



U.S. AIR FORCE



AIR FORCE ENERGY PLAN 2010





The Air Force Energy Plan serves as the operational framework for all military and civilian Air Force personnel in communicating the Air Force energy goals, objectives and metrics. The Air Force Energy Plan aligns with the goals outlined in the Air Force Strategic Plan, and is aligned under the Agile Combat Support Master Plan. Air Force energy goals, objectives, and metrics are specified in the Air Force Energy Plan, as well as the cross-functional governance and management structure of all levels of the Air Force command responsible for executing the Air Force Energy Policy stated in Air Force Policy Directive (AFPD) 90-17, *Energy Management*, dated 16 July 2009, and Air Force Instruction (AFI) 90-1701, *Energy Management*, dated 16 July 2009. The Assistant Secretary of the Air Force for Installations, Environment and Logistics (SAF/IE) is the Office of Primary Responsibility (OPR) for the Air Force Energy Plan and serves as the Director of the Headquarters Air Force (HAF) Energy Program Management Office (EPMO).

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Secretary of the Air Force

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1 Executive Summary

The Air Force's mission—to *fly, fight, and win...* in air, space, and cyberspace—entails operations that require a tremendous amount of energy. The Vision for the Air Force Energy Plan—"Make Energy a Consideration In All We Do"—highlights that energy is central to all of the interdependent functional aspects of the Air Force's mission execution. As such, the Energy Plan aligns with the goals outlined in the Air Force Strategic Plan, the Agile Combat Support Master Plan as well as the Deputy Chief of Staff for Logistics, Installations & Mission Support Strategic Plan Goal 4.6. The Air Force Energy Plan supports Air Force priorities and provides links to energy goals established by the federal government.

Energy management is an evolving process that will require the systematic incorporation of new information, rigorous insertion of technological advancements, and continuous improvement of processes and practices.

The Air Force Energy Plan is built upon three pillars that guide energy management within the Air Force. Each pillar of the Plan is equally important. The pillars of the Air Force Energy Plan are as follows:

- **Reduce Demand:** The Air Force is committed to reducing aviation, ground operations, and installation energy demand. The goals and objectives developed to reduce demand cover each of these areas and provide the framework for each executing organization.
- **Increase Supply:** The Air Force is committed to increasing the amount of energy supplies available to enhance our nation's energy security. Where possible, the Air Force will develop and utilize renewable and alternative energy to reduce greenhouse gas emissions. The goals and objectives to increase supply target these three areas: aviation fuel, ground fuels, and installation energy.

- **Culture Change:** Changing the Air Force culture is critical to achieving the Air Force's Energy Vision. As the culture changes and the Air Force increases its energy awareness, new ideas and methodologies for operating more efficiently will emerge as airmen consider energy in their day-to-day duties.

In order to ensure the integration of all three pillars across Air Force operational areas, the Air Force has established a management structure, known as the Energy Senior Focus Group (SFG), to oversee all energy management issues within the Air Force. The Energy SFG coordinates energy-oriented considerations across multiple platforms, including aviation operations, acquisitions/technology, installations/infrastructure, and support equipment/systems.

The Air Force is proud to be a leader in America's ongoing quest to use energy more efficiently through better procedures and new technologies while, at the same time, decreasing energy consumption and the nation's dependence on imported oil.

To address this challenge, the Air Force Energy Plan provides a comprehensive and cohesive framework for all airmen to utilize in determining how to make energy a part of operational considerations. From developing new energy options that include secure and reliable energy alternatives to energy efficiency and conservation initiatives, the Air Force is making great strides in shifting the culture to where energy is a major component of Air Force operations, which helps sustain mission readiness and responsiveness on a global scale.

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2 Background

Reliance and Criticality of Energy to Air Force Operations

Energy availability and management is critical to Air Force readiness. Energy enables the Air Force to deliver its designed capabilities without unacceptable delay and is essential for successful execution of the mission. From installation infrastructure to aviation operations, energy provides the Air Force with the power it needs to perform.

Energy availability and security impacts all Air Force missions, operations, and organizations, and is necessary for the support of Air Force priorities. Energy enables the Air Force to develop and care for airmen and families in training and daily living. The Air Force must have reliable energy supplies to meet the demands of the overseas contingency operations and protect our nation from emerging threats. Though there is no silver bullet solution for reducing energy dependence in day-to-day operations, the Air Force is dedicated to integrating energy management across mission areas and implementing a portfolio of renewable and alternative energy projects that will enhance the Air Force's energy security.

Energy flows throughout the Air Force, whether it is from well-to-wing, grid-to-buildings, or well-to-wheel. Energy flows are critical to chart so that all Air Force personnel and leadership understand the channels through which their operational capabilities are established. From the acquisition of jet fuel to the transmission of electricity to installations, energy flows in Air Force operations are a complex

network of supply-and-demand chains that are potentially vulnerable to disruption and have serious implications for national security.

Whether on the ground, in the air, or up in space, energy use pervades Air Force operations. Energy management is critical to sustaining Air Force mission readiness. From utilizing flight simulators for training to applying space satellites (i.e., global positioning systems) for flight route configuration, the Air Force can reduce its energy use across platforms.

Maintaining dominance in both space and cyberspace is critical to Air Force operations. Specifically, the Air Force relies on satellite technologies for navigational purposes, which can additionally be used for land surveying, map-making, and scientific monitoring. Military applications of satellite technologies span from missile guidance to search and rescue operations, and are increasingly utilized as an energy optimization tool by facilitating direct routing and efficient profile descents. Global Positioning System (GPS) technology enhances the conduct of mission operations by providing accurate position, velocity and time determination on a worldwide scale, which can be converted into data that provides real-time and continuous information sources. Computer technology enables the transfer of information from satellite technologies into utilizable formats. Since critical infrastructure systems, such as the electrical grid, are managed through computer networking systems, energy security needs to be viewed not just from a physical infrastructure standpoint, but also a cybersecurity standpoint. The emergence of "cyber spies" that infiltrate sensitive computer networking systems, including computer

control units that manage the electrical grid, illustrates how energy security directly relates to national security. Providing power to installations and aircraft is contingent upon continuous energy flows, yet in the event of a grid or fuel delivery disruption, the ability of the Air Force to sustain mission-critical operations is limited to short-term backup power systems. For this reason, a comprehensive Air Force Energy Plan is required.

Synopsis of Air Force Energy Use

The Air Force is the largest consumer of energy in the U.S. federal government, as our mission and global operations require a tremendous amount of energy. In Fiscal Year (FY) 2008, the Air Force spent approximately \$9 billion to fuel aircraft and ground vehicles and provide utility services (primarily electricity and natural gas) to installations. The Air Force is also the largest purchaser of renewable energy in the federal government, and is continuously seeking out interagency/industry partnerships to expand its renewable portfolio. As the Air Force modernizes aircraft, satellites, and equipment, new energy technology will be incorporated into these systems to enhance the energy efficiency of Air Force operations. To optimize energy usage across mission areas, it is imperative that the Air Force continually refines its Energy Plan and creates a culture that is mindful of the footprint we leave on the environment, and yet produces combat power, yielding options for America.

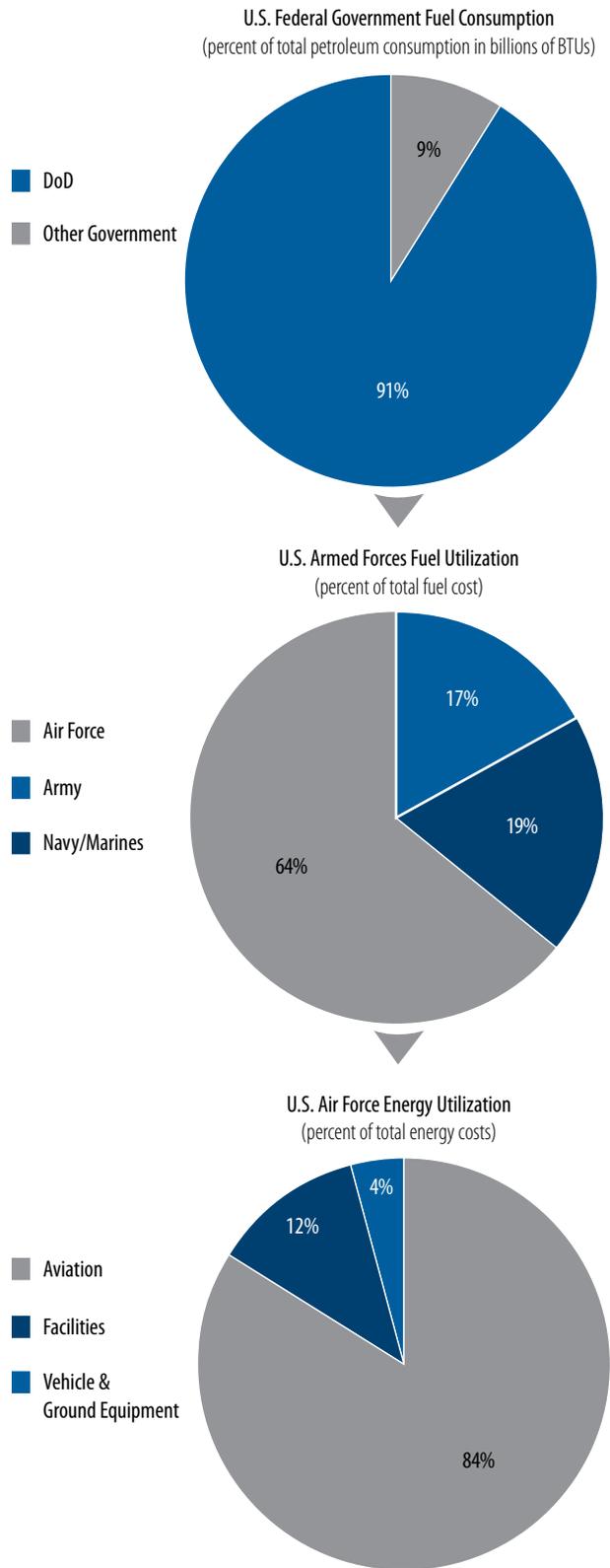
In response to rising energy costs, energy security considerations, and international concerns regarding greenhouse gas emissions, the Air Force Energy Plan serves as the framework for integrating energy considerations across Air Force operations. Energy is a key enabler of U.S. military combat power and, as such, must be managed in an integrated manner. From stationary infrastructure to mobility aircraft, Air Force energy demands are expansive and expensive.

The United States Air Force’s mission is to *fly, fight, and win...* in air, space, and cyberspace. This mission requires global reach and flawless performance by the most sophisticated and advanced aircraft and trained Air Force staff in the world. To conduct this mission, the Air Force uses approximately 2.5 billion gallons of aviation fuel per year and is the largest fuel consumer in the federal government.

Figure 1 provides a summary of the U.S. federal government energy consumption universe, which illustrates the percentage of energy consumed from the Department of Defense (DoD) level down to the Air Force operational level. The U.S. federal government is the world’s largest volume-buyer of energy-related products, with the DoD accounting for approximately 91 percent of all federal government energy consumption. By disaggregating the U.S. Armed Services, the Air Force consumes the largest proportion of DoD energy inputs (64 percent), with aviation operations accounting for approximately 84 percent of the Air Force’s energy consumption, or approximately 50 percent of DoD’s energy consumption.

Energy is a critical component of Air Force strategy and sustainability. Due to the magnitude of energy consumed by the Air Force, any actions taken to reduce energy consumption and procure alternative/renewable energy sources are significant in their potential impact for enhancing energy and national security.

Figure 1 U.S. Federal Energy Consumption Snapshot: From the Federal Government to the Air Force





3 Vision: Make Energy a Consideration in All We Do

Achieving the Vision of the Air Force Energy Plan involves establishing a clear picture of how energy impacts the Air Force's critical capabilities: Global Vigilance, Global Reach, and Global Power. Energy must be recognized as the base ingredient for Air Force missions and operations. By considering energy in every mission and organization, the Air Force can leverage energy as a combat enabler.

By building a solid foundation of energy operational awareness, the Air Force will evolve into a more sustainable security force, both environmentally and strategically. Understanding the implications of energy supply and utilization across all operational domains (i.e., air, land, sea, and space) will enhance the response capabilities of the Air Force by preparing personnel to recognize energy as vital to operational readiness across these domains. From aircraft and ground vehicle refueling requirements to satellite orbit and information transmittance capabilities, the Air Force must address the impacts of energy and the systems that support energy flows. This will entail effective forecasting of emerging energy supply vulnerabilities, incorporating energy factors into technology research, development, and deployment processes, and applying readily available energy-saving techniques and technologies across Air Force operational platforms, all of which will make the Air Force vision a reality.

Energy End State Goals to Achieve by 2030

The Air Force Energy Plan is built upon a core set of goals, objectives, and metrics designed to provide the platform for continuous

improvement in Air Force energy management techniques. The Air Force will approach energy management issues from both a short- and long-term perspective, achieving energy savings by instilling basic behavioral shifts while charting new territory in creating a more sustainable energy future for the Air Force.

In order to move in this direction, the Air Force must envision its energy state in the future. This entails outlining core energy end state goals to set the long-term trajectory for the Air Force to realize its Energy Plan. Achieving these goals increases the Air Force's energy security posture and provides a picture for all Air Force personnel to envision as they join together in building a sustainable energy future.

The Air Force's Energy End State Goals are designed to ensure that the Air Force progresses toward energy management considerations that will position the Air Force in being a cutting-edge leader in the arenas of renewable energy, alternative fuels, advanced design systems, and sustainability. Achieving the Energy End State Goals (referred to in Figure 2) will not only minimize the Air Force's environmental footprint, but it will enhance the energy security and resiliency of the United States. The Air Force Energy End State Goals serve as an ever-evolving framework, recognizing that new information and advances on the energy management front will require the refinement of the Air Force Energy Plan. Yet the Energy End State Goals withstand the test of time, as they represent overarching aspects of energy management as it pertains to the Air Force.

Figure 2 Air Force 2030 Energy End State Goals

End State Goals

- Sustainability strategies are incorporated to aid in greenhouse gas mitigation
- Bases meet Air Force energy security criteria, while optimizing the mix of on-base and off-base generation
- Aircraft are flying on alternative fuel blends if cost competitive, domestically produced, and have a lifecycle greenhouse gas footprint equal to or less than petroleum
- Forward Operating Bases are capable of operating on renewable energy
- Energy utilization is optimized as a tactical advantage across disciplines
- Research, Development, Test, and Evaluation (RDT&E) has delivered the new cost-effective energy technologies necessary to substantially reduce demand and increase supply
- Acquisitions prioritize energy as a key consideration
- Make energy a consideration in all that we do





4 Creating a Framework for Energy Management Across the Air Force

The Air Force Energy Plan supports Air Force priorities and provides a framework for energy management across the Air Force to achieve both federal and Air Force-specific energy goals. The Air Force aims to continually improve its energy management processes to maximize energy conservation and promote alternative energy platforms.

The Air Force Energy Plan is built upon three primary pillars: *Reduce Demand*, *Increase Supply*, and *Culture Change*. Each pillar has been defined and further developed to include implementing goals, objectives, and metrics. This three-pronged Energy Plan integrates demand-side energy efficiency with supply-side alternative energy utilization, both of which are enhanced by creating a cultural climate that values energy as a mission-critical resource that must be managed. Below is a synopsis of the overarching goals of the Air Force Energy Plan:

- **Reduce Demand:** Through energy efficiency and conservation measures, and by raising awareness of the need to reduce Air Force energy consumption.
- **Increase Supply:** By researching, testing, and certifying new technologies, including renewable, alternative, and traditional energy sources, the Air Force can assist in creating new domestic energy supplies.
- **Culture Change:** The Air Force must create a culture where all airmen make energy a consideration in everything they do, every day.

The next section of the report provides the strategic framework for how each energy goal will be accomplished, by outlining specific objectives and metrics associated with reducing demand, increasing supply, and changing the culture within the Air Force. Each Air Force Energy Plan goal is represented in what we refer to as an “Energy Goal Flow Diagram.” The “Energy Goal Flow Diagrams” are designed to illustrate the dynamic process involved in achieving the Air Force Energy Goals by connecting overarching goals and objectives with specific implementation goals, objectives, and metrics to measure progress toward meeting the Air Force Energy Plan.

Figure 3 Air Force Energy Plan Pillars



Figure 4 Air Force Energy Goals, Objectives, and Metrics





5 Constraints/Assumptions that Impact the Implementation of the Air Force Energy Plan

Accomplishing the goals and objectives of the Air Force Energy Plan will require a convergence of conditions: adequate financial resources to make the Air Force Energy Vision a reality, support of personnel in executing energy-related endeavors, and an evolving knowledge of existing and emerging energy issues affecting the Air Force. These conditions are central to the implementation of the Air Force Energy Plan and thus must be taken into consideration as the Air Force integrates energy management across its operational areas.

Funding

Because energy is an operational requirement of Air Force mission readiness, budgetary priorities need to reflect this reality and enable the systematic deployment of energy management programs across the Air Force. Reaching Air Force energy goals will require targeted investments in projects that enhance the Air Force's ability to affect substantial reductions in energy usage rates and enhancements in domestic energy supplies. Funding drives the pace of energy initiatives; therefore, funding must be aligned and balanced to support the transformational changes required to realize Air Force energy goals and objectives. Additionally, the cost-savings potential associated with Air Force energy management measures will help mitigate against future budgetary constraints and energy price volatility. The Air Force needs to provide options to manage financial and operational challenges generated by the cost and availability of oil and other forms of energy.

Operations Tempo

Maintaining a high degree of mission readiness and response is the key to ensuring national security. As U.S. military operations span a global scale, operations tempo (optempo) drives energy consumption rates and are conversely dependent on energy to drive Air Force operations. No matter what the pace of U.S. military operations is now and in the future, the Air Force must integrate energy management strategies seamlessly into Air Force operations so that our military can sustain its mission capabilities. Enhancements in operational efficiencies will not only save energy and money, but can also extend the lifespan of equipment and reserves of energy supplies, thus reducing the vulnerabilities associated with replenishing our forces and equipment during operational endeavors. The Air Force will continue to explore how it can configure its operations to be more efficient, even during periods of high optempo. Accessibility to energy supplies and delivery infrastructure will be critical in maintaining a high optempo.

Energy Expertise

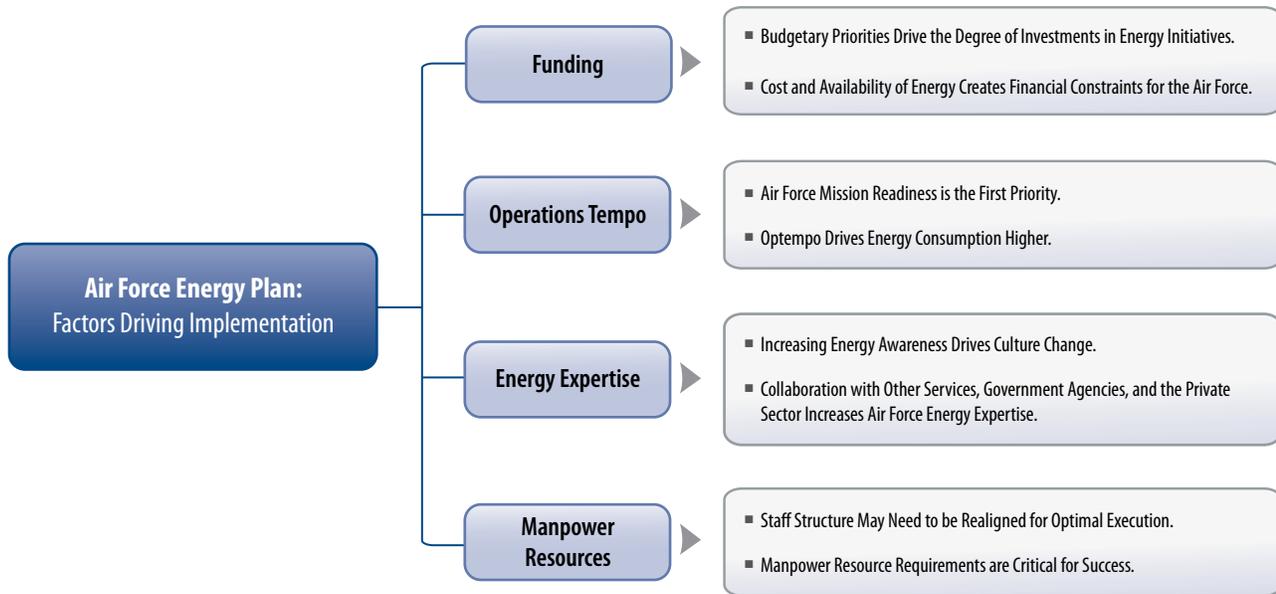
To achieve a culture shift in energy usage patterns, an increase in energy knowledge is required. Experts enable outcomes by exercising a functional understanding of how energy systems work in the context of the Air Force. Yet not all Air Force personnel can be energy management experts; developing this expertise is time-consuming and beyond the immediate mission scope of all Air Force operational arenas. Therefore, Air Force personnel with

energy expertise will need to share that knowledge and provide leadership in designing energy initiatives from the unit level up to the Major Command (MAJCOM) level. Information needs to be effectively disseminated across the Air Force to translate ideas into reality. The Air Force will need to continue to collaborate with other federal government agencies that specialize in energy issues and access opportunities for applying knowledge and technologies in Air Force operations. Leveraging interagency and industry partnerships will enable the Air Force to apply best-in-field knowledge without over-extending its own personnel.

Manpower Resources

The Air Force is constantly assessing its manpower requirements, but realizes this is a limited resource. As the range of Air Force operations expands, prioritization and maximization of available resources will be critical toward maintaining mission capabilities. Identification of efficiencies and process improvements will enable the Air Force to meet growing demands and changing priorities within these manpower resource constraints.

Figure 5 Conditions Affecting the Implementation of the Air Force Energy Plan





6 Governance Structure

The Energy Senior Focus Group (SFG) is the steering group for Air Force energy decisions. It is chaired by the Senior Energy Official, the Under Secretary of the Air Force, and the Vice Chief of the Air Force. Membership representation is at the General Officer level from each organization. The Energy SFG's scope extends to all energy use and management issues within the Air Force to include aviation, installation, ground transportation, and support equipment and systems, as well as associated science and technology opportunities. The Energy SFG does not replace normal staffing activities on energy issues within the Air Force Headquarters. However, it is expected that Air Force officers' responsible for energy issues will keep the Energy SFG informed of ongoing activities and programs. The Energy SFG is responsible for ensuring all goals and objectives of the Air Force Energy Plan are properly integrated across SFG Working Groups.

SFG Working Groups

The Air Force Energy Plan requires analytical, institutional, administrative, and management support that provide the foundation for the three Pillars: Reduce Demand, Increase Supply, and Culture Change. In order to facilitate the advancement of energy management integration across Air Force mission areas, the Energy SFG established Working Groups to provide support on specific issues. The five primary Working Groups are:

- Aviation Operations
- Acquisition and Technology

- Provide Infrastructure
- International
- Culture Change

Each Working Group develops guidance, reporting metrics, and other documents and tools relating to its area of Air Force energy management. The SFG Working Groups may establish subcommittees to make recommendations for addressing implementation issues that are identified. The synergy between the SFG Working Groups link decision making and advocacy, thus optimizing resources and program performance. The Energy SFG has the authority to task Air Force Headquarters and MAJCOM offices to conduct special studies and report on the status of energy-related initiatives and programs. The Energy SFG serves as the single voice on energy-related matters both internally and externally to the Air Force.

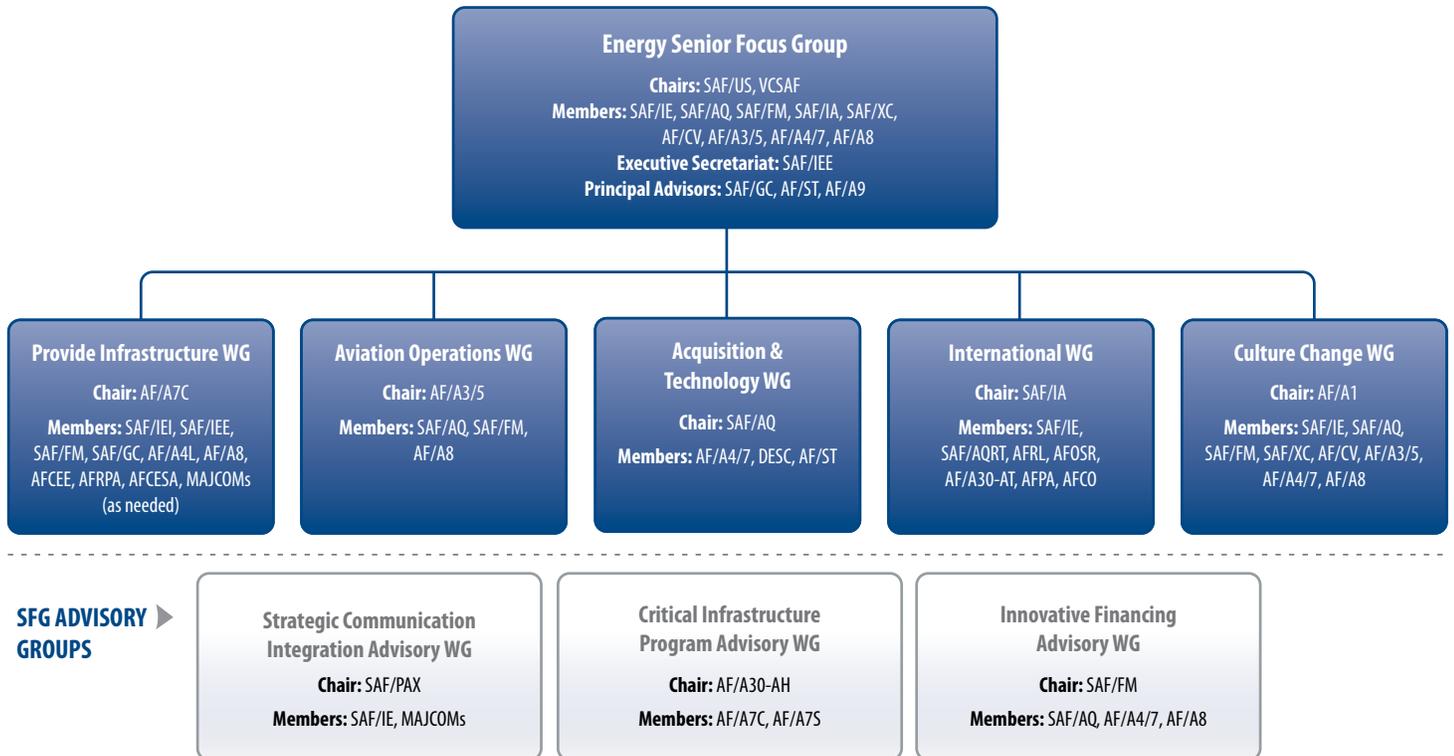
In addition to the five primary Working Groups, the Energy SFG established Advisory Working Groups to provide support to the Energy SFG on aspects that transect mission areas. The three Advisory Working Groups are:

- Strategic Communication Integration
- Critical Infrastructure Program (CIP)
- Innovative Financing

Each Working Group and Advisory Working Group is comprised of members from Air Force Headquarters and MAJCOMs.

The next section of the Air Force Energy Plan provides a synopsis of the overall goals and objectives associated with the following Working Groups: *Culture Change*, *International*, *Critical Infrastructure Program*, *Innovative Financing*, and *Strategic Communication Integration*. Three of the Working Groups: *Provide Infrastructure*, *Acquisition and Technology*, and *Aviation Operations*, have developed separate Energy Plans that provide a comprehensive framework of their goals, objectives, and metrics associated with energy management in these key Air Force operational areas.

Figure 6 Organizational Structure of Air Force Energy Senior Focus Group





7 Culture Change Working Group

Mission in Relation to Energy

Changing the Air Force culture is critical to achieving the Air Force's Vision to "Make Energy a Consideration in All We Do." As the culture changes and the Air Force increases its energy awareness, new ideas and methodologies for operating more efficiently will emerge as each airman considers the energy impact of their day-to-day duties.

The Culture Change Working Group is a component of the Air Force Energy SFG. It focuses on the implementation of programs and communication messages that will promote culture change within all levels of the Air Force to "Make Energy a Consideration in All We Do." As one of the three primary goals of the Air Force Energy Plan, culture change is critical to fostering energy management norms of behavior within the Air Force community.

Instilling energy awareness across the Air Force is a cornerstone goal of the Culture Change Working Group. As an energy management culture develops within the Air Force community, a firm foundation of attitudinal and behavioral norms emerges, providing all airmen with the impetus to factor energy in their daily operations. As personal responsibility in energy management permeates throughout the Air Force, shared values will unlock mass innovation in finding ways to utilize energy in more efficient ways.

Culture change is difficult because, by definition, it is an attempt to change behaviors on a large scale. This challenge can be addressed

by applying a multi-faceted approach, which leverages the capabilities of existing training platforms and communication mediums while continuously providing the context as to why energy is important. Another challenge is developing content that is both values-based and actionable while robust enough to address the continuous changes observed in energy prices, technology, and markets. Energy awareness and cultural change will be achieved when members hold the belief that energy security and energy efficiency are vital to national security.

Scanning the Environment

Education and Training

Proper training is fundamental to understanding why culture change supports the Air Force Energy Plan and how behavioral norms impact energy consumption. Groups only accept cultural change if members understand how the change furthers the organization's missions. In education, training, and personal communication, the Air Force must consistently explain why energy is important to the overall mission of the Air Force. The appropriate content and insertion points for energy in accession schools, the Air Force Academy, and Reserve Officer Training Corps will be critical in creating the curricular component of cultural change. The Culture Change Working Group will need to develop core teams of educators to work with the Energy SFG in developing cutting-edge curriculum that incorporates energy lessons into training and orientation of airmen. Existing education

and training platforms will be leveraged for the incorporation of energy management conventions associated with Air Force operations. The challenge is developing content that is both broadly values-based and responsive to the evolution of technical innovation and market developments.

Training is where airmen will execute their knowledge of how to enhance operational energy efficiencies in their daily activities. Linking energy security to national security will provide airmen with an overarching mission of why energy is important to the Air Force and the nation. Training will demonstrate that integrated energy management plays an important role in fostering the long-term security of our nation. Energy efficiency is an individual responsibility, and training will help establish the standards by which airmen will be measured. The MAJCOMs and service schools will establish education and training programs and review them annually.

Awareness and Communication

The Culture Change Working Group will develop the plans to ensure leadership's energy priorities are communicated throughout the Air Force. Airmen embrace culture change only if they understand how the change furthers the mission. All available mediums are available to communicate 1) where we are; 2) where we're headed; and 3) how we're going to get there. The Air Force Energy Plan changes the culture, sets the standards, and creates alignment on how we "Make Energy a Consideration in All We Do."

Leadership is crucial in creating the atmosphere for culture change. Air Force leadership needs to regularly initiate personal communications with subordinates on the subject of energy management and demonstrate their commitment to energy management through personal actions. The campaign to change the culture will be similar to awareness campaigns for safety initiatives and drug-free initiatives; they should tie in to local community messages. The awareness campaign should be creative and take the message to families as well as airmen.

A creative and values-based awareness campaign includes leaders conducting Energy Awareness Month (October) activities. Each MAJCOM will have an Energy Award Program. The awareness campaign demonstrates leadership commitment to energy security and energy efficiency, while also providing a rewards system to encourage innovation in the implementation of energy management.

Measurement, Management, Awards, and Incentives

The commitment of our leadership to energy security is an important motivator for airmen. The Culture Change Working Group will measure workforce motivation, alignment, and action. The Culture Change Working Group will develop metrics, measurement capabilities, and a scoring system to track and grade airmen, wings, and assets at the appropriate level. The incorporation of energy-knowledge measurements will allow the Air Force to evaluate how familiar airmen are with the Air Force's commitment to energy management. The key to sustaining a shared vision of making energy a consideration of the Air Force is to continuously educate, train, and communicate across the

organizational structure. Leadership will integrate the findings from all best energy practices and awareness programs across the Services. Culture change requires persistent, interactive application over long periods of time. Leaders will simultaneously measure, reward, teach, facilitate, and exemplify the expected behavior. Incentives for exhibiting energy efficiency will be created. Leadership must be clear and focused on communicating expected behaviors. Promptly recognizing and generously rewarding exceptional performers inspires others to change their behavior. Awards generate support and pride within an organization and foster continued success. Leaders will publicize award-winning efforts to promulgate energy best practices across the Air Force. Surveys will be used to measure how well energy awareness and personal responsibility for energy efficiency has penetrated segments of the work force. The results of measurement initiatives will be published to support awareness.

Conclusion

Successful implementation of the Air Force Energy Plan is predicated on a culture change whereby Air Force members embrace saving energy as being part of their core competencies. Culture change is a long process that is best achieved through consistent delivery of awareness, training, and expectations. The Culture Change Energy Plan will deliver training and awareness so each airman understands why energy security is crucial to the mission and what behaviors demonstrate commitment to energy efficiency.

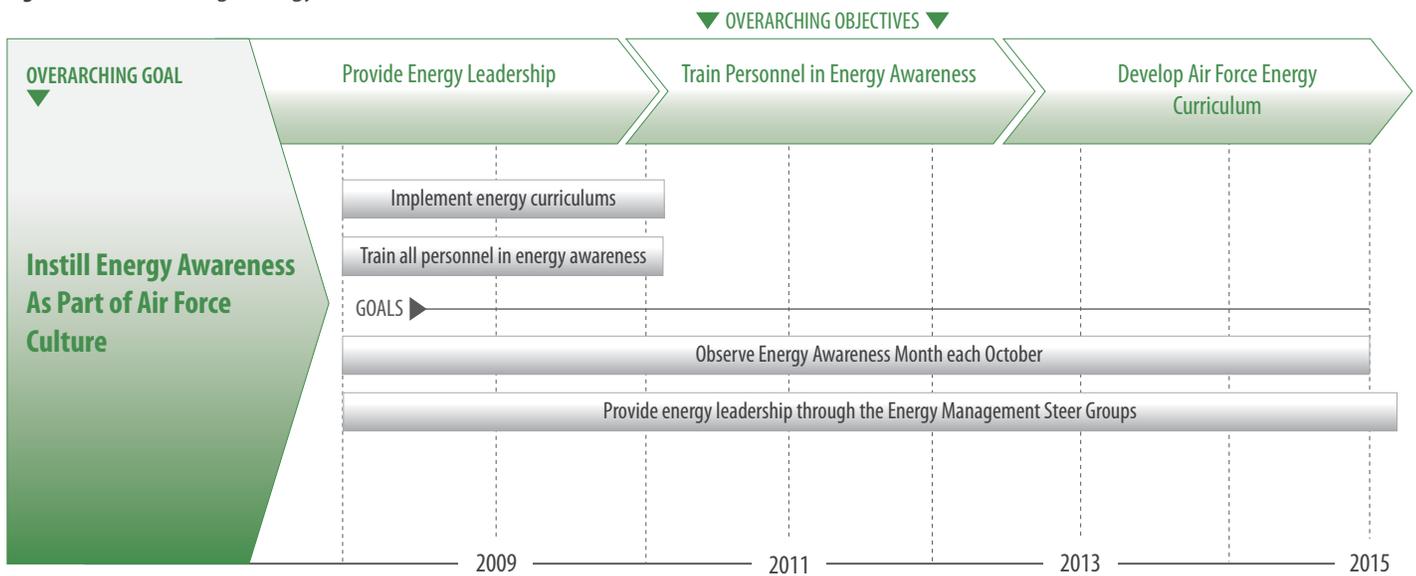
CULTURE CHANGE ENERGY PLAN



Implementing Objectives

- Provide energy leadership throughout the Air Force
- Provide energy awareness training to each uniformed and civilian member of the Air Force
- Develop energy awareness training materials and revise curriculums to include energy sections in all educational materials and curriculums
- Communicate Air Force energy successes and lessons learned
- Identify/develop privately financed energy sources on underutilized land

Figure 7 Culture Change Energy Plan



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8 International Working Group

Mission in Relation to Energy

The International Working Group is a component of the Air Force Energy SFG. The International Energy Plan supports the Air Force Energy Plan by engaging foreign partners in energy partnerships to achieve three main goals: achieve interoperability between air forces as alternative fuel use increases, gain access to global energy technology and best practices, and create a culture among global air forces to address common energy concerns cooperatively.

Scanning the Environment

As demand for energy increases, governments and their militaries, particularly air forces of the world, will face the same challenges in meeting their energy needs. Addressing these common challenges cooperatively can help air forces find the best solutions and practices, while saving money and avoiding duplication of effort. By engaging our international partners in established forums and developing new energy dialogues, DoD and the Air Force seek to take advantage of partner efforts and ensure future interoperability.

As the use of alternative fuels for aviation and ground operations increases, the Air Force and its international partners must work to ensure interoperability by rewriting fuel specification standards to include allowances for alternative fuel and developing an agreed-upon process to certify alternative fuels.

Gaining access to global technology and best practices involves being engaged with our partners to identify opportunities for RDT&E cooperation and exchange information on new approaches to conducting and supporting air operations. The International Working

Group will coordinate with non-DoD agencies and the Acquisition and Technology Working Group to explore new technologies and sustainability practices. Engagement in these areas will lead to cooperative development, evaluation, and certification of promising energy initiatives. By working with international partners that are committed to the same objectives, the Air Force will address these common concerns cooperatively and seek novel solutions to the energy challenges facing global air forces.

Energy and the environment are invariably linked by the utilization of limited natural resources to produce energy and the by-products that are created through energy use. The Air Force is identifying alternative sources of energy to reduce the impact of energy use on the environment and is pledging support to achieve DoD and Air Force environmental goals.

Conclusion

Achieving the objectives of the International Energy Plan requires a multidisciplinary team approach, involving organizations across DoD and the Air Force's international, operational, technical, and acquisition communities. Air Force organizations will work together to achieve these objectives by applying their respective core competencies using the available tools and mechanisms within their area of expertise. These tools include utilizing existing international fora to introduce dialog on energy security, developing agreements to exchange data, or developing collaborative research projects in areas of common requirements. By using these tools, in concert with others, the Air Force will work with our international partners to achieve our energy goals of reducing demand, increasing supply, and changing our culture.

INTERNATIONAL ENERGY PLAN



Implementing Objectives

Short Term

- Work with coalition partners to certify aircraft to use JP-8 fuel containing up to 50 percent blend of synthetic component
- Identify cooperative opportunities in energy technologies, alternative fuels, and demand reduction practices
- Make energy a component of existing international forums
- Strengthen existing energy security relationships
- Explore and understand methods to identify and inventory greenhouse gas emissions from aviation and ground operations
- Share best practices for efficient fuel usage in operations
- Utilize best practices to facilitate a harmonious shift in the current energy culture
- Share information on the use of renewable energies to power air bases/air stations

Mid Term

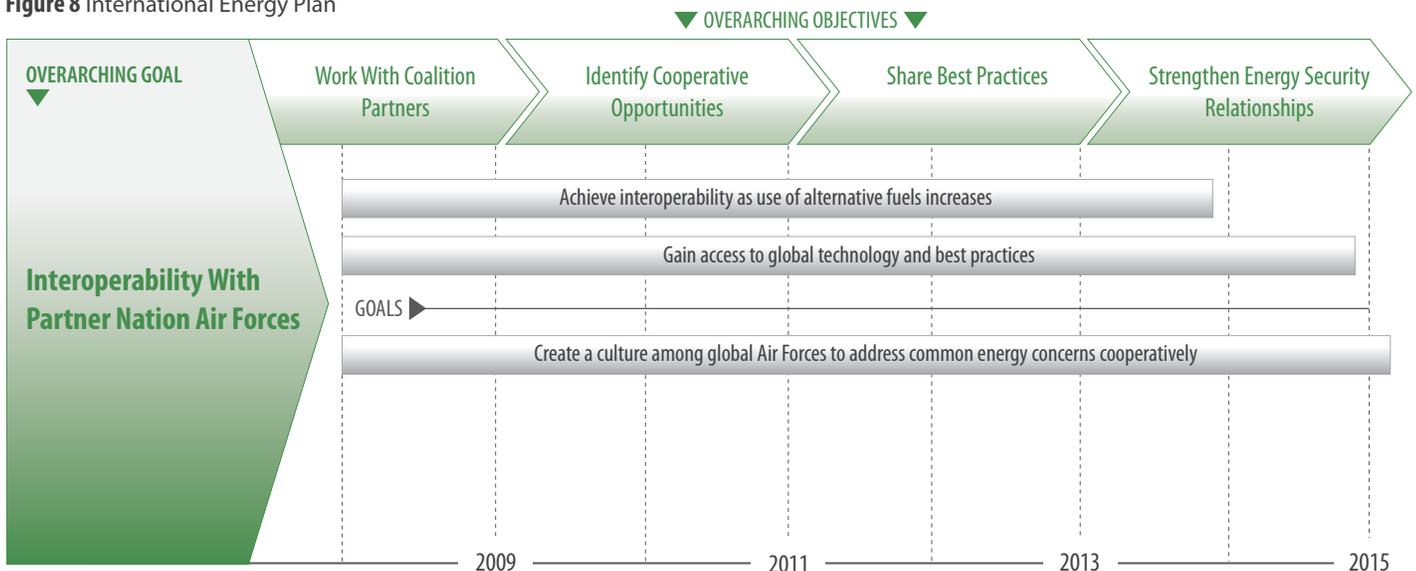
- Expand engagement to include other countries not already certified to use JP-8 fuel containing up to 50 percent blend of synthetic component
- Cooperative development of fuel cell-based power systems for use in military-related applications
- Cooperative development of lightweight materials for use in aviation and ground equipment
- Cooperative development, evaluation, and certification of promising biofuels for determining technical suitability, environmental compliance, and sustainability
- Identify, inventory, understand, and potentially reduce the life cycle greenhouse gas emissions impact from aviation and ground operations, while continuing to perform defense missions potentially using a common set of tools and protocols

- Incorporate bilateral and multilateral Distributed Mission Operations into U.S.-international exercises
- Engage partners in cooperative research and development for energy technologies and alternative fuels not specifically mentioned above

Long Term

- Solidify an interoperable framework of partner countries that use alternative fuels, focus on demand reduction, and manage greenhouse gas emissions
- Ensure continued interoperability as more alternative fuel options are introduced
- Collaborate efforts to use renewable energy power during coalition operations and exercises
- Continue fundamental research cooperation with foreign universities and governments

Figure 8 International Energy Plan





9 Critical Infrastructure Program Advisory Working Group

Mission in Relation to Energy

The purpose of the Air Force's Critical Infrastructure Program (CIP) is to ensure Air Force's ability to execute missions and capabilities that are essential to planning, mobilizing, deploying, executing, and sustaining military operations on a global basis. With respect to energy, critical infrastructure protection entails securing a reliable supply of energy—electricity, natural gas, and fuel—to enable mission continuity. The CIP is determining what supporting infrastructure (e.g., oil tanks, petroleum pipelines, electrical grids, etc.) is critical in directly supporting critical assets used to execute military operations.

Scanning the Environment

Energy flows across mission areas are critically important to understand when assessing Air Force assets and infrastructure dependencies that are critical to the execution of missions, capabilities, and core functions. The CIP needs to determine what supporting infrastructure (e.g., oil tanks, petroleum pipelines, electrical grids, etc.) is critical in directly supporting military operations.

Vulnerability to disruptions in electric service is a particular concern. Potential attacks from terrorist entities, the fact that our national grid system is aging and overtaxed, and the interrelatedness of the many systems that make up the U.S. electric grid are contributing factors to this vulnerability. The risk from exposure to these vulnerabilities is extended power outages to Air Force installations.

The threat of physical attacks to the grid poses risks to both our national security and daily electricity-dependent processes. This risk is attributable to the connectivity between substations and control hardware and software. The threat from weather or non-hostile grid failures is well-known and has been experienced recently in North America. Although the impact of short-term outages is fairly well understood and planned for, the impact of extended outages that could result from more serious disruptions needs to be addressed to adequately plan for unexpected power outages.

Conclusion

Recognizing the threat to critical infrastructure from disruptions in energy supplies, the Air Force is working with DoD on the following approach:

- Define an active role for DoD in the Energy CIP's Government Coordinating Council
- Quantify the other vulnerabilities/threats/risks to military installations
- Prioritize and implement mitigation strategies

The Air Force is actively participating in DoD's Working Groups to develop risk mitigation strategies and other responses to protect critical infrastructure. The CIP is the link between DoD and Air Force initiatives to address energy disruptions that can impact critical infrastructure, and provide continuity to the SFG on energy issues that impact critical assets.

CRITICAL INFRASTRUCTURE PROGRAM ENERGY PLAN

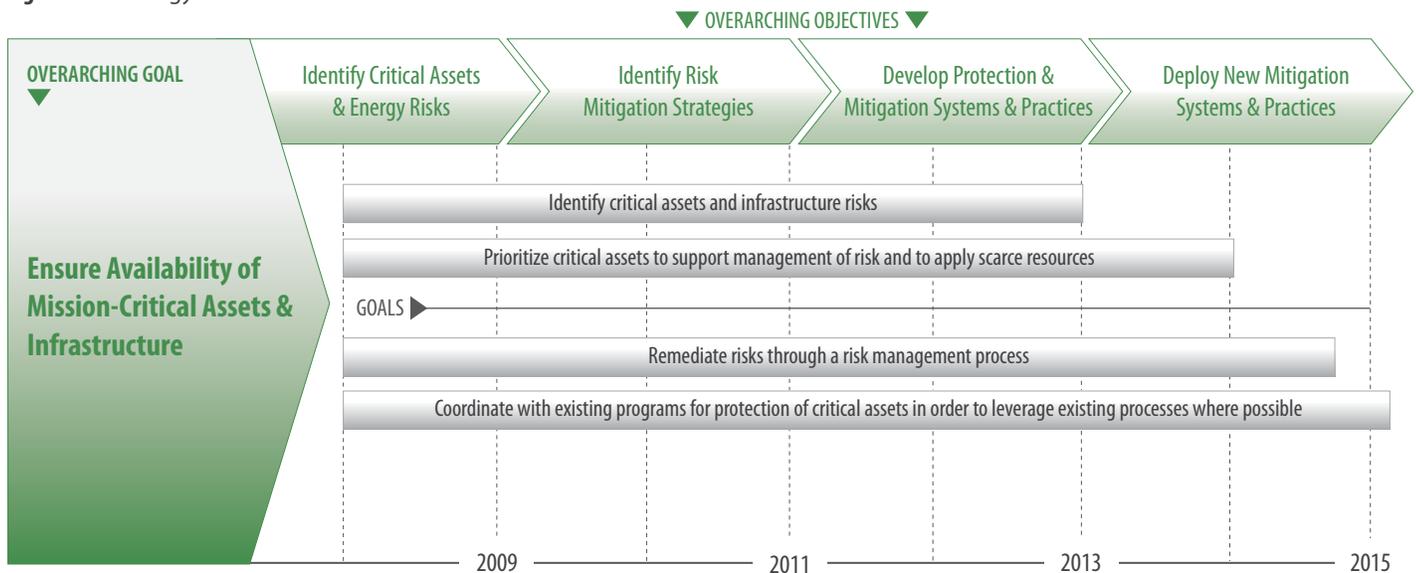


The Air Force CIP is responsible for making implementation recommendations for DoD policies intended to mitigate the risks to critical Air Force operational assets. This includes new tactics, techniques, procedures, protection measures, and implementation of redundancy capabilities.

Implementing Objectives

- Assist in developing guidance on the execution of CIP programs
- Partner/assist with Assistant Secretary of Defense for Homeland Defense & Americas' Security Affairs (ASD(HD&ASA)) and Joint Staff (J34 AT/FP Division) in a Central Analytical Capability, an effort designed to characterize the infrastructure outside the installation fence-lines. This effort shall assist in determining what supporting infrastructure (energy, Petroleum Oil and Lubricants [POL], water, etc.) is critical in directly supporting critical assets residing on military installations
- Field the Critical Asset Prioritization Methodology (CAPM) tool. This CAPM tool will allow prioritization of Air Force critical assets. This allows leadership to utilize its limited funding to remediate the most important critical assets at highest risk of being degraded or lost
- Refine the Air Force critical asset list to capture the critical supporting infrastructure between host and tenants on installations
- Establish programmatic funding for AF CIP
- Commence official critical asset risk assessments with the Air Force Security Forces Center
- Build remediation recommendations that provide Commanders with options to remediate their risk of loss of their critical assets (for the critical supporting energy infrastructure, including new tactics, techniques, procedures, protection measures, implementation of redundancy capabilities, etc.)

Figure 9 CIP Energy Plan





10 Innovative Financing Advisory Working Group

Mission in Relation to Energy

The purpose of the Innovative Financing Advisory Working Group is to explore, identify, and analyze best financial approaches to support the Air Force Energy Plan. The Innovative Financing Advisory Working Group provides cost and financial analytical support to the Air Force Energy SFG and its Working Groups. The Innovative Financing Advisory Working Group reviews and assesses potential energy financial initiatives and recommends the implementation of those that are economically sound.

Scanning the Environment

Funding is a key factor in the implementation of the Air Force Energy Plan. The Air Force's challenge is to use available energy funding wisely and search for opportunities to implement innovative financing options in support of energy goals and objectives. Air Force energy initiatives should have, as a key program deliverable, reduction of overall operating costs.

The Air Force is developing innovative funding strategies to meet the challenge of achieving aggressive energy goals. Funding all energy programs and projects using traditional funding methods will not enable the Air Force to reach its energy goals. The Air Force is meeting the energy funding challenge by exploring partnerships with industry through innovative programs, such as the Enhanced Use Lease Program. This and others like it will allow the Air Force to develop mutually beneficial projects for both the Air Force and private companies with minimal expense to the Air Force.

The Innovative Financing Advisory Working Group will evaluate best practices and facilitate the dissemination of information that can be utilized in securing funding for energy projects. Public-private partnerships are increasingly being explored by the U.S. federal government in the execution of energy development projects. Consistency and financial standards facilitate the identification of the most economically-sound initiatives. The advisory group will oversee the fielding of the Critical Asset Prioritization Methodology (CAPM) tool and the adoption of financial standards to enable transparency across Air Force energy investments. The Working Group is working to establish Fully Burdened Cost of Fuel Initiative Awareness. Additionally, the Innovative Financing Advisory Working Group is seeking to establish Air Force accounts for savings and requisite budget guidance.

Conclusion

As the Air Force implements the Energy Plan, the Innovative Financing Advisory Working Group will continue to provide financial insight and work with the Office of the Secretary of Defense to gain support for energy legislative initiatives/proposals with a financial impact. Alternative financing mechanisms can help the Air Force achieve its energy goals and priorities. As federal regulations continue to emerge around renewable and alternative energy, demand for technological innovation will also emerge and require adequate financing streams that can be accomplished through public-private partnerships. Innovative financing will provide the Air Force with innovative energy sources and innovative energy savings.

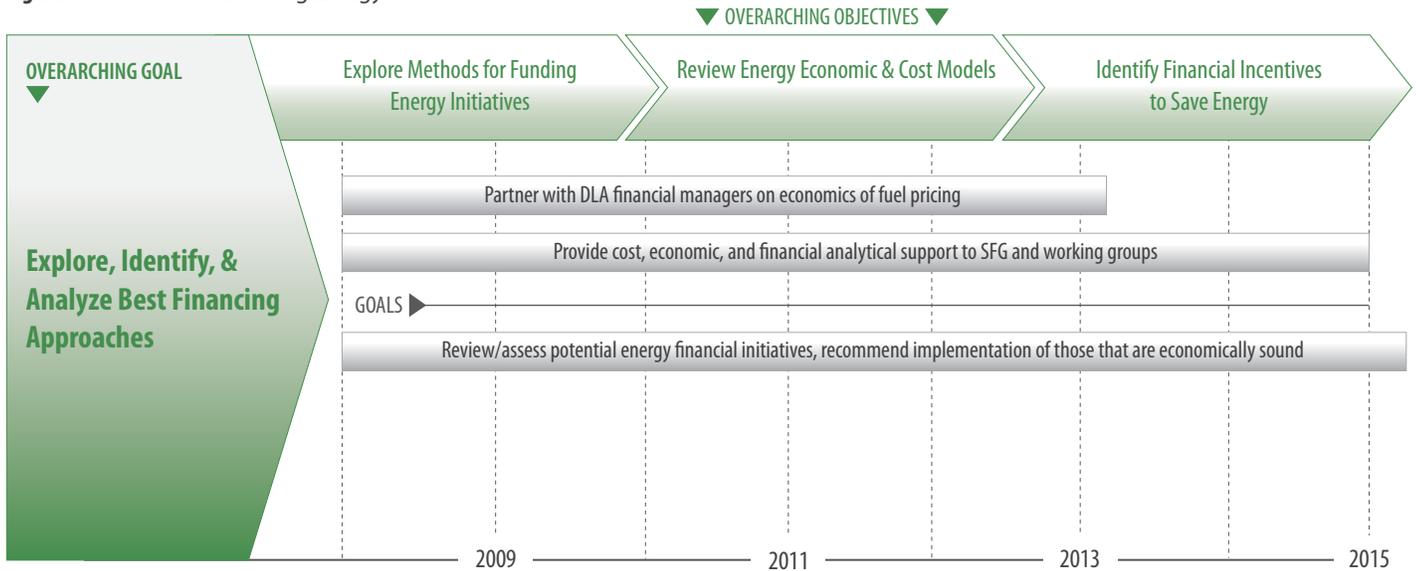
INNOVATIVE FINANCING ENERGY PLAN



Implementing Objectives

- Explore other methods of funding for energy initiatives
- Review economic and cost models developed for energy
- Explore best practices from government and the private sector for energy purchases
- Engage the Office of the Secretary of Defense to influence DoD financial regulations pertaining to energy as laws and policies change, and update or develop requisite Air Force budget policies
- Interact with and gain Congressional support for energy legislative initiatives/ proposals with financial impact
- Identify financial incentives for installations that save energy through supply/demand initiatives

Figure 10 Innovative Financing Energy Plan





11 Strategic Communication Integration Advisory Working Group

Mission in Relation to Energy

Strategic communication efforts related to the Air Force Energy Plan begin with a two-pronged approach using existing and chartered communications forums. The Strategic Communication Working Group (SCWG) is a weekly meeting of action officers from across the Secretary of the Air Force Headquarters Air Force (SAF/HAF) staff and is chaired by SAF/Office of Public Affairs (PAX). This forum is used to introduce communication issues, themes, messages and planning ideas on a wide variety of topics. The SCWG serves as an entry point to strategic communication planning. The second chartered meeting is the Strategic Communication Integration Group (SCIG), chaired by the Director of AF Public Affairs (SAF/PA). This is a GO-level meeting that occurs weekly. Almost all topics presented at the SCIG for discussion have already been presented and vetted at the SCWG and refined based on inputs from the meeting.

The primary purpose of the all strategic communication efforts is to promote and support the Air Force Energy Plan through the application of strategic communication devices. The dissemination of information to targeted audiences is an important instrument for providing all levels of personnel with the knowledge needed to implement the Air Force Energy Plan. By providing consistent and streamlined communication channels, the forums build cohesive communication networks across Air Force mission areas to ensure all airmen are equipped with energy-related information to support the Air Force Energy Plan.

Scanning the Environment

As the Air Force tackles energy demand reduction and supply enhancement issues, communicating energy strategic priorities across the Air Force organizational structure will be critical in creating the cultural shifts necessary to develop and implement energy initiatives. Strategic communications build the foundation for establishing energy awareness across Air Force personnel, emphasizing that energy is important to the overall mission of the Air Force. By synchronizing energy information with a cohesive Air Force communications framework, the Strategic Communication forums provide a mechanism for conveying the Air Force vision of energy management. Strategic communication is the key toward creating a durable model of strategic direction that can adapt as new information arises and integrate knowledge and functional expertise across the Air Force.

Both the SCWG and the SCIG will assist in the coordination among all Air Force Energy Working Groups in order to convey a comprehensive message revolving around the Air Force Energy Plan across all levels of the Air Force.

Conclusion

As the Air Force implements its Energy Plan, SCWG and SCIG strategic communications will continue to develop and refine energy communication themes and messages that are consistent with national, DoD, and Air Force priorities.

STRATEGIC COMMUNICATION INTEGRATION ENERGY PLAN

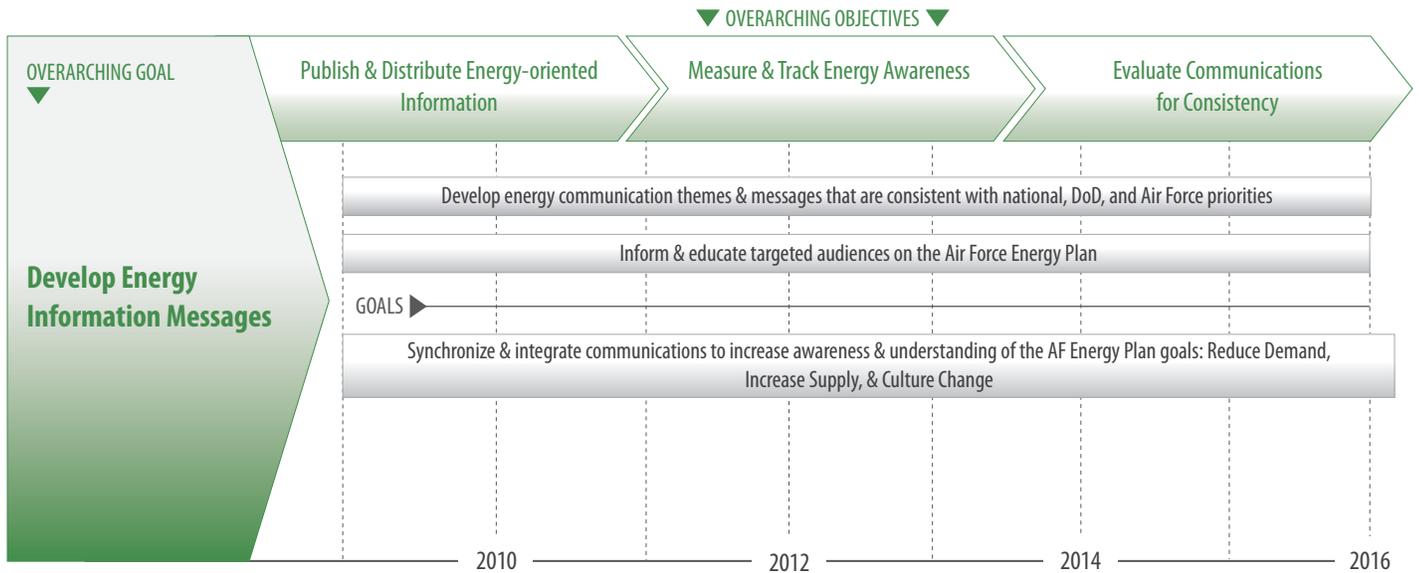


Adapting the Air Force’s culture to integrate energy concerns is critical to achieving the Air Force’s vision to “Make Energy a Consideration in All We Do.” The Air Force is committed to instilling energy awareness through focused leadership, energy-specific training, curriculum development, and effective communication. As the culture changes and the Air Force increases its energy awareness, new ideas and methodologies for operating more efficiently will emerge as airmen consider energy in their day-to-day duties.

Implementing Objectives

- Publish and distribute an Air Force Energy Plan Communication Plan
- Communicate a vision of energy conservation becoming part of the Air Force culture
- Communicate how the Air Force Energy Plan benefits the Air Force and DoD as well as the nation’s economy, security, and environment
- Simplify Air Force Energy Plan communications
- Measure and track internal and external audience awareness, understanding, and support of the Air Force Energy Plan through internal and external sources
- Track and evaluate communication engagements for consistency of message

Figure 11 Strategic Communications Integration Energy Plan





12 Energy Focus Areas

The Air Force must consider additional funding and resources across its organizational structure to realize the Air Force Energy Plan. Energy Focus Areas pinpoint issues that the Air Force will have to take into consideration when making the Energy Plan operational.

Alternative Fuels

The U.S. Air Force's mission is to *fly, fight, and win*...in air, space, and cyberspace. This mission requires global reach and flawless performance by the most sophisticated and advanced aircraft and trained Airmen in the world. To conduct this mission, the Air Force uses approximately 2.5 billion gallons of aviation fuel annually, making the Air Force the largest fuel consumer in the federal government. An assured supply of fuel is critical to sustaining the mission of air superiority, support, and global reach. Enhancing domestic energy supplies will be contingent on the development of domestic fuel alternatives. As the Federal Government's largest consumer of fuel, the Air Force plays a critical role in the research, testing, and certification of new technologies for the deployment of alternative fuels in powering aircraft and ground operations equipment. Air Force research, testing, and certification of new technologies include renewable, unconventional, and traditional energy sources, all of which will leverage the natural energy resources found in the United States. Advancements in biomass conversion techniques will assist in increasing domestic production of biofuels that can be used as an alternative to petroleum-based jet fuel. Already, the Air Force has made great strides in the testing and certification of a 50/50 blend of JP-8 and synthetic fuel for use in aircraft. By developing and

deploying alternative fuels for ground and air operations, the Air Force will position itself for sustainable energy security.

Carbon Emissions Reduction

The Air Force recognizes the importance of addressing climate change, and supports all DoD and Administration objectives in tackling this global problem. Carbon dioxide emissions, the primary contributor to human-induced climate change, are largely a result of fossil fuel combustion. As the largest consumer of fossil fuels in the federal government, the Air Force recognizes that any efforts to reduce its consumption of fossil fuels will also reduce the Air Force's carbon footprint. The projected impacts of climate change are varied, but it is known that unstable regions of the world are most vulnerable to social and political unrest as a result of climate change. The national security consequences of climate change should be fully integrated into national defense strategies to ensure Air Force operational capabilities are aligned with the potential challenges ahead. Additionally, an assessment of the impact of rising sea levels, extreme weather events, and other climate change-related impacts on Air Force installations and MAJCOMs should be conducted. The Air Force should enhance its operational capabilities by accelerating the adoption of improved business processes and innovative technologies that result in improved U.S. combat power and energy efficiency. The Air Force must be an active participant in climate change mitigation efforts by the military and should pursue global partnerships to address the global security implications of climate change.

Communication

Energy management execution is contingent on timely and coordinated conveyance of information across the Air Force organizational structure. Raising energy awareness across the Air Force in a systematic manner will optimize energy-oriented decision making and ensure consistent implementation of Air Force energy management strategies. Cultural shifts in the Air Force originate through clear and effective communication. Energy management in the Air Force is complex and will require the involvement of personnel from every level of the organization to communicate energy operational considerations and translate Energy Plan goals and objectives into tangible implementation procedures. Consistent communication on Air Force energy management strategies will not only provide a cohesive distribution of information to all airmen, but will also ensure that energy awareness becomes a critical component of Air Force operations. Beyond communicating facts and figures, the Air Force must convey why energy is important to mission execution and national security. Communication will build the foundation for a culture that will continuously reduce energy consumption and identify ways to use energy wisely across Air Force operational areas.

Energy Security

Energy security drives the goals and objectives of the Air Force Energy Plan. Energy security includes physical security of infrastructure and supply, and continuity of operations. All aspects of energy security must be addressed to develop and implement comprehensive plans and strategies that enable the Air Force to respond to any energy security threat. DoD requires enormous energy reserves to maintain tactical mission readiness. Insecure and inadequate energy supplies pose major threats to the Air Force's ability to maintain energy-intensive operations on a global scale. The Air Force Energy Plan incorporates energy security considerations to mitigate against energy supply disruptions. The United States is heavily dependent on foreign oil, much of which originates out of politically unstable and volatile regions of the world (see Figure 12). Reducing domestic demand of foreign oil by improving energy efficiency and developing domestic energy supplies will enhance the national security of the United States. The Air Force must identify energy-dependent operational risk areas and implement preemptive measures to mitigate against energy-oriented exposure. The Air Force Energy Plan provides the foundational framework for integrating energy security considerations into all aspects of the Air Force's operational enterprise. From physical infrastructure to aircraft platforms, the Air Force is proactively addressing energy security issues by reducing dependence on non-assured sources of oil, stabilizing or reducing operational energy demand, and developing domestic alternative and renewable energy supply chains to build a strategic network of energy resource management across the organization.

Forward Operating Bases

As the U.S. military executes overseas contingency operations and responds to emerging threats to our national security and global stability, proximity to regional risk areas is critical to the effective execution of tactical operations. Minimizing the distance and time travel requirements of Air Force missions can lead to enhanced

responsiveness and reduce energy consumption rates. Energy infrastructure and delivery mechanisms are an inherent requirement of establishing forward operating bases, and by increasing the energy efficiency of ground and air operations, the Air Force can mitigate against energy supply disruptions that can occur in volatile regions of the world. Forward planning on energy usage and distribution mechanisms can help fortify forward operating bases against the threat of energy disruptions. The Air Force is researching base energy production capabilities to support the warfighter in any operational theatre.

International Energy Landscape

Diminishing supplies of fossil fuels coupled with the increased dependency on foreign oil presents the United States with serious challenges in achieving energy and national security. As is shown in Figure 12, the dominant oil producers in the world are in regions where the conflict potential is high and thus global energy supply disruptions are a possibility. To mitigate against energy supply disruptions and to reduce the leverage of countries adverse to U.S. strategic interests, the U.S. will need to simultaneously decrease demand for foreign oil while increasing domestic energy production capabilities. By decreasing U.S. dependence on foreign oil, the U.S. can create a buffer that protects the nation from countries that have the ability to decide who receives energy, a scenario that has far-reaching implications not just from a national security standpoint, but also for daily activities that are highly dependent on energy. The Air Force is reducing its reliance on foreign oil by applying energy efficiency techniques and developing alternative energy options to ensure the mission readiness and responsiveness needed to protect the homeland.

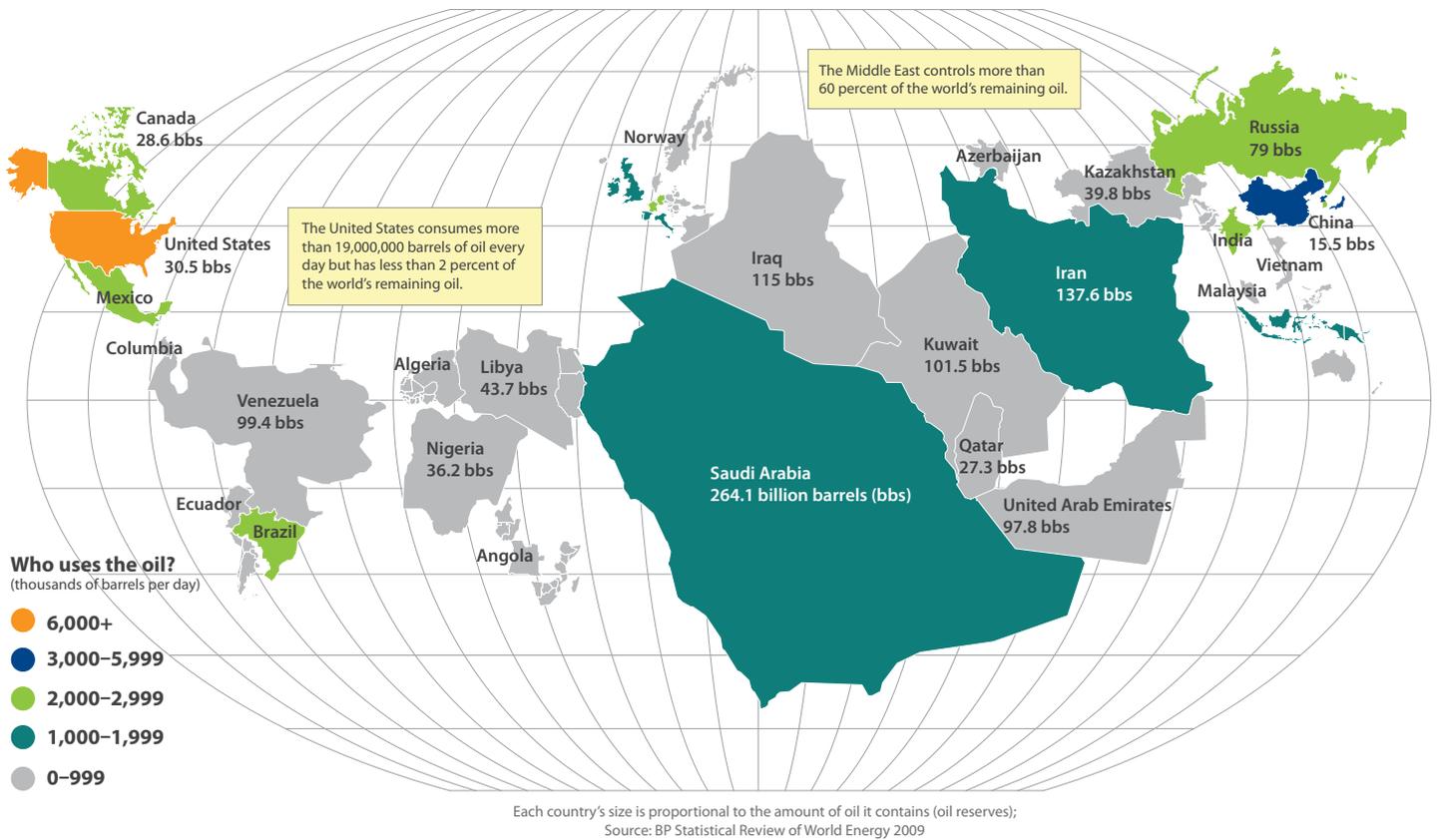
Model Energy Base Initiative

Military bases provide the platform for Air Force operational capabilities. From housing equipment to repairing and refueling aircraft, the military base is a critical support unit of the Services. A base never "shuts down" and, thus, the energy inputs required to run a military base are significant. Many Air Force bases are reconfiguring their operations to be more energy efficient, saving fuel and funding. And as part of the Air Force's efforts to benchmark best practices in energy, the model energy base initiative was developed to systematically identify energy-savings solutions across the Air Force organizational structure. The energy model base initiative encourages the active participation of Air Force personnel in formulating innovative and readily implementable energy-savings techniques, spurring not only operational shifts, but culture shifts in the way airmen view energy.

Nuclear Energy Options

Applying advanced nuclear energy technologies can help mitigate against power disruptions and grid failure, which can interfere with the defense support capabilities of the military. DoD is exploring the application of nuclear compact reactors as an alternative and secure power supply for installations. Off-grid technologies, such as using small-scale nuclear power to generate electricity, could reduce the potential for energy disruptions

Figure 12 Scaled Map of World Oil Reserves: Who has the Oil?



World Reserves of Oil

	Saudi Arabia	Iran	Iraq	Kuwait	Venezuela	United Arab Emirates	Russia	Libya	Kazakhstan	Nigeria	United States	Canada	Qatar	China
Billions of Barrels	264.1	137.6	115.00	101.5	99.4	97.80	79	43.7	39.8	36.2	30.5	28.6	27.3	15.5
Percentage of World Reserves	21%	10.9%	9.1%	8.1%	7.9%	7.8%	6.3%	3.5%	3.2%	2.9%	2.4%	2.3%	2.2%	1.2%
Consumption (thousands of barrels per day)	2,224	1,730	N/A	300	719	467	2,797	N/A	229	N/A	19,419	2,295	104	7,999

associated with grid failure scenarios. The Air Force is investigating nuclear energy options for its installations in conjunction with other Services and the Department of Energy, which is the lead federal agency for nuclear energy development.

Renewable Energy Development and Deployment

The Air Force is one of the largest consumers of renewable energy in the United States and has contributed to the development and deployment of renewable energy technologies. From solar arrays to wind turbines, the Air Force is equipping its installations with renewable energy sources to enhance operational efficiencies and insulate operations from grid disruptions. Because Air Force missions are often energy dependent, there is a need to ramp up the development of renewable energy infrastructure that can insulate the Air Force from grid failure or supply chain

disruptions. Currently, about 85 percent of the energy infrastructure upon which DoD depends is commercially owned, and 99 percent of the electrical energy DoD installations consumes originates outside installations. Neither the grid nor on-base backup power provides sufficient reliability to ensure continuity of critical national priority functions and oversight of strategic missions in the face of a long-term (several months) outage. The Air Force is also identifying installations with optimal geographical conditions for enhanced energy generation derived from wind, solar, and other renewable energy resources.

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13 Conclusion

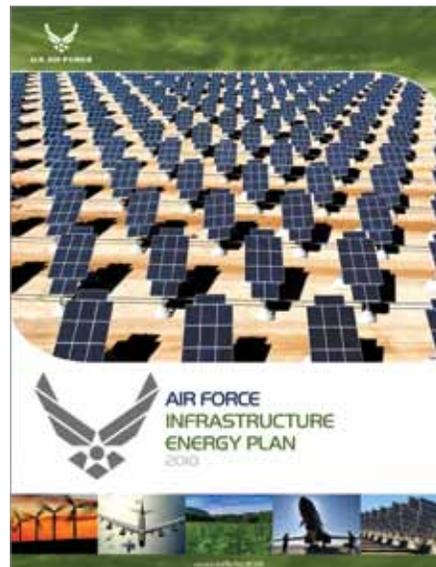
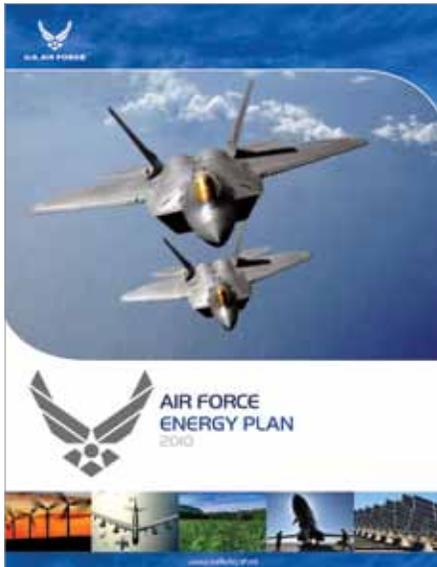
Energy—it is a critical component of Air Force operations. Without jet fuel, the fleet of high performance aircraft would be grounded. Without heat and gasoline, the many installations around the world could not function.

Energy impacts all Air Force missions, operations, and organizations, and allows the Air Force to deliver its designed capabilities without unacceptable delay. As DoD's largest energy consumer, the Air Force is taking a leadership role in developing an Energy Plan that includes goals, objectives, and metrics to reduce energy consumption across operational areas and foster innovation in the development of alternative energy sources. The Air Force Energy Plan is an evolving framework designed to be a reference point for all Air Force personnel. Energy management is a dynamic process that will necessitate the continuous incorporation of new information and developments on the energy front, and thus the Air Force views its Energy Plan as an adaptive framework for accomplishing Air Force energy goals.

The Air Force Energy Plan represents an institutional shift within the Air Force, whereby energy considerations are embedded across Air Force operational processes. The Vision for the Air Force Energy Plan is "Make Energy a Consideration In All We Do." This vision highlights that energy is central to many interdependent aspects of the mission execution of the Air Force, and the security of the United States. Energy security is at the nexus of national, environmental, and economic security. Energy drives our economy, fuels our forces, and affects our environment. The Air

Force recognizes the significance of its role in reducing our country's dependence on foreign energy sources while also leading the world in the development and deployment of clean energy technologies. This Plan is designed to provide the overarching Air Force energy plan elements alongside mission-specific energy management protocols. Using energy wisely is the cornerstone of building an Air Force capable of complete air domination, for today, tomorrow, and beyond.

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