

**Statement of Dr. Kevin Geiss,
Deputy Assistant Secretary of the Air Force for Energy
for a Hearing before the
Senate Environment and Public Works Committee
Subcommittee on Green Jobs and the New Economy and the Subcommittee on Oversight
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Energy is a common thread that runs through every mission in the Department of Defense and each of us brings different capabilities to this challenge, but our overarching mission is the same: *protect the security of our nation*. Each day, the Air Force flies to points around the globe, including over 900 mobility missions a day to provide the Nation with *Global Vigilance*, *Global Reach*, and *Global Power*, missions that require significant amounts of energy. To meet our energy needs, the Air Force is leveraging sound business practices and making prudent investments in energy conservation and alternative sources of energy to enable our warfighters and improve our energy security. These investments are crucial to ensure we have the energy where and when we need it to conduct the military missions that protect our core national interests.

Energy Strategy

Energy is the corner stone of the Air Force's ability to maintain global vigilance, reach, and power at home and abroad. Energy security is having assured access to reliable supplies of energy and the ability to protect and deliver sufficient energy to meet operational needs. To enhance its energy security, we have developed a three-part strategy to:

- 1) Reduce energy demand through conservation and efficiency,
- 2) Assure and expand supply through alternative and resilient energy sources, and
- 3) Foster an Air Force culture to recognize the necessity and criticality of energy.

These three goals are aimed towards making energy a consideration in all we do. To support these goals, we have set a number of aggressive targets across our entire portfolio—targets that, if met, will help us avoid over \$1 billion a year (based on today’s energy prices) and improve energy security for our critical assets.

Energy Consumption and Expenditures

The Air Force is the largest single consumer of energy in the federal government, spending more than \$9.7 billion on fuel and electricity for approximately 2.5 billion gallons of aviation fuel and more than 64 trillion British Thermal Units (BTUs) of installation energy in Fiscal Year 2011 (FY11). That energy bill equates to over 8% of the entire Air Force budget. Expenditures for aviation fuel drive our energy costs—in FY11, we spent \$8.3 billion for aviation fuel, compared to \$1.1 billion for facility energy and \$323 million for ground vehicle fuels.

Despite our reduction in consumption, fuel costs have increased 225% over the past decade and we are expecting them to continue to rise in the future. Between FY10 and FY11, our energy costs increased by \$1.5 billion, an increase that occurred even as fuel use went down by more than 50 million gallons and facility energy consumption was reduced by 2 trillion BTUs. Moreover, as energy costs increase and take up more and more of our budget, it is essential that we continue to reduce the amount we consume. Every dollar we don’t spend on fuel frees up funds for reinvestment into capabilities for the warfighter.

ENERGY SECURITY

There are risks from depending solely upon traditional energy supplies, as access and costs are impacted by natural disasters, accidents, terrorism, and political instability. In addition to petroleum fuels, our installations are heavily dependant on the commercial grid. These

dependencies add risk to our core mission support functions and can jeopardize effectiveness. To address these, we are mitigating risks by identifying alternate sources of energy, building in redundancies, and identifying where and for how long we need to ensure we have the ability to operate. These challenges require an energy security posture that is *robust, resilient, and ready*.

- A Robust posture means that the Air Force has sufficient supply when and where we need it, regardless of external challenges.
- A Resilient posture means we have options – whether in terms of location or the types of fuel or electricity.
- A Ready posture means we are prepared to respond at a moment’s notice if energy supplies are compromised or our mission requires large amounts of additional fuel or electricity.

In short, energy security enables our warfighters, expands operational effectiveness, and enhances national security.

BUSINESS RULES

Our first priority is doing what is right to make sure we can achieve our mission. To achieve that, we are implementing no- or low-cost initiatives, such as policy changes, wherever possible, partnering with other federal agencies and private industry to share best practices, and investing in those material solutions that provide the best returns from both financial and energy security perspectives.

The Air Force recognizes the value of the limited financial resources available for investments. To ensure we are making the best use of taxpayer dollars, our corporate structure requires strong evaluations based on sound business case analyses, with a particular focus on return on investment and payback period. Every action taken by the Air Force to improve its

energy security and efficiency is well researched and executed to provide the greatest impact in support of the Air Force mission.

The Air Force is also looking at private investment wherever possible, particularly with regards to developing renewable energy sources and reducing our facility consumption. By utilizing this approach, we can improve our energy security and take advantage of underutilized land with little or no additional costs to the taxpayer. Beyond our installations, we are looking to expand the concept of third party investment into other areas of our operations.

INSTALLATIONS

The Air Force's infrastructure portfolio is immense—we serve as the taxpayers' stewards for an amount of land twice the acreage of New Jersey, almost 90 times more facility square footage than the Microsoft Corporation, and enough airfield runways that would be equal to the length of a highway from Philadelphia to Boston. And each of those items requires electricity, heating and cooling, or water to fulfill their mission requirements. At our installations, the Air Force spent more than \$1 billion for facility energy in both FY10 and FY11. To improve our energy security and reduce our costs, we are actively pursuing on-base renewable energy projects and identifying ways to conserve energy.

Renewable Energy

The Air Force is looking to improve its energy security and diversify its energy supply through increased use of renewable energy. In FY11, more than 6% of the electrical energy used by the Air Force was produced from renewable sources. By making the most of private sector knowledge, technology, and financing, we plan to improve our energy security by capitalizing on

underutilized land on our installations to develop those projects. Currently, the Air Force has 131 operational renewable energy projects and another 50 under construction across a wide variety of renewable energy sources, including 8.7MW from wind energy, 26.2 MW from solar, and 2.4MW from waste-to-energy projects.

The Air Force has been a green power partner with EPA since 2003, and we are currently the second largest user of green power in the federal government, behind only the Department of Energy. During our partnership, we have received multiple awards for our leadership in renewable energy. While the accolades are appreciated, they are not the reason the Air Force is pursuing on-base development of renewable energy sources. We develop renewable projects to diversify our energy portfolio and reduce stress on the commercial grid.

For example, the Air Force recently installed a 1.45MW solar project at Burlington Air National Guard Base, Vermont, including a roof-mounted array on the fire station, which serves not only the base, but also the Burlington International Airport and the local surrounding community. Combined, these projects produce 40% of the installation's needs, and are expected to save the Air National Guard \$246,000 in electric costs a year. More importantly, the base will be helping reduce the stress on the commercial grid and increasing its energy resiliency.

The Air Force is pursuing renewable energy on a cost effective basis through a three-tier priority order. The first priority is to develop renewable energy generation either on Air Force property or on adjacent federal property. There are three avenues to accomplish this. First, a renewable energy Power Purchase Agreement (PPA) may be developed with third parties under a utility purchase contract. This allows third party developers to obtain financing and build renewable generation with cost recovery through a long-term utility purchase agreement. Second, the Air Force can sign an agreement with a utility or other third party to provide

renewable energy at a pre-negotiated rate. Third, a direct Air Force investment could be made to construct the renewable power generator.

Direct Air Force funding of renewable projects is very rarely cost-effective when compared to commercial utility rates, due to the inability of federal agencies, including the Air Force, to gain the benefit of renewable energy certificate (REC) sale value, tax rebates, and state or federal incentives. If the Air Force attempted to meet the renewable energy goal through direct investment, the cost would be over \$7 billion, based on our history with recent renewable energy projects and the current cost of power.

To address this, the Air Force is using existing authorities, such as Enhanced Use Leases (EUL) and PPA, to attract private industry to develop renewable energy projects on underutilized land on Air Force installations. The Air Force is anticipating third-party investments could reach more than \$1 billion over the next 5 years to construct on-base renewable projects, while we plan to invest only \$5 to \$8 million a year for renewable projects over the same period. The Air Force has set a goal to identify \$5 billion worth of EULs and over half will be energy EULs.

The second priority is to purchase renewable energy from a distant producer and have it delivered to us via the normal power grid. The third priority is to purchase RECs along with the renewable power from an off-base generator.

Energy Conservation

Overall, our focus is to reduce our energy footprint across all operations and we have made significant progress. We have reduced our overall facility energy consumption by nearly 20% and reduced energy intensity by more than 16% since FY03. However, installation energy

expenditures have increased by 32% over that same period due to increase prices for electricity. Looking long term, the Air Force is on track to meet its installation energy goals by reducing its energy intensity by 37.5% by 2020 and increasing its renewable energy use to 25% by 2025.

Included in our FY13 budget request is \$215 million for energy conservation projects on our installations, a continuation of the nearly \$800 million we have invested in such projects over the last four years. As a result of the initiatives put in place over the last eight years, we have cumulatively avoided \$1.1 billion in facility energy costs since FY03, including over \$250 million in additional facility energy costs in FY11 alone, which is money that could be redirected to better support our warfighters. Investments we are making in FY12 to improve our facility energy efficiency and reduce our energy requirement are expected to start generating savings in FY14, and the majority are expected to payback before or just shortly after the FY13-17 Future Years Defense Plan (FYDP) period.

For example, at Dover Air Force Base, Delaware, the Air Force recently began a heat plant decentralization project. This project, which replaces a 1950's era system, is estimated to save about \$2 million a year by reducing energy use by more than 15% per year. All new building projects on base are also having new boilers installed, so no new specialized training will be required. The project is scheduled to be completed in December 2012, and we anticipate recovering our funding costs in 12 years.

The Energy Conservation Investment Program (ECIP) is a critical element of the Air Force's strategy to improve the energy performance of its permanent installations. In FY11, we completed 17 ECIP projects at a cost of under \$30 million. The Air Force estimates these projects will save more than 253 billion BTUs annually and nearly \$54 million over the life of the projects. For FY12, we have submitted an additional six projects to save 213 billion BTUs to the Office of the Secretary of Defense (OSD), which manages ECIP.

The Air Force is looking to reduce demand by building in smarter ways that maximize energy efficiency and use environmentally-friendly materials. We are also identifying and demolishing 20% of our old, unnecessary, and high-energy use facilities by 2020.

Greenhouse Gases

The Air Force has a robust Strategic Sustainability Implementation Plan that supports DoD's Strategic Sustainability Performance Plan, which provides a coherent approach both for complying with multiple federal requirements for sustainability, including the reduction of greenhouse gas emissions, and for ensuring the mission. While the Air Force does generate greenhouse gases from some process activities, such as wastewater treatment plants, the vast majority of our greenhouse gas emissions, which contribute to climate change, are attributable to our use of energy in the form of electricity and fuels to power, heat, and cool our weapons systems, vehicle fleets, and facilities. By reducing our energy consumption and increasing our use of renewable energy, we improve our energy security, as well as reduce greenhouse gas emissions in support of U.S. climate change initiatives. As our energy use has declined, so have our greenhouse gas emissions; specifically, Air Force greenhouse gas emissions resulting from the direct and indirect use of energy are down over 17% against a 2008 baseline. Climate change has the potential to significantly impact future Air Force actions—from the environments where we operate to the missions we undertake and where our facilities can be located. It is essential we consider the impacts to our capabilities and our energy security in future planning efforts.

AVIATION

The Air Force's aviation fleet is composed of more than 4,600 aircraft that consume nearly 2.5 billion gallons of jet fuel every year. Our fleet represents the largest category of energy consumption in the military, accounting for approximately 59% of the total DoD aviation fuel

consumption. Aviation fuel costs represent a significant financial requirement for the Air Force. To help mitigate the impact of those costs, we have set a target to reduce aviation fuel consumption 10% by 2015 based on our 2006 consumption. While this 10% reduction target—which equates to 254 million gallons—is aggressive, if we can achieve it, there will be a big impact. Since 2006, the Air Force has reduced its aviation fuel consumption by 4%, which translated into a cost avoidance of \$165 million in 2011. In 2015, if the price of fuel were at \$4, the Air Force would avoid more than a billion dollars of energy costs.

Efficiencies

Efficiency is not just about aircraft improvements, but also changing how we fly. To address this, the Air Force is looking at policy changes across our mobility, combat, and training aircraft, in addition to investments in equipment. The Mobility Air Forces account for 64% of aviation fuel consumption within the Air Force, and as their mission lends itself to capturing lessons from industry, these aircraft have been our primary focus for energy savings.

For example, Air Mobility Command (AMC) updated their policies to eliminate any extra fuel carried, while still maintaining safety standards. Category 1 fuel requirements existed for decades as an added amount of reserve fuel equal to 10% of the time over water (outside of ground-based navigation systems) to account for inaccurate navigation systems. With technological advances and current on-board navigation systems requirements, this additional fuel is unnecessary, and by eliminating the requirement (and associated excess weight) we estimate an annual savings of 5 million gallons in fuel, or more than \$19 million a year based on today's fuel prices. While each one of these policy changes is small, together they add up to 19.5 million gallons of fuel, or \$75 million, in FY11, with an expected savings of \$325 million

over the Future Years Defense Program (FYDP). With these efficiencies put into practice, the cost for AMC to move 1 ton of cargo 1 mile by air is down by 21% and the Air Force was able to move 27% more cargo on just 3% more fuel last year.

Alternative Aviation Fuels

While we endeavor to reduce demand in our aviation fleet, we are also focused on increasing and diversifying the supply side of the equation to improve energy security. The Air Force views energy security as a strategic imperative and alternative fuels are key to addressing that imperative. To demonstrate our commitment to this effort, we set a very ambitious target to be prepared by 2016 to meet half of our domestic jet fuel needs via an alternative fuel blend by ensuring our aircraft can fly on commercially available fuels. These blends must be drop-in fuels that are cost competitive with traditional petroleum-based jet fuels and meet our environmental and technical specifications.

To get there, we are certifying our aircraft to fly on three different alternative fuel blends, all of which are half-traditional petroleum-based JP-8 fuel and half-alternative fuel. The first blend the Air Force tested was synthetic fuel developed using the Fischer – Tropsch process. The Air Force has completed the testing and certification process for 100% of its fleet on a 50/50 blend of Fisher-Tropsch and JP-8. By applying lessons learned and experience from the extensive Fisher-Tropsch certification program, the Air Force conducted certification of the second alternative fuel effort, hydro-treated renewable jet (HRJ) fuel, using a “pathfinder” approach. Only the most challenging systems, such as the C-17 and F-15, were tested and the rest of the fleet will be “certified by similarity.” The Air Force expects to complete certification of the entire fleet by the end of 2012. The Air Force is beginning to evaluate a third alternative

fuel process called alcohol-to-jet (ATJ), which is produced using cellulosic materials.

Depending on funding availability, the Air Force anticipates completing certification efforts by 2014 using the “certification by similarity” approach used for HRJ.

By preparing for a variety of alternatives, we are ensuring we will be ready for whatever private industry is able to bring to market, as well as having the flexibility to use those fuels in different areas of the world, depending on the availability of fuel stocks and refining capability. Since we started our certification initiative in 2006, we have purchased 1.1 million gallons of alternative fuels. Through our certification process, we are ensuring we will be ready to purchase a variety of different fuels by 2016 but we are just a purchaser, not a producer, of alternative aviation fuels. The Air Force’s core competency is understanding the fuel/engine interface, not producing fuel. We will need industry to produce those fuels in a manner that meets our criteria.

Promising market opportunities and testing of these fuels in the field are positive steps; however, we recognize that to achieve our ambitious goal, we need to be involved directly with the private sector to share lessons learned, establish standards, and support the development of these fuels as a consumer. While the Air Force consumes a large amount of fuel, we are relatively small compared to the commercial sector. Overall, the Air Force makes up just 11% of the aviation fuel market in the United States, about the same as American Airlines. This means that while we do have some market power, we are not large enough to drive the market.

To help move the market and provide the ability to exchange data and best practices, we are partnering with commercial industry through the Commercial Aviation Alternative Fuels Initiative (CAAFI). CAAFI includes other government entities like the Federal Aviation

Administration, along with airlines, airports, aircraft and engine manufacturers, energy producers, researchers, and international participants. Together, we developed a repeatable process to certify fuels in a way that helps both commercial aviation and the military. Through CAAFI's efforts, ASTM International, which develops industry technical standards, approved the 50% HRJ blend for use in commercial aircraft in July 2011. As several of our aircraft are commercial derivatives, we can apply the aircraft certifications directly to our fleet.

Role of RDT&E

Innovation is part of our DNA and the Air Force is on the lookout for ways to improve warfighter effectiveness. Led by Dr. Maybury, the Air Force Chief Scientist, a team from across the Air Force collaborated with other Services and federal agencies to identify a framework for thinking about new energy technologies that are being developing in the near, mid, and long terms. The report looks at all aspects of the Air Force mission—air, space and cyberspace—and evaluates many technologies, including aircraft engines, airframe design, energy storage, and best practices in planning and logistics. Energy Horizons identifies three priority categories for technology:

- Technology Leader – The Air Force is inventing novel technologies that are at the core of our mission. Aircraft engines and airframes fall into this category.
- Fast Follower – The Air Force is not at the forefront of research but looks to rapidly adopt, adapt, or accelerate technologies originating from external leading organizations.
- Technology Watcher – The Air Force stays aware of developments and is ready to adopt technology as it matures.

While some are unique, many of the challenges we face are similar to those of the Army and Navy, federal agencies, and private industry and we are actively partnering with them to leverage each entities unique expertise, resources, and experience. For the Air Force, we are

focusing our RDT&E efforts primarily to meet our aviation, space, and cyberspace missions, as opposed to areas where there is significant overlap with our Sister Services or private industry. For example, in FY13 we are investing more than \$300 million in energy RDT&E, which includes \$214 million for the Adaptive Engine Technology Development (AETD) initiative. This initiative will build upon the Adaptive Versatile Engine Technology (ADVENT) effort to reduce energy consumption and improve efficiency and reliability of future and legacy aircraft, and estimates are that it will be as much as 25% more fuel efficient than current technology.

GROUND VEHICLES

In FY11, the Air Force spent \$323 million on fuel for ground vehicles and equipment, or 96 million gallons, which equates to approximately 3% of the overall Air Force energy costs. This is an increase of \$13 million from FY10, even though consumption declined by 20 million gallons. The Air Force is committed to reducing the amount of petroleum products it utilizes for its ground vehicle fleet, and has targets to reduce fossil fuel consumption 2% annually through 2020 while increasing alternative fuel usage 10% compounded annually by 2015. The Air Force has made significant progress towards both targets seeing a reduction in vehicle petroleum consumption by 8% and an increase in alternative fuel use by 70% since 2005 (in its CONUS based vehicle fleet applicable to executive orders and federal mandates). The Air Force's plan to meet its targets include: implementing an acquisition strategy to procure the right-sized, least cost vehicle option; maximizing the use of alternative fuels; and increasing the use of hybrid electric vehicles and explore the use of plug-in electric vehicles.

Right sizing

One effort that the Air Force is undertaking right now is right-sizing our motor vehicle fleet, which entails eliminating unfilled and underutilized vehicle authorizations to get to true mission needs , and using more fuel-efficient vehicles. To date, the Air Force has identified over 5,000 vacant or underutilized vehicle authorizations. The Air Force has also been working on a midsize and large vehicle burn down plan to reduce the number of high gas-consuming vehicles. Over 2,250 vehicles have been identified for down-sizing to smaller, more fuel efficient vehicles, and over 725 of those have already been down-sized.

Alternative Fueled Vehicles

In FY11, the Air Force consumed 1.7 million gallons of alternative fuel (E85 ethanol and biodiesel) and has 28 E85 stations and 63 B20 stations on Air Force installations. We now have over 10,000 E85 capable vehicles in the light duty fleet, compared to only 9,000 in FY10. The Air Force has also incorporated nearly 1,000 hybrid electric vehicles into its vehicle fleet.

The Air Force is not just limiting its efforts to incorporating alternative fueled ground vehicles into our fleet through acquisition, but is also working to ensure such vehicles as compatible with its mission. With the support of other private and public stakeholders, the Air Force is currently working to develop an all plug-in electric vehicle fleet at Los Angeles Air Force Base (AFB) in California. When the initiative is completed later this year, Los Angeles AFB will be the first federal facility to replace 100% of its general-purpose vehicle fleet with plug-in electric vehicles. By working with OSD and our Sister Services, we have identified 15 other potential locations where such vehicles will support the mission and improve our energy security. We will use the lessons learned at Los Angeles AFB to continue to refine the business case and operational analyses to determine where best to employ electric vehicles.

CONCLUSION

From aviation operations to installation infrastructure within the homeland and abroad, energy enables the dynamic and unique defense capabilities the Air Force requires to fly, fight and win...in air, space and cyberspace. Effective and efficient energy management is not only necessary, it is critical to assuring energy availability today and energy sustainability into the future to ensure the Air Force can execute these missions. We are making business-driven investments to reduce our energy demand and assure our supply to meet our mission needs. The Air Force is taking a coordinated, progressive, and comprehensive stance towards energy management through the integration of its three-part energy strategy to reduce demand, assure supply, and foster an energy aware culture. This approach will lead to enhanced energy security and reduced energy costs, and enables our warfighters, expands operational effectiveness, and enhances national security.