertise to address the growing use of these technically, legally, and financially complex contract instruments. For details, see the Air Force ESPC and UESC Policy (HQ USAF/A7C Memo, 30 Oct 2007).

At Hickam AFB, the Air Force is testing the HydraFLX System as an alternate energy source. It will generate ultra-pure hydrogen from water for fueling buses, tow-tractors, vans, sedans, and ground support equipment.

Objective PPB 8: Conduct a third-party financed projects lean improvement event for ESPCs and UESCs to improve planning, project approval processes, execution, and required documentation. (ECD: Dec 2008 / OPR: AFCESA / OCR: A7C / CE Strat Plan 3.1C, 3.6C-E)

Objective PPB 9: Identify conservation project requirements for execution through ESPCs and UESCs using the facility energy audit results and submit annually to AF/A7C. (ECD: Annually / OPR: MAJCOM A7s / OCR: AFCESA / CE Strat Plan 3.1, 3.6C-E)

Objective PPB 10: Develop annual call for ESPC and UESC projects and submit to AF/A7C. (ECD: February annually / OPR: AFCESA / OCR: MAJCOM A7s / CE Strat Plan 3.1, 3.6C-E)

Objective PPB 11: Establish a data warehouse for basic documentation on all ESPCs and UESCs to improve portfolio management at the Air Force's program management office, the Air Force Facility Energy Center. (ECD: Dec 2008 / OPR: AFCESA / CE Strat Plan 3.1, 3.6C-E)

Objective PPB 12: Establish portfolio management for ESPCs at the Air Force Facility Energy Center to ensure managed risk and benefits through enhanced planning, execution, and

Biodiesel is just one of the alternative fuels the Air Forces uses to help cut back on fossil fuels.



performance evaluation and validation of fiscal, energy and water savings. (ECD: Mar 2009 / OPR: AFCESA / CE Strat Plan 3.1, 3.6C-E)

Manpower: Energy Management is not a task that is executed effectively at base level by one or two people; it requires a team of multi-skilled engineers and technicians to operate facility equipment and control systems. In most squadrons today, energy management is a part-time job or an “additional duty,” performed by an Energy Manager who is heavily tasked with non-energy activities, unable to focus on identifying real energy saving projects and potential investments. To balance risk across the demand for conservation and alternative sources of supply, energy investment must become a managed asset, and base-level energy management a full-time job. Consequently, HAF will fund Resource Efficiency Managers (REMs) — contracted and credentialed energy managers — at all bases, beginning with high energy intensity installations, then funded in accordance with MAJCOM priorities. Although this strategy establishes a full-time base energy management capability, it falls short of the resources needed to execute energy requirements; therefore, a case can be made for realignment of existing engineer and technician resources to form an energy section within the Civil Engineer Squadron. An Energy Management Section within the Asset Optimization Branch of the Asset Management Flight can be carved out of existing authorized manpower and should combine the talents of degreed engineers and technicians and maintainers. The section utilizes other CE Squadron organic resources to plan, program, design, and execute energy requirements and performs tasks such as auditing, monitoring, and controlling energy consumption; analyzing data and building life-cycle costs; establishing and prioritizing requirements; and charting investment strategies.

Objective PPB 13: Develop and implement an Air Force REM program including a standard statement of work, a standard REM performance evaluation system, a program evaluation system, and funding profile through FY15. (ECD: Dec 2008 / OPR: AFCESA / OCR: MAJCOM A7s / CE Strat Plan 2.1, 3.6C-E)

Objective PPB 14: Develop a draft manpower standard for an Energy Management Section within the CE Squadron and test at the two Model Energy Bases, Barksdale and McGuire. (ECD: Jan 2009 / OPR: A7CA / OCRs: MAJCOMs, AFCESA, A7CAE, and A7CR / CE Strat Plan 2.1, 3.4B, 3.6C-E)

Objective PPB 15: Develop a draft manpower standard for Energy Management at all staff levels. (ECD: Jan 2009 / OPR: A7CA / OCRs: MAJCOMs, AFCESA, A7CAE, and A7CR / CE Strat Plan 2.1, 3.4B, 3.6C-E)

Decision Management

Decision Management is the set of activities that converts raw data into actionable information on the efficiency and performance of energy systems. The integration of energy considerations into corporate decisions across MAJCOMs, wings, and installations enhances enterprise asset management. Decision Management incorporates four key elements:

- ◆ Energy Management Plans
- ◆ Management Information Systems
- ◆ Performance Measurement
- ◆ Energy and Asset Management

Energy Management Plans: Plans must be developed at MAJCOMs, wings, installations, and field operating agencies to document strategies that mirror the Air Force Infrastructure Energy Strategy, including its pillars and objectives; articulate resource requirements; and reflect verifiable conservation and cost management results.

Objective DM 1: Develop and publish an Air Force Installation Energy Management Plan template that incorporates the elements within the Air Force's energy strategic and implementation plans. (ECD: Feb 2009 / OPR: AFCESA / OCR: A7CAE, A4R / CE Strat Plan 3.6C-E)

Objective DM 2: Develop and publish Installation and MAJCOM Energy Management Plans using the Air Force template. (ECD: 120 days after publication of the template or Apr 2009, whichever is sooner / OPR: CE Squadron Commanders / OCR: MAJCOM A7s / CE Strat Plan 3.3B, 3.6C-E)

Effective Management Information Systems: Modern information technology (IT) is enterprise-wide and provides accurate, relevant, near real-time data that is readily available and easily interpreted. Wise asset management decisions and energy stewardship result when consumption is understood and unit and individual accountability is created. IT is a key enabler of effective performance measurement and metrics (next section). We will deploy enhanced energy management tools through the Air Force Civil Engineer's IT system modernization effort, Agile Installation Management (AIM).



Vegetative roofs can help cut down on utility bills as well as rainwater runoff by insulating the roof from the heat of the sun and capturing the rainwater for the plants. The Air Force is testing the concept on an administrative building at Peterson AFB.



Top: Xeriscaping helps conserve water and cut down on fuel used for lawn equipment. It's in use at a number of Air Forces bases, including Peterson, Kirtland, and Edwards.



Bottom: The Combined Support Facility at Edwards AFB employs sustainable design solutions, including innovative cooling technologies, energy-efficient lighting, daylight harvesting, and extensive use of recycled materials.

Objective DM 3: Establish an Air Force Energy Database and Information Center and normalize existing data across all existing energy-related databases in preparation for deployment of AIM. (ECD: Mar 2009 / OPR: A7CI and AFCESA/CENF / CE Strat Plan 3.6C-E, 3.7B)

Objective DM 4: Measurement and Reporting – Deploy energy management functionality within the AIM system to give senior leadership at all levels the ability to promote energy stewardship through unit and individual accountability. (ECD: FY 2009 / OPR: A7CI / OCR: A7CAE, AFCESA/CENF / CE Strat Plan 3.6C-E, 3.7B)

Objective DM 5: Enhance energy performance measurement capabilities and data analysis through advanced meters and Defense Utility Energy Reporting System modernization. (ECD: FY 2009 / OPR: AFCESA / CE Strat Plan 3.6C-E, 3.7B)

Performance Measurement: Performance measurement is built upon effective information management systems that tie meaningful outcome metrics and performance indicators to the Air Force's key business processes. Infrastructure energy decisions are based upon performance measures tied to the overall energy strategy of reducing energy intensity, increasing renewable energy use, constructing sustainable facilities, and proactively managing utility costs. To improve communication of results to all levels of the Air Force through the Energy Management Steering Groups (EMSGs) and the SFG Governance, the Infrastructure Energy Metrics have been standardized across the Air Force (see Appendix C).

Objective DM 6: Develop metrics and measurement capabilities to track execution and energy performance of vehicles and alternative energy sources. (ECD: Aug 2008 / OPR: VEMSO or AFVESA)

Energy and Asset Management: Energy is an important asset to be managed. We will identify best practices through our Asset Management transformation across the Air Force, as well as through beta testing at our Model Energy Bases, so that asset life-cycle decisions will be informed by verifiable energy and water conservation impact, total cost of ownership, and other key financial performance indicators.

Objective DM 7: Develop a scoring system, incorporating criteria based on the four strategic energy pillars, for CE Commanders to rank projects at the Wing Facilities Utilization Board. (ECD: Jan 2009 / OPR: AFCESA / CE Strat Plan 3.6C-E)

Energy Awareness

Energy Awareness is about the human element and behavioral change. It bridges the gap between the actions and technology that can conserve energy and the people who must accept and use them to create actual energy savings. Making energy a consideration in all we do requires cultural change and the modifications in behavior and attitude that accompany it. Our strategy for enhancing energy awareness includes four key elements:

- ◆ Education and Training
- ◆ Awards and Incentives
- ◆ Strategic Communication
- ◆ Strategic Partnerships

Education And Training: Properly trained Energy Managers and technical personnel of the Energy Section are fundamental to identifying energy opportunities, developing plans and programs, and tracking progress. An educated workforce and populace will be equipped to implement energy initiatives and effectively manage energy resources.

Objective EA 1: Annually review the energy education and training program at the Program Review Committee chaired by AF/A7C to ensure alignment of courses with current policy and guidance and senior leader vision. (ECD: Jun 2009 / OPR: AFCESA / OCR: MAJCOM A7s, AFIT / CE Strat Plan 2.3A, 3.6C-E)

Objective EA 2: Develop an energy training course to be applied at all technical CE schools. (ECD: Jun 2009 / OPR: AFCESA / OCR: MAJCOM A7s, AFIT / CE Strat Plan 2.3B, 3.6C-E)



The ZENN, a low-speed electric car, is under evaluation at McGuire AFB for on-base use.

- Objective EA 3:** Develop annual energy refresher course for technical staff and base contracting personnel. (ECD: Jun 2009 / OPR: AFCESA / OCR: MAJCOM A7s, AFIT / CE Strat Plan 2.3B, 3.6C-E)
- Objective EA 4:** Develop an Air Force-wide base facility manager's energy handbook. (ECD: Sep 2008 / OPR: AFCESA / OCR: MAJCOM A7s, AFIT / CE Strat Plan 3.4, 3.6C-D)
- Objective EA 5:** Develop an Air Force-wide distance learning energy course for the base populace that can be incorporated into ancillary training programs. (ECD: May 2009 / OPR: AFCESA / OCR: MAJCOM A7s, AFIT / CE Strat Plan 3.4, 3.6C-E)

Awards and Incentives: Promptly recognizing and generously rewarding exceptional performers can inspire others to change their behavior. Awards generate support and pride within an organization and foster continued success. Publicizing award-winning efforts promulgates energy best practices across the Air Force. There are many Air Force and other federal programs that recognize individual and groups. For example, the Commander-in-Chief's Annual Awards for Installation Excellence use energy as a criterion to promote energy awareness and to "make energy a consideration in all we do."

- Objective EA 6:** MAJCOMs and bases develop Energy Awards Programs. (ECD: FY 2009 / OPR: MAJCOM A7s / OCR: AFCESA/CENF / CE Strat Plan 3.4, 3.6C-E)
- Objective EA 7:** Publish an article annually in the Air Force Civil Engineer magazine on all energy awards received in the past fiscal year to coincide with the Energy Awareness Month and the FEMP Award Program. (ECD: Oct each year / OPR: AFCESA/CENF / CE Strat Plan 3.4, 3.6C-E)

Strategic Communication: Successfully executing any strategic plan requires continuously and effectively communicating three things to both internal and external audiences: 1) where we are; 2) where we're headed; and 3) how we're going to get there. For the purposes of this plan, internal audiences are defined as those internal to the Air Force — stakeholders in achieving the vision to "make energy a consideration in all we do."

External audiences are defined as “strategic partners” who play a role in assisting the Air Force to meet its goals; DoE is a prime example of an Air Force strategic partner.

The Air Force Model Energy Base Initiative is a primary means of testing concepts for Air Force-wide adoption. As it develops, this initiative will provide an opportunity to test specific measures, to expand strategic partnerships, and to communicate both lessons learned and how a focused energy effort can achieve results.

This plan and its companion implementation plan form the basis of the Air Force’s approach to managing infrastructure energy initiatives and for measuring attainment of our goals. As such, it facilitates alignment of policies and implementation plans among all Air Force levels, to maximize the opportunity for success across the entire Air Force. A sampling of methodologies for communicating with target audiences is given in Appendix D.

Objective EA 8: Develop standard messaging and requirements briefs to be used at all MAJCOM EMSGs to ensure overall Air Force metrics are promulgated and awareness programs reach all members. (ECD: Nov 2008 / OPR: AFCEA and A4R / OCR: MAJCOMs / CE Strat Plan 3.4, 3.6C-E)

Objective EA 9: Develop a strategic communication plan in conjunction with Public Affairs for outreach to the base populace on a semiannual basis, such as October for DoE’s Energy Awareness Month campaign and April for Earth Day. (ECD: March and September annually / OPR: AFCEA / OCR: MAJCOMs / CE Strat Plan 3.4, 3.6C-D)

Objective EA 10: Provide lessons learned from the Model Energy Bases and meeting minutes from EMSGs to the Energy Community of Practice. (ECD: Quarterly / OPR: AFCEA / CE Strat Plan 3.4, 3.6C-E)

Strategic Partnerships: The DoE is a key strategic partner for the Air Force. The DoE plays a role in developing policy and supplying technical expertise, as well as facilitating the cross-flow of information and best practices between federal agencies. The Air Force actively participates in the Inter-Agency Energy Management Task Force, chaired by DoE, as well as several of its sub-working groups. A table listing other strategic partners and external audiences can be found in Appendix D.

Objective EA 11: Correlate research and development milestones and achievements among the DoD services to CE and Logistics Readiness mission capabilities and present to Energy Senior Focus Group annually. (ECD: Oct 2008 / OPR: AFCEA and A4R / OCR: MAJCOM A4s and A7s / CE Strat Plan 3.6C-E)

Governance

The energy program governance includes Energy Management Steering Groups (EMSGs) at base, MAJCOM, and Air Force levels that link decision-making and advocacy to optimize resources and program performance. The Energy Senior Focus Group (SFG) with its working groups (Figure 10)

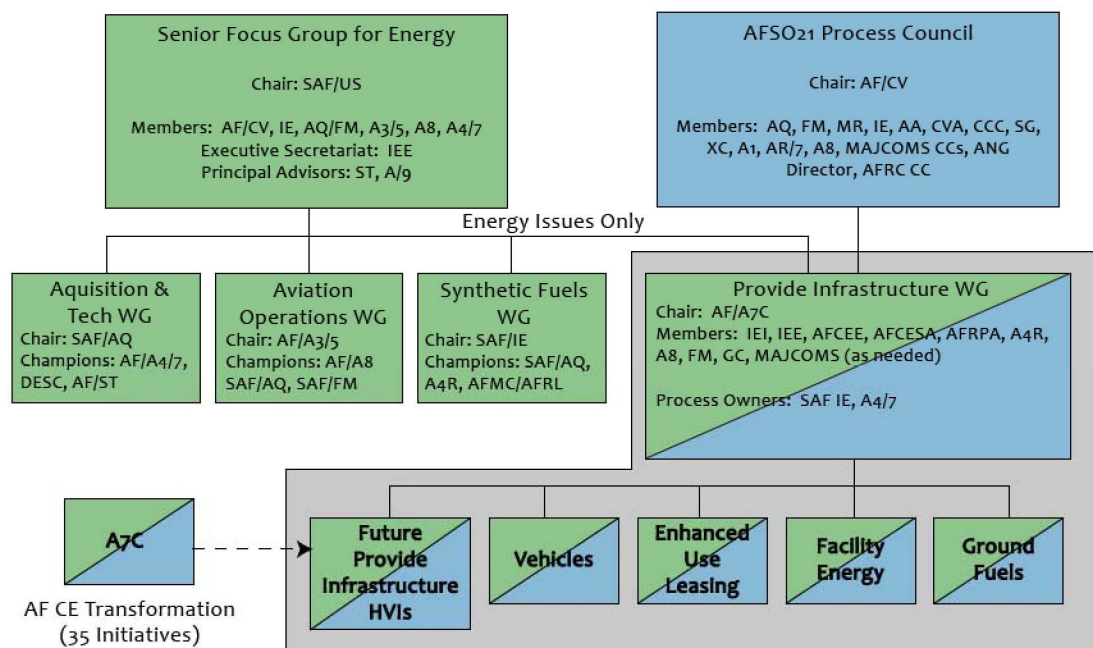


Figure 10. Air Force energy governance structure

constitutes the senior governance structure for energy matters in the Air Force. The SFG, which was recognized in 2007 with the Presidential Award for Leadership in Federal Energy Management, acts as a coordinating body for cross-functional issues, working through the offices having primary responsibility for policy and execution (Appendix E). The Air Force Smart Operations for the 21st Century (AFS021) Process Council is responsible for identifying and institutionalizing Air Force-wide efficiency initiatives.

Objective GOV 1: Formally charter an EMSG at the Wing, MAJCOM, and HAF levels that mirrors the Air Force SFG and meets to promote energy programs, review performance, and allocate resources to ensure attainment of Air Force and command goals. (ECD: Jan 2009 / OPR: MAJCOM CVs and Wing Commanders / CE Strat Plan 3.6C-E)

Objective GOV 2: All EMSGs must meet at least twice annually to plan local and MAJCOM Energy Awareness Month (October) activities. (ECD: annually / OPR: MAJCOM and Installation EMSGs / CE Strat Plan 3.6C-D)

Senior Focus Group

As the senior energy management steering group, the SFG's scope extends to all energy use and conservation issues within the Air Force, including seeking alternative energy opportunities, at all Air Force installations, within ground transportation and support equipment/systems, aviation fuel use, and associated science and technology opportunities. The SFG is chaired by the Department's Senior Energy Official, the Assistant Secretary of the Air Force for Installations, Environment, and Logistics (SAF/IE). Infrastructure Energy issues are governed by the Provide Infrastructure Working Group (PIWG), which is chaired by the Air Force Civil Engineer (HQ USAF/A7C) and acts as the conduit to the SFG for MAJCOM infrastructure energy policy and initiatives.

Provide Infrastructure Working Group

The PIWG addresses facilities, infrastructure, ground vehicles and equipment, and ground fuels initiatives, and reports to the SFG as well as to the AFS021 Process Council, the Air Force Corporate Structure, and other

senior-level forums on all infrastructure transformation issues, including energy. The PIWG is the advocate for MAJCOM initiatives and resource requirements through the corporate process. It links base-level EMSG priorities through the respective MAJCOM steering group to advocacy at the corporate Air Force level. The PIWG is chaired by the Air Force Civil Engineer (HQ USAF/A7C) with functional representation spanning the full scope of the Infrastructure Energy Strategy.

Wing Energy Management Steering Group

EMSGs are essential to the implementation of the Air Force Energy program. The EMSG is a cross-functional working group comprising mission owners and subject-matter experts, in areas such as aviation, logistics readiness, vehicles, ground fuels, communications, public affairs, and facilities engineering. It sets the tone of the energy program; provides command emphasis and direction; develops initiatives, ideas, and potential strategies; and further develops command policy, guidance, and execution strategies.



Shaw AFB is investing in environmentally friendly dormitories that are expected to meet LEED Silver certification criteria. One of the technologies in use is a geothermal well for heating and cooling.

Conclusion

This strategy, when embraced and followed by all Air Force members, will produce verifiable reductions in energy consumption and provide alternative and renewable energy sources that will drastically increase our energy independence and enhance our energy security. It will also save money — money that can be used in other ways to support to the Air Force's mission. The projected monetary savings over the next 5-10 years can approach \$3.0 billion.

The Air Force has a history of being a leader in energy management, a history achieved by many individual acts and events of energy conservation. To turn today's energy goals into tomorrow's achievements requires not only sustained leadership and funding, but the efforts of every individual, with energy a consideration in everything we do. This strategy is simple and elements of it can be achieved by every Air Force member every day.

Learn the strategy; apply leadership; make smart energy choices; achieve the goals, and along the way, keep an eye on your wingman. This way we'll make it.

Authors and Major Contributors

Mr. Brian Lally, P.E., Chief, Energy Branch, HQ USAF/A7CAE

Lt Col Brian Weidmann, HQ USAF/A7CAE

SMSgt Stephen Grafton, HQ USAF/A4RE

Air Force Facility Energy Steering Group

Special Thanks to Dr Stephen Doig,
Air Force Smart Operations for the 21st Century, SAF/S0

*Editing and design/layout services provided by
Ms. Teresa Hood and Mr. Guy Ivie, AFCESA Support Contractors*

Appendix A: Statutory and Policy Mandates and Drivers

These are excerpts only; for full text of each requirement, refer to noted references.

	EPACT 2005 (P.L. 109-58) except as noted	Executive Order 13423	EISA 2007	Implementing Instructions	Air Force Policy
Facility Energy Efficiency	Beginning in FY06, reduce facility energy intensity (MBTU/sf) 2% per year based on 2003 baseline (Title I, Subtitle A, Section 102)	Beginning in FY06, reduce facility energy intensity (MBTU/SF) 3% per year based on 2003 baseline (30% by 2015). (Section 2)	Repeat EO 13423 goal of 3% per year based on 2003 baseline (30% by 2015). (Title IV, Subtitle C, Section 431)	DoDI 4170.11 (22 Nov 05) New version being updated to include EISA requirements.	AFEPPM 04-1 (published) AFEPPM 07-01 (draft)
Renewable Energy	Sets annual goals for electricity generated with renewables: <ul style="list-style-type: none"> • 3% in FY07-FY09 • 5% in FY10-FY12 • 7.5% in FY13-thereafter • 25% by 2025 (10 USC 2911) (Title II, Subtitle A, Section 203)	50% of statutorily required renewable energy must be from sources placed into service after 1 Jan 1999. Includes various "counting" rules. (Section 2)	N/A	2007 Federal Renewable Energy Requirement Guidance for EPAct 2005 and EO13423	

	EPACT 2005 (P.L. 109-58) except as noted	Executive Order 13423	EISA 2007	Implementing Instructions	Air Force Policy
Building Performance / Sustainability	Establishes building performance standards—30% below ASHRAE 90.1 if life-cycle cost effective. (Title I, Subtitle A, Section 109)	All MILCON and major renovation comply with MOU on sustainability. Must incorporate into 15% of existing bldgs by end of FY15. (Section 2)	Section 436. High-Performance Green Federal Building	DoE published final rule effective date of 22 Jan 08 for 10 CFR 433, 434, and 435 to meet the EPAct 2005 performance standards. http://www1.eere.energy.gov/femp/pdfs/fr_notice_cfr433_434_435.pdf The guiding principles of the signed MOU are located at this website: http://www.wbdg.org/references/mou.php	Air Force Sustainable Design and Development (SDD) Policy (31 Jul 07). Leadership in Energy and Environmental Design (LEED) is the AF standard. Beginning with the FY09 Military Construction (MILCON) program: <ul style="list-style-type: none"> • 100% capable of achieving LEED Silver certification • Program SDD costs at 2% of primary facility cost • 5% per FY for formal LEED certification • 10% LEED certified in FY10 and after • All S/R&M projects shall consider using LEED principles where financially feasible
Advanced Utility Meters	Meter all facilities for electrical where economically feasible by 2012. (Title I, Subtitle A, Section 103)	N/A	Adds requirement for steam and natural gas meters by 2016. (Title IV, Subtitle C, Section 434)	DoE Electric Metering Guidance Feb 2006 DoE/FEMP Metering Best Practices Oct 2007	Defines “cost effectiveness” <ul style="list-style-type: none"> • Meter steam at plant • Electric, gas, and water meters on renovations over \$200K • Meter all buildings over 35K SF for electrical and over 50K SF for natural gas. (A7C Memo, 27 Apr 06)

	EPACT 2005 (P.L. 109-58) except as noted	Executive Order 13423	EISA 2007	Implementing Instructions	Air Force Policy
Utility Meter Reporting	Electric meter reports (annually) (Title I, Subtitle A, Section 103)		DOE to field Web-based tool for certification of reports (FY09 2Qtr) Benchmarking metered facilities (Title IV, Subtitle C Section 432) OMB/DoE Annual Renewable reports (Title V, Subtitle C, section 528)	DoE to provide Web-based certification and benchmarking system within 1 year after enactment of law (ECD Dec 08) OMB will issue Energy scorecards semi-annually	
Energy Star Products	Must purchase Energy Star rated or FEMP designated products. Specific products: electric motors (1 to 500 HP) and air conditioning/refrigeration equipment. (Title I, Subtitle A, Section 104)		Refers to residential boiler efficiencies. (Title III, Subtitle A, Section 303)	The FEMP product Web site contains guidance on all associated products including a link to Energy Star: http://www1.eere.energy.gov/femp/procurement/index.html	Can be waived if the agency head determines in writing that no ENERGY STAR® or FEMP-designated product (a) meets the functional requirement of the agency; (b) is not cost-effective over the life of the product taking energy cost savings into account; or (c) the product requirement is combat-related.
Solar Hot Water			New/renovated facility with a hot water requirement must be 30% solar generated. (Title V, Subtitle C Section 523)	FEMP Web site on solar hot water design and specifications: http://www1.eere.energy.gov/solar/sh_basics_water.html	
Reduce Fossil Fuel Usage in New Facilities			55% by 2010 65% by 2015 80% by 2020 90% by 2025 100% by 2030 (Title IV, Subtitle C, Section 433)	DoE will publish rule within 1 year from date of EISA for new Federal buildings and Federal buildings undergoing major renovations or of buildings of at least \$2.5M in cost.	

	EPACT 2005 (P.L. 109-58) except as noted	Executive Order 13423	EISA 2007	Implementing Instructions	Air Force Policy
Commissioning, Recommissioning, and Retro- Commissioning			Verification and documentation, during the period beginning on the initial day of the design phase of the facility and ending not earlier than 1 year after the date of completion of construction. (Title IV, Subtitle C, section 432)		
Energy Audits			25% of audits per year in "covered" facilities will be "comprehensive" audits for energy and water. (Title IV, Subtitle C, Section 432)	DoD Energy Management Handbook 2005 DoE to define "covered" facilities and what "comprehensive" entails	
Storm Water Runoff			Provides guidelines for facilities over 5000 SF. (Title IV, Subtitle C, Section 438)		
Water Conservation		Beginning in FY08: <ul style="list-style-type: none"> 2% reduction per year based on 2007 baseline 16% by 2015. (Section 2)		Establishing Baseline and Meeting Water Conservation Goals of EO 13423, Jan 08 (DoE Supplemental Guidance)	Water use is defined as all water used at federal facilities that is obtained from public water systems or from natural freshwater sources such as lakes, streams, and aquifers, where the water is classified or permitted for human consumption. The 2007 Water Intensity baseline has been established for the Air Force as 55.8 gal per SF per year. (Air Force Guidance 28 March 08)

	EPACT 2005 (P.L. 109-58) except as noted	Executive Order 13423	EISA 2007	Implementing Instructions	Air Force Policy
Greenhouse Gases		Reduce greenhouse gas emissions through reduction of energy intensity. (Section 2)			
Ground Vehicles	75% AFV Acquisitions at agency level, (WR-ALC)	Increase purchase of alternative fuel, hybrid, and plug-in hybrid vehicles when commercially available.	Section 141, Agencies must procure LDV or MDVs that are low in greenhouse gases.	DoD 4500.36-R , 16 Mar 07	A4R Policy Letter, 100% acquisition/lease where available. AFI 23-302, Oct 2007
Petroleum Conservation	100% utilization of alternative fuels in AFVs (Section 701)	Reduce petroleum consumption in vehicle fleet by 2% annually through 2015, 20% total by 2015	Petroleum Reduction and Alternative Fuel use (Section 142)		AFI 23-302, Oct 2007
Alternative Fuel Use	100% utilization of alternative fuels in AFVs (Section 701)	Increase alternative fuel consumption at least 10% annually.	Petroleum Reduction and Alternative Fuel use. (Section 142)	OSD Policy Directive Memorandum, 27 Dec 07	AFI 23-302, Oct 2007

Appendix B: Funding Sources / Programming Avenues

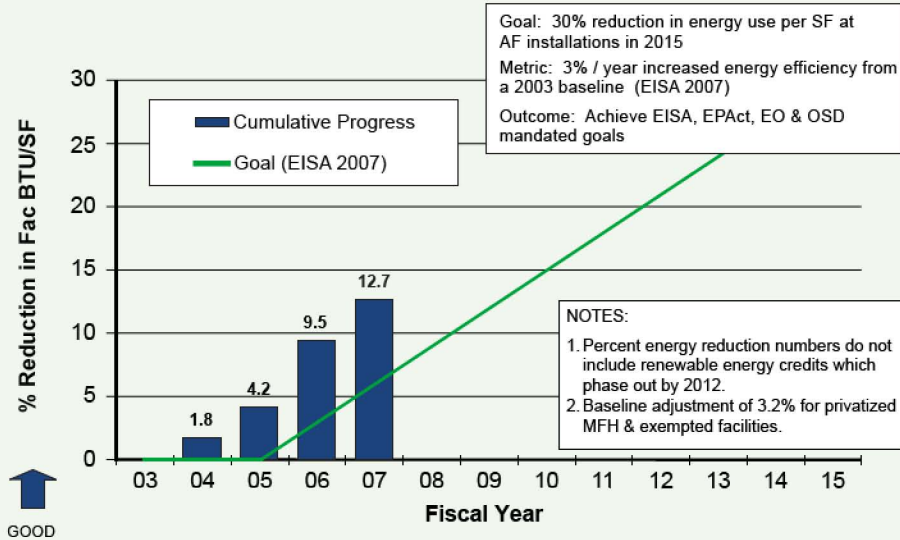
Program	Appropriation	Account
<ul style="list-style-type: none"> Energy Service Performance Contract (ESPC) Utility Energy Service Contract (UESC) Enhanced Use Lease (EUL) 	<ul style="list-style-type: none"> 3400 	<ul style="list-style-type: none"> Facility Operations Sustainment, Restoration, and Modernization
<ul style="list-style-type: none"> Energy Conservation Investment Program (ECIP) New Construction Major Renovation 	<ul style="list-style-type: none"> MILCON (3300) 	
<ul style="list-style-type: none"> Productivity Enhancing Capital Investment (PECI) Fast Payback Capital Investment (FASCAP) Program Productivity Investment Fund (PIF) Program 	Various: <ul style="list-style-type: none"> 3080 MILCON (3300) 3400 	
<ul style="list-style-type: none"> Host Nation Funding 		
<ul style="list-style-type: none"> Strategic Environmental Research and Development Program (SERDP) 	Basic and applied research and technology development instead of demonstration and validation of existing technologies.	
<ul style="list-style-type: none"> Environmental Security Technology Certification Program (ESTCP) 		
<ul style="list-style-type: none"> Tax credits and incentives (federal and state), utility rebates 		

Appendix C: Energy Metrics



EISA 2007 Energy Reduction Status

U.S. AIR FORCE

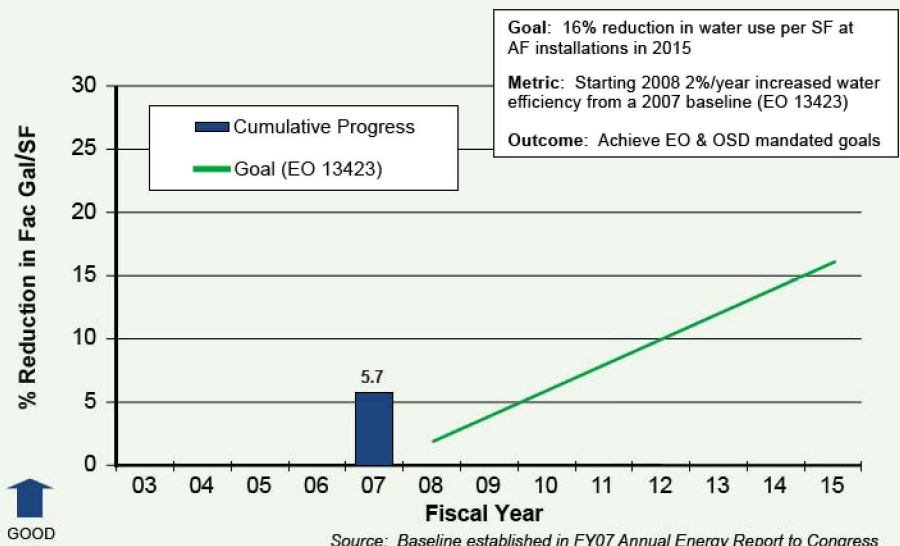


Integrity - Service - Excellence



E.O. 13423 Water Reduction Status

U.S. AIR FORCE

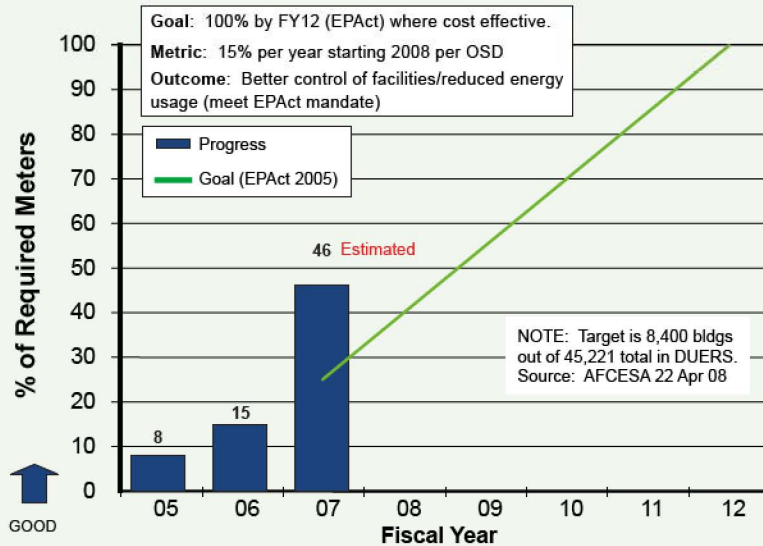


Integrity - Service - Excellence



EPAct 2005 Electric Metering Status

U.S. AIR FORCE

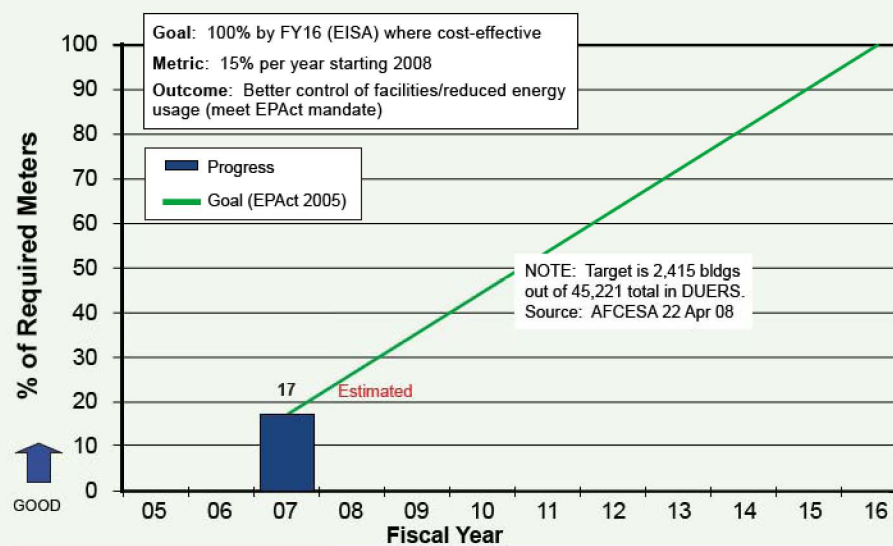


Integrity – Service – Excellence



EISA 2007 Natural Gas Metering Status

U.S. AIR FORCE

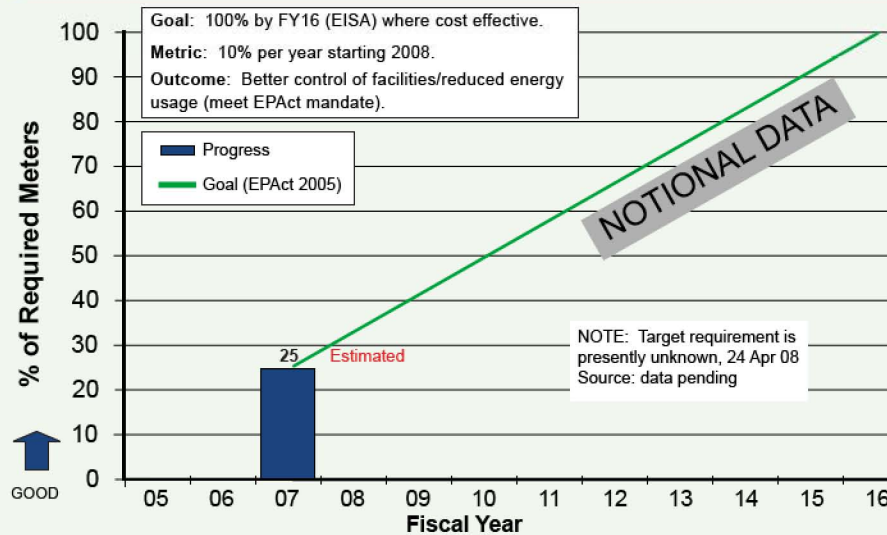


Integrity – Service – Excellence



EISA 2007 Steam Metering Status

U.S. AIR FORCE

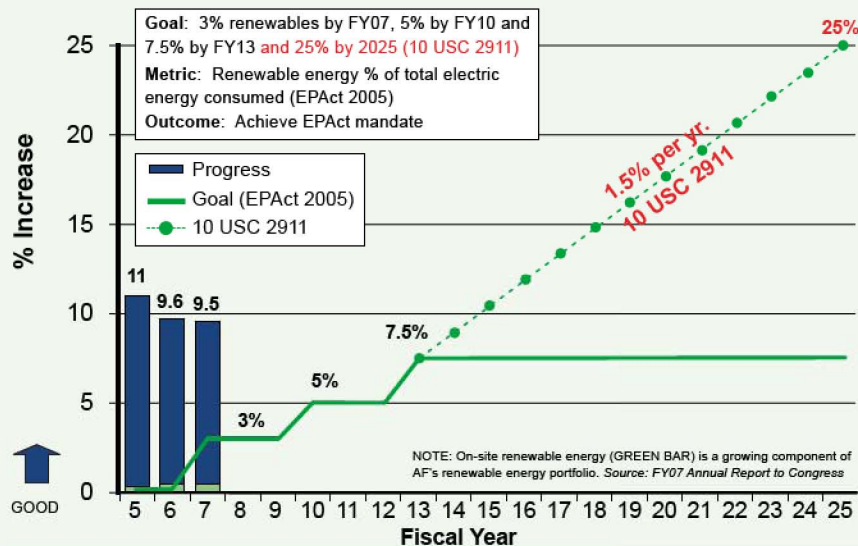


Integrity - Service - Excellence



EAct 2005 Renewable Power Status

U.S. AIR FORCE

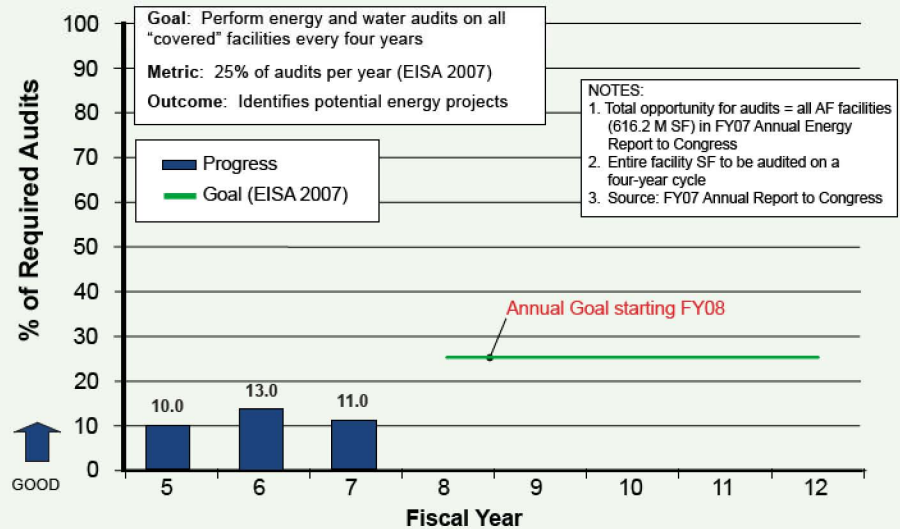


Integrity - Service - Excellence



EISA Energy and Water Audits Status

U.S. AIR FORCE

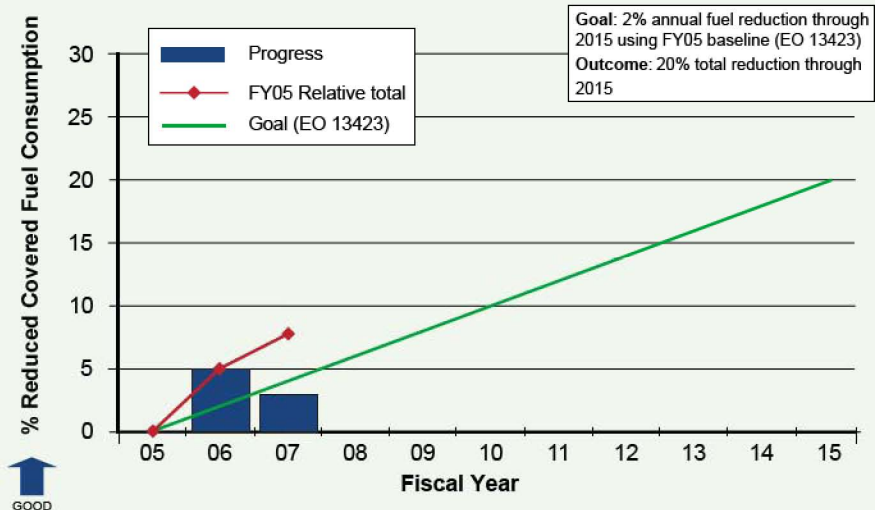


Integrity – Service – Excellence



U.S. AIR FORCE

EPAct-Reportable Fleet Fossil Fuel Consumption

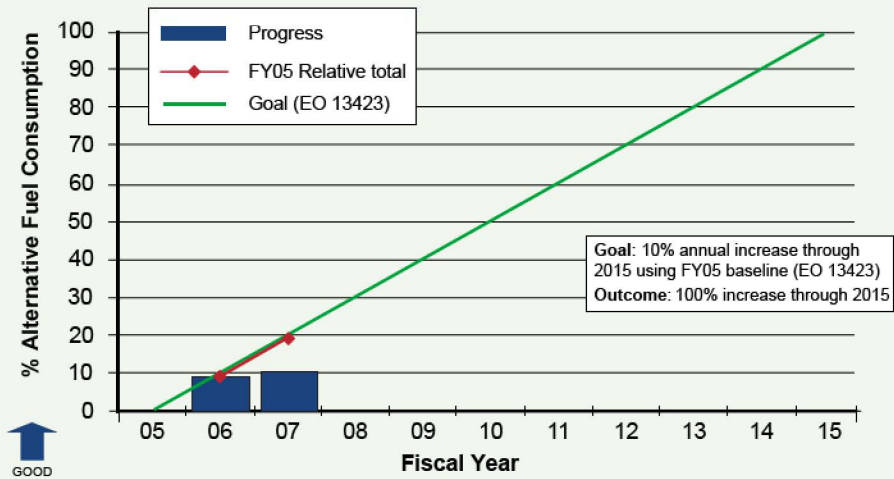


Integrity – Service – Excellence



Alternative Fuel Consumption

U.S. AIR FORCE



Integrity - Service - Excellence



AFV Acquisitions

U.S. AIR FORCE



Integrity - Service - Excellence

Appendix D: Communication Methods with Target Audiences

Internal Audiences — Stakeholders	Sample Methods of Communication
<ul style="list-style-type: none"> Base personnel and organizational commanders 	<ul style="list-style-type: none"> Wing Energy Management Steering Group, base newsletters, commanders' speeches, staff meetings, Energy Awareness Month programs, AFSO21 events such as Rapid Improvements, SECAF Letter to Airmen, CSAF Vector and CMSAF Perspectives (available on http://www.af.mil)
<ul style="list-style-type: none"> MAJCOM staffs 	<ul style="list-style-type: none"> HQ USAF/A7C monthly VTC, MAJCOM Energy Management Steering Group HQ USAF/A4R annual Vehicle Transformation Advisory Council, (VTAC) USAF/A4RE Quarterly Vehicle Management VTC
<ul style="list-style-type: none"> HQ Air Force, SAF, FOAs and functional staffs at all levels 	<ul style="list-style-type: none"> Senior Focus Group Meetings
<ul style="list-style-type: none"> Energy professionals 	<ul style="list-style-type: none"> DoE and industry conferences and trade shows, AFCESA Energy Community of Practice website, continuing education, DoE and AF energy audits and email communication, newsletters
External Audiences — Strategic Partners	Sample Methods of Communication
<ul style="list-style-type: none"> Office of the Secretary of Defense 	<ul style="list-style-type: none"> Working Groups/Task Forces Semi-Annual Energy Scorecard Submissions The annual Federal Automotive Statistical Tool, (FAST) Report
<ul style="list-style-type: none"> Sister Services 	<ul style="list-style-type: none"> Working Groups/Task Forces
<ul style="list-style-type: none"> Department of Energy and other federal entities such as the Environmental Protection Agency 	<ul style="list-style-type: none"> Working Groups/Inter Agency Energy Management Task Force, DoE and industry conferences and trade shows Semi-Annual Energy Scorecard Submissions
<ul style="list-style-type: none"> Providers of utility and energy services – Energy Service Companies (ESCOs) and utility providers 	<ul style="list-style-type: none"> Working Groups/Task Forces, federally sponsored Industry Forums
<ul style="list-style-type: none"> American Public/Local Community 	<ul style="list-style-type: none"> Print and broadcast media, industry trade shows

Appendix E: Roles and Responsibilities

Headquarters United States Air Force (HQ USAF) — Provides the policy, guidance, oversight, and resources to ensure an effective strategy is employed at all levels. The Air Force Senior Focus Group (SFG) leads this level. The SFG stimulates energy conservation opportunities and energy technology implementation across the full spectrum of Air Force energy applications. The Air Force Provide Infrastructure Working Group (PIWG) reports to the SFG and is responsible for all facility energy, infrastructure, ground vehicles, and ground fuels initiatives.

MAJCOMs — Develop plans to support or supplement Air Force goals and strategies, execute programs (includes planning and programming requirements to support the various energy program mandates), evaluate energy usage of subordinate units, provide inputs required by HQ USAF for annual reports, and nominate their most successful units for energy awards.

Air Force Civil Engineer Support Agency (AFCESA) — Advises HQ USAF, providing assistance to the MAJCOMs and installations developing plans and strategies to meet mandated energy goals. Manages and facilitates execution of energy programs as the home to the Air Force Facility Energy Center (AFFEC), the central Program Management Office for facility energy. Develops guidance to implement energy programs and projects. Provides technical, contractual, and legal review and analysis support for energy and utility initiatives. Acts as the Air Force's Subject Matter Expert in various technical areas required to support the pillars of the strategic plan. Acts as the consolidator and central repository for data in support of energy goals and reporting. Member of the PIWG.

Air Force Center for Engineering and the Environment (AFCEE) — Advises HQ USAF, providing assistance to the MAJCOMs and installations developing plans and strategies to meet mandated sustainable design and construction goals. Manages and facilitates the Air Force MILCON program. Develops guidance to implement construction programs and projects, provides technical, contractual, and legal review. Acts as the consolidator and central repository for data in support of sustainable development goals and reporting.

Air Force Real Property Agency (AFRPA) — Acts as the center of real estate excellence within the Air Force. Establishes EUL implementation guidelines and resolves program issues. Advises Source Selection Authorities during the selection and approval process. Oversees and ensures necessary support to the MAJCOM and installation teams as needed to execute projects. Reviews performance standards to monitor progress of EUL transactions. Advocates use of Air Force and DoD resources to fund EUL project development. Reviews and reports progress of EUL projects to the Air Force Board Structure and OSD, as required, and serve as a member of the SAF/IEI-chaired Privatization Executive Steering Group and the PIWG.

Air Force Petroleum Agency (AFPA) — Provides the warfighter with technical support and specialized capabilities in petroleum, propellants, cryogenics, chemicals, and gases for all aerospace vehicles, systems and equipment. Develop quality assurance and surveillance specifications and standards. Provide professional (analytical, scientific, and engineering) services to Air Force installations. Develops standardized policy and procedures for operations and maintenance for the fuels community.

Air Force Advanced Power Technology Office (APTO) — Advises HQ USAF, providing assistance to MAJCOMs and installations developing plans and strategies to support installation and end user alternative power solutions to meet mission needs. Manages the identification and integration of advanced power, alternative energy, and alternative fuel technologies into the Air Force's inventory: ground vehicles, support equipment, basic expeditionary airfield resources, fuel-cell equipment/applications, and base infrastructure. Provides technology demonstration/validation and acts as the bridge between research and development and acquisition and deployment.

Air Force Vehicle Equipment Support Activity (AFVESA) — Provides a responsive and dynamic Global Logistics Support Capability to the war-fighter, as it relates to vehicles, equipment commodities, War Readiness Materiel, and Base Expeditionary Airfield Resources, using standardized processes to deliver high-level, sustained logistical support.

Installations — Develop plans to support or supplement Air Force and MAJCOM goals/strategies. They execute those plans, measure and evaluate their base energy usage, provide inputs required by their MAJCOM for annual reports, and nominate their most successful people and units for energy awards.

Base Level Energy Manager— Every installation is required by the Energy Independence and Security Act of 2007 to have an energy manager. Within the Civil Engineer Squadron, the Energy Manager is a member of the Asset Management Flight. The Energy Manager is normally supplemented by a Utility Manager, who deals with daily management of utility contracts and reimbursements. Where a Resource Efficiency Manager is assigned, the Energy Manager provides daily management and oversight. The scope of the Energy Manager's duties includes primary responsibility and/or oversight for the following areas:

- ◆ Installation Energy Management Plan (including water conservation strategies)
- ◆ Awareness (energy steering groups, outreach programs)
- ◆ Education and Training
- ◆ Energy Audits
- ◆ Energy Maintenance (HVAC, controls, and lighting, power, and water technical experts)
- ◆ EMCS Operations
- ◆ Utility Company Interface and Contracts Management
- ◆ Utility Billing
- ◆ Utility Resale (reimbursable)
- ◆ Utility Budget Development
- ◆ ESPCs and UESCs
- ◆ Capital Program and Business Case Development (ECIP, ESPCs, UESC, S/R&M, PECL, RDTE, Grants, SERDP, ESTCP, EEUL, PPA)
- ◆ Data Management and Reporting
- ◆ Sustainable Design and Master Planning Coordination
- ◆ Energy Security Assessments in Support of Continuity of Operations

Appendix F: Abbreviations and Acronyms

ACES	Automated Civil Engineer System	BRAC	Base Realignment and Closure
AF	US Air Force	CE	Civil Engineer
AFCEE	Air Force Center for Engineering and Environment	CEM	Certified Energy Manager
AFCESA	Air Force Civil Engineer Support Agency	CMSAF	Chief Master Sergeant of the Air Force
AFEPPM	Air Force Energy Policy Procedural Memorandum	CSAF	Chief of Staff of the Air Force
AFFEC	Air Force Facility Energy Center	DESC	Defense Energy Support Center
AFIT	Air Force Institute of Technology	DHS	Department of Homeland Security
AFMA	Air Force Manpower Agency	DLA	Defense Logistics Agency
AFPA	Air Force Petroleum Agency	DoD	Department of Defense
AFRPA	Air Force Real Property Agency	DoDI	Department of Defense Instruction
AFSO21	Air Force Smart Operations for the Twenty-First Century	DoE	Department of Energy
AFV	Alternative Fuel Vehicle	DRU	Direct Reporting Unit
AFVESA	Air Force Vehicle Equipment Support Activity	DUERS	Defense Utility Energy Reporting System
AIM	Agile Installation Management	ECD	Estimated Completion Date
AMP	Activity Management Plan	ECIP	Energy Conservation Investment Program
APTO	Advanced Power Technology Office	EISA	Energy Independence and Security Act of 2007
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers	EMCS	Energy Management Control System
BCE	Base Civil Engineer	EMSG	Energy Management Steering Group
BLCC	Building Life Cycle Cost	EO	Executive Order
		EPA	Environmental Protection Agency
		EPAAct	Energy Policy Act of 2005
		ESCO	Energy Services Company

ESPC	Energy Savings Performance Contract	MILCON	Military Construction
ESTCP	Environmental Security Technology Certification Program	MIS	Management Information Systems
EUL	Enhanced Use Lease	MBTU	Million British Thermal Units
FAST	Federal Automotive Statistical Tool	MOU	Memorandum of Understanding
FEMP	Federal Energy Management Program	NAF	Non-Appropriated Funds
FM/RA	Financial Manager/Resource Advisor	NDAA	National Defense Authorization Act
FOA	Field Operating Agency	O&M	Operations and Maintenance
FUB	Facility Utilization Board	OCR	Office of Collateral Responsibility
FY	Fiscal Year	OPR	Office of Primary Responsibility
Gal	Gallons	PBD	Program Budget Decision
GGE	Gasoline Gallon Equivalent	PECI	Productivity Enhancement and Capital Investment
GHG	Greenhouse Gases	PIWG	Provide Infrastructure Working Group
GWOT	Global War On Terror	POM	Program Objective Memorandum
HAF	Headquarters Air Force	PPA	Power Purchase Agreement
HQ	Headquarters	QOL	Quality of Life
HVAC	Heating, Ventilation, and Air Conditioning	RDTE	Research, Development, Test, and Evaluation
HVI	High Value Initiatives	REC	Renewable Energy Credit
IT	Information Technology	REM	Resource Efficiency Manager
LDV	Light-Duty Vehicles	ROI	Return on Investment
LEED	Leadership in Energy and Environmental Design	RP	Real Property
LIMFAC	Limiting Factor	S/R&M	Sustainment, Restoration and Modernization
LSV	Low Speed Vehicle	SAF	Secretary of the Air Force
MAJCOM	Major Command	SDD	Sustainable Design and Development
MDV	Medium Duty Vehicles	SECAF	Secretary of the Air Force



SERDP	Strategic Environmental Research & Development Program
SF	Square Feet
SFG	Senior Focus Group
SIR	Savings to Investment Ratio
UESC	Utility Energy Services Contract
UP	Utility Privatization
VEMSO	Vehicles and Equipment Management Support Office
VTC	Video Teleconferencing

Appendix G: References

The following statutes and policies control infrastructure energy programs:

Facility Energy Programs

Statutes and United States Codes

1. Energy Policy Act (EPAct) of 2005 (P.L. 109-58, 8 Aug 05)
2. National Defense Authorization Act (NDAA) of 2007 (P.L. 109-364, 17 Oct 06), 10 USC 2911. Also reference, Title 10 USC 2912 to 2918 to existing 2911
3. Energy Independence and Security Act (EISA) of 2007 (P.L. 110-140, H.R. 6, 19 Dec 07)
4. Title 10 USC 2865, Energy Savings at Military Installations
5. Title 10 USC 2866, Water Conservation
6. Title 40 USC 591, Purchase of Electricity
7. Title 42 USC 8287, Energy Savings Performance Contract

Executive Orders and Implementation Guidelines

1. Executive Order 13221, *Energy Efficient Standby Power Devices* (2 Aug 2001).
2. Executive Order 13423, *Strengthening Federal Environmental, Energy, and Transportation Management* (24 Jan 2007).
3. Presidential Memorandum for the Heads of Executive Departments and Agencies, "Energy and Fuel Conservation by Federal Agencies" (Sep 2005)
4. Federal Leadership in High Performance and Sustainable Buildings Memorandum of Understanding (24 Jan 2006)

Department of Energy, Environmental Protection Agency, and Non-DoD Executive Branch Policies

1. DoE, *Guidance for Electric Metering in Federal Buildings* (6 Feb 2006)
2. DoE Metering Best Practices, *A Guide to Achieving Utility Resource Efficiency* (Oct 2007)
3. DoE Supplemental Guidance to the Instructions for Implementing Executive Order 13423, "Strengthening Federal Environmental, Energy, and Transportation Management": *Establishing Baseline and Meeting Water Conservation Goals of Executive Order 13423* (Jan 2008)
4. DoE, 2007 *Federal Energy Management Program (FEMP) Renewable Energy Requirement Guidance for EPACT 2005 and Executive Order 13423* (28 Jan 2008)
5. Chairman of the Council on Environmental Quality (CEQ), *Instructions for Implementing Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management* (29 Mar 2007)

6. Final rule, 10 CFR Parts 433, 434, and 435, *Energy Conservation Standards for New Federal Commercial and Multi-Family High-Rise Residential Buildings and New Federal Low-Rise Residential Buildings*, Federal Register / Vol. 72, No. 245 / Friday, December 21, 2007 / Rules and Regulations 72565, Office of Energy Efficiency and Renewable Energy [Docket No. EE-RM/STD-02-112] RIN 1904-AB13

Department of Defense Policies

1. DoD Energy Conservation Investment Program guidance (17 Mar 1993)
2. DoD 5126.46-M-2, Defense Utility Energy Reporting System (Nov 1993)
3. DoD Directive 4140.25, DoD Management Policy for Energy Commodities and Related Services (Apr 2004)
4. DoD Renewable Energy Assessment Final Report (Mar 2005)
5. DoD Energy Manager's Handbook (Aug 2005 update)
6. DoDI 4170.10, Energy Management Policy (8 Aug 1991).
7. DoDI 4170.11, Installation Energy Management (22 Nov 2005)
8. OUSD Memorandum, Installation Energy Policy Goals (18 Nov 2005)
9. OUSD memorandum, Energy Awareness Campaign (23 Oct 2007)
10. OUSD memorandum, Energy Savings Performance Contracts and Utility Energy Services Contracts (24 Jan 2008)

Air Force Policies

1. SECAF Memorandum to ALMAJCOMs, "Appointment of the AF Senior Energy Official" (9 Dec 05), <http://www.af.mil/shared/media/document/AFD-060801-039.pdf>
2. SECAF Memorandum to (all) Airmen, "Energy Conservation" (6 Sep 2006), <http://www.af.mil/library/viewpoints/secaf.asp?id=269>
3. SAF Memorandum, "Clarification of Roles, Responsibilities, and Authorities Following the Departure of the Undersecretary of the Air Force" (4 Sep 2007)
4. SAF Memorandum, "Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management" (18 Sep 2007)
5. SAF/IE/AQ Memorandum to ALMAJCOMs, "Policy to Establish the Air Force Green Procurement Program" (29 Sep 2006), <http://www.af.mil/shared/media/document/AFD-070110-233.pdf>
6. AFDPD 23-3, Energy Management, (7 Sep 1993)
7. AFI 32-1061, Providing Utilities to US Air Force Installations (15 Mar 2002)
8. AFI 32-1021, Planning and Programming Military Construction (MILCON) projects (24 Jan 2003)
9. AFI 32-1032, Planning and Programming Appropriated Funded Maintenance, Repair, and Construction Projects (15 Oct 2003)
10. Air Force Aviation Fuel Conservation Policy (21 Sep 2006)
11. Air Force Guidance accompanying DoE Supplemental Guidance dated January 2008 (24 Mar 2008)

12. AFEPPM 96-3, Defense Utility Energy Reporting System (DUERS), (Jun 1996)
13. AFEPPM 96-2, Air Force Water Management Program (1 Jun 1996)
14. AFEPPM 04-1, Air Force Energy Management Plan (AFEMP), (Nov 2004)
15. AFEPPM 08-1, Air Force Energy Management Plan (AFEMP) Draft (Jan 2008)
16. AF/IL Memorandum, "Installation Energy Policy Goals and Reporting Requirements" (30 Dec 2005)
17. A7C policy, DoD Facility Metering Installation Initiative (27 Apr 2006)
18. A7C policy, Air Force Sustainable Design and Development (SDD) Policy (31 Jul 2007)
19. A7C Policy, Energy Savings Performance Contracts and Utility Energy Services Contracts (ESPC and UESC) Policy (30 Oct 2007)
20. AFCESA, Utility Managers Handbook (Mar 2006)

Unified Facilities Criteria, ETLs – More UFCs and ETLs available via these links

<http://www.wbdg.org/design/index.php>

<http://www.afcesa.af.mil/library/etl.asp?Category=Engineering%20Technical%20Letters>

1. UFC 3-400-01, Design: Energy Conservation, including change (2 Jan 2008)
2. UFC 3-410-01FA, Design: Heating, Ventilating, and Air Conditioning (15 May 2003)
3. UFC 3-401-01FA, Utility Monitoring And Control Systems (1 Mar 2005)
4. UFGS 26 27 13.10 30, Electric Meters (Oct 2007)
5. ETL 06-8, Energy Savings Performance Contracts, (19 Sep 2006) - (under revision)
6. ETL 08-13, Incorporating Sustainable Design and Development (SDD) and Facility Energy Attributes in the Air Force Construction Program (August 2008)
7. ETL 05-1, Use of Acrylic Diffusers with Metal Halide Fixtures (5 Feb 2005)
8. ETL 07-7, Compact Fluorescent Lamps (6 Nov 2007)
9. ETL 03-4, Alternate Fuels E85 and B20 (21 Oct 2003)
10. ETL 98-4, Building Manager Energy Conservation Handbook (1 Jan 1998)
11. ETL 90-10, Commissioning of Heating, Ventilating, and Air Conditioning (HVAC) Systems Guide Specification (17 Oct 1990)
12. ETL 86-16, Direct Digital Control of Heating, Ventilation, and Air Conditioning Systems (9 Dec 1986)
13. ETL 83-1, Design of Control Systems for HVAC (16 Feb 1983)

Vehicle Management Energy Programs

Statutes and United States Codes

1. Title 10 USC, Section 2632, Transportation To and From Certain Places of Employment and on Military Installations, 19 January 2004
2. Title 31 USC, Section 1344, Passenger Motor Vehicle and Aircraft Use, 3 October 2006
3. Title 40 USC, Subtitle 1, Chapter 3, Organization of General Services Administration, 19 January 2004
4. Title 40 USC, Subtitle 1, Chapter 5, Subchapter VI, Motor Vehicle Pools and Transportation Systems, 19 January 2004

Department of Defense Policies

1. DODD 4500.36, Management, Acquisition, and Use of Motor Vehicles, 10 April 1985
2. DODI 4715.4, Pollution Prevention, 18 June 1996
3. DOD 4140.26-M, Defense Integrated Materiel Management Manual for Consumable Items, 16 May 1997
4. DOD 4160.21-M, Defense Materiel Disposition Manual, August 1997
5. DOD 4500.9-R, Defense Transportation Regulation, Part II, November 2004
6. DOD 4500.9-R, Defense Transportation Regulation, Part III, April 2004
7. DOD 4500.36-R, Management, Acquisition, and Use of Motor Vehicles, 16 March 2007
8. DOD 5500.7-R, Joint Ethics Regulation, August 1993

Allowance Standards

1. AS 006, Organizational and Administrative Equipment, September 2006
2. AS 019, ALLMAJCOM Vehicle Support (Registered Fleet), January 2003
3. AS 157, Base Expeditionary Airfield Resources (BEAR), April 2006
4. AS 464, Civil Engineering Equipment, September 2006

Federal Acquisitions Regulations

1. FAR 7.401, Acquisition Considerations, March 2005 Edition
2. FAR 7.402, Acquisition Methods, March 2005 Edition
3. FAR 45.304, Providing Motor Vehicles, March 2005 Edition
4. FAR 45.310, Providing Agency-Peculiar Property, March 2005 Edition

Air Force Policies

1. AFPD 23-1, Materiel Management Policy and Procedures, 10 March 2006
2. AFPD 32-70, Environmental Quality, 20 July 1994
3. AFI 10-201, Status of Resources and Training System (SORTS), 13 April 2006
4. AFI 10-601, Capabilities Based Requirements Development, 31 July 2006
5. AFI 24-301, Vehicle Operations, 1 November 2001
6. AFI 32-7042, Solid and Hazardous Waste Compliance, 12 May 1994
7. AFI 32-7086, Hazardous Materials Management, 1 Nov 2004
8. AFI 36-2201V1, Training Development, Delivery and Evaluation, 1 October 2002
9. AFI 38-203, Commercial Activities Program, 19 July 2001
10. AFI 91-207, The US Air Force Traffic Safety Program, 1 October 1995
11. AFI 91-301, Air Force Occupational and Environmental Safety, Fire Protection and Health (AFOSH) Program, 1 June 1996
12. AFCSM 24-1, On-Line Vehicle Interactive Management System (OLVIMS), 1 September 1994
13. Vehicle Management Index File, <https://sevpqgm.robins.af.mil/vehicle/vmif/> (Formerly TO 36A-1-1301)





published by
the Office of The Air Force Civil Engineer