

Headquarters U.S. Air Force

Integrity - Service - Excellence

U.S. Air Force Energy Program

**Year of the Air Force
Family**



Mr. Bobby Diltz
Technical Lead
Energy Systems Research Group
AFRL/RXQD

The United States Air Force Exists to DOMINATE Air, Space, and Cyberspace for America

***The mission of the
United States Air Force is
to fly, fight and win...
in air, space, and cyberspace***



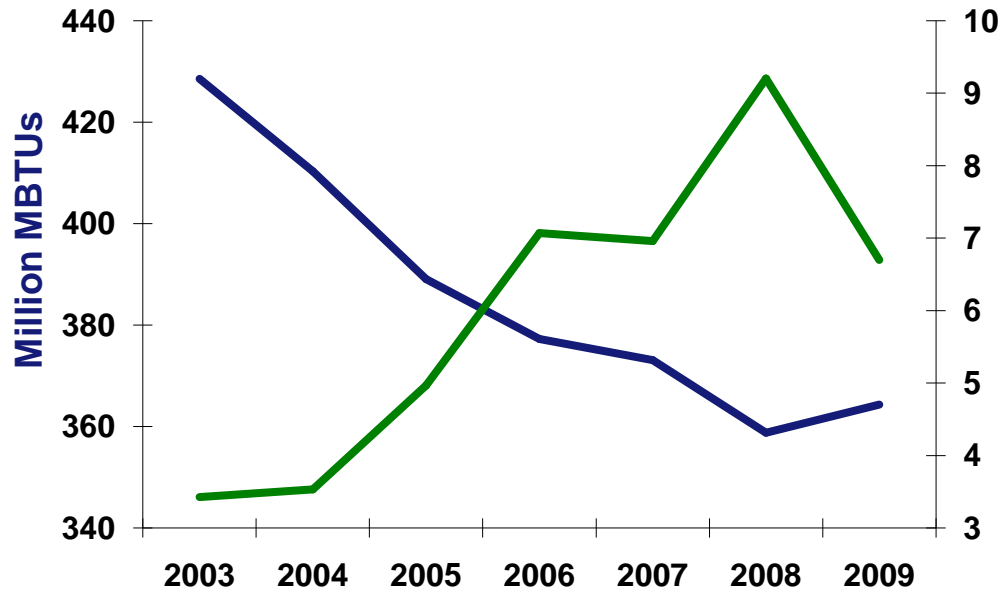
Global Vigilance, Global Reach and Global Power



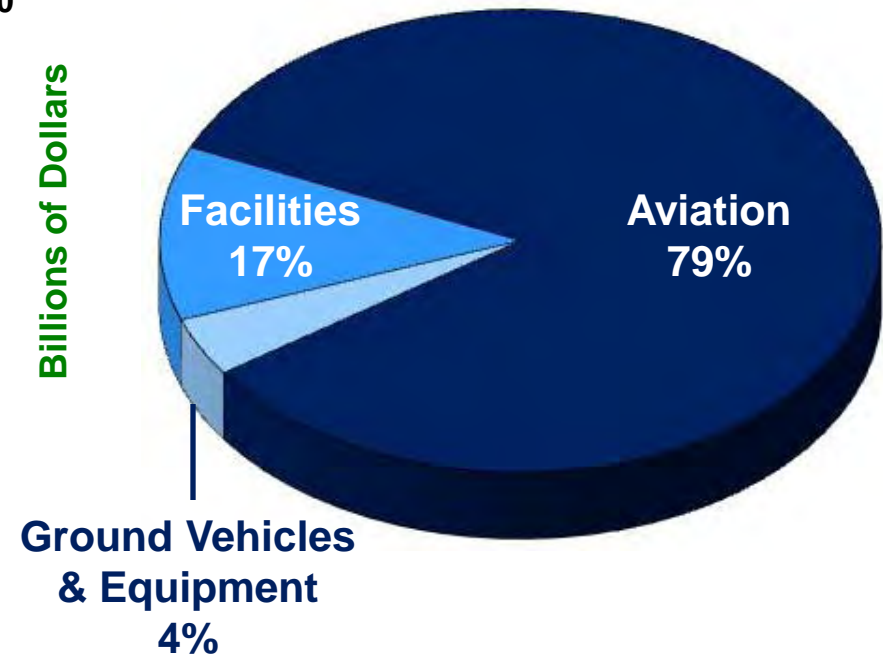


Air Force 2009 Energy Use

Energy Cost and Consumption Trends



Energy Cost Breakdown



***The Air Force spent approximately
\$6.7 billion for energy in 2009***



Energy is an Air Force Priority



We can't rest until we harness the renewable energy that can create millions of new jobs and new industries. ...That's how we can grow our economy, enhance our security, and protect our planet at the same time.

- President Obama, 29 Apr 2009

The Air Force energy strategy furthers an energy future that is secure, efficient, and environmentally sound.

- Michael Donley, Secretary of the Air Force, Jan 2009



We must continue to identify innovative ways to conserve energy and take actions to build upon our success. Let's be passionate energy advocates, set the example, and remind those around us that our individual actions can make a significant difference in creating a more energy-efficient Air Force.

- General Norton Schwartz, USAF Chief of Staff, Jan 2009





Air Force Energy Governance

HQ Air Force Energy Senior Focus Group

Co-Chairs: AF/CV, SAF/US (SAF/IE Interim)

Members: SAF/IE, SAF/AQ, SAF/IA, SAF/PA, SAF/FM, AF/A1, AF/A3/5, AF/A8, AF/A4/7

Executive Secretariat: SAF/IEE Principal Advisors: AF/ST, AF/A9

Infrastructure Workgroup

Chair: AF/A7C

Champions: AF/A4R,
AF/A8, SAF/FM

Acquisition & Tech Workgroup

Chair: SAF/AQR

Champions: AF/A4/7,
AFCO, DESC, AF/ST

Aviation Ops Workgroup

Chair: AF/A3/5

Champions: AF/A8,
SAF/AQ, SAF/FM

International Workgroup

Chair: SAF/IA

Champions: SAF/IE,
AF/A30, SAF/AQ

Culture Change Workgroup

Chair: AF/A1

Champions: SAF/AQ,
SAF/IE, A4/7, A7C

Advisory Groups

Strategic Communication Integration Group

Chair: SAF/PA
Champions: SAF/IE,
MAJCOMs

Critical Infrastructure Protection Workgroup

Chair: AF/A3S
Champions: AF/A7CX, A7S

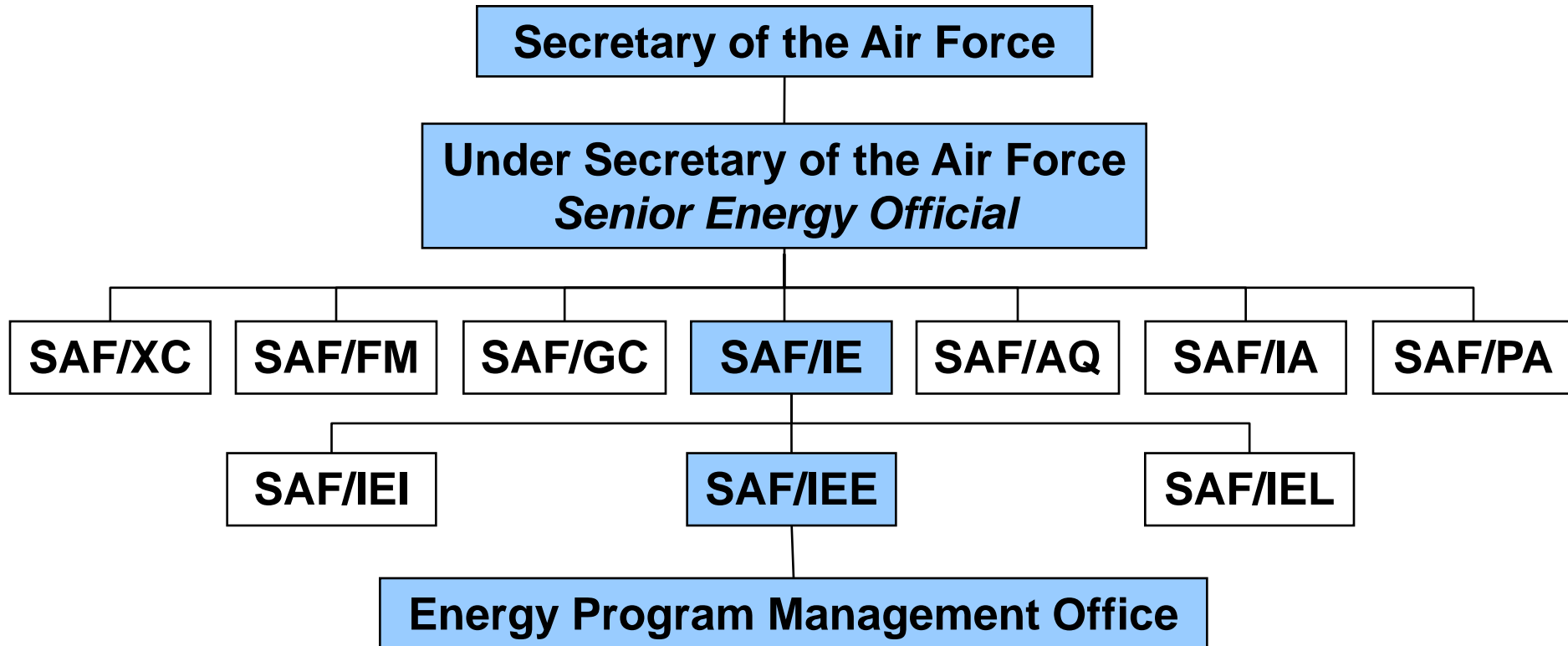
Innovative Financing Workgroup

Chair: SAF/FM
Champions: AF/A8, SAF/AQ, AF/A4/7

**Similar energy governance structures exists
at the MAJCOMs and Wings**



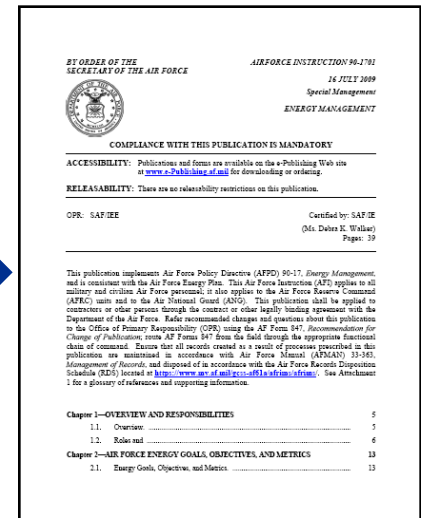
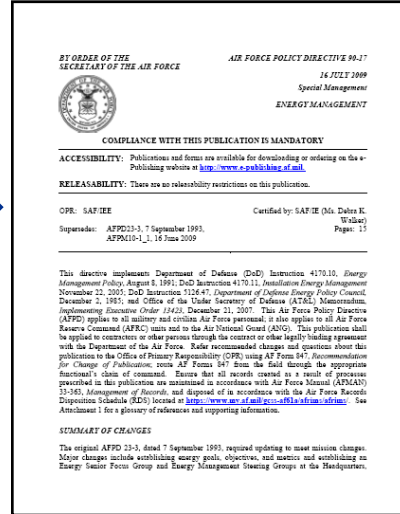
Air Force Energy Program Management Office



***Provides Policy Guidance on
Cross-functional Energy Issues***



Air Force Energy Policy



AFPD 90-17
Signed 16 July 2009

AFI 90-1701
Signed 16 July 2009

**Formally established the AF Energy Program:
Strategy, Goals, Objectives and Metrics**



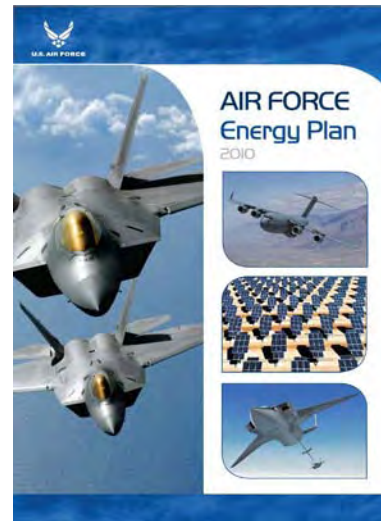
Air Force Energy Plan

3-Part Strategy

Reduce Demand

Increase Supply

Change the Culture



Vision

Make Energy A Consideration In All We Do



Air Force Energy Initiatives are Many and Varied

3.2 MW Landfill Gas Power plant, Hill AFB



Alternative Fuels Certification Office & AF Research Lab, WPAFB



1.5 MW Wind Project, MMR

Oxygenated biodiesel test site, Minot AFB

Hybrid Aviation Refueler, Shaw AFB



14.2 MW PV Array, Nellis AFB



Wind turbines, FE Warren AFB



Advanced Power Technology Office, Robins AFB

460 KW PV Project, March AFB

122 KW PV Project, Luke AFB

Facility Energy Office, Tyndall AFB

Wind Turbine Project, Tin City



Ice Storage System, Dyess AFB



Alternative Fueled Vehicles, Hickam AFB



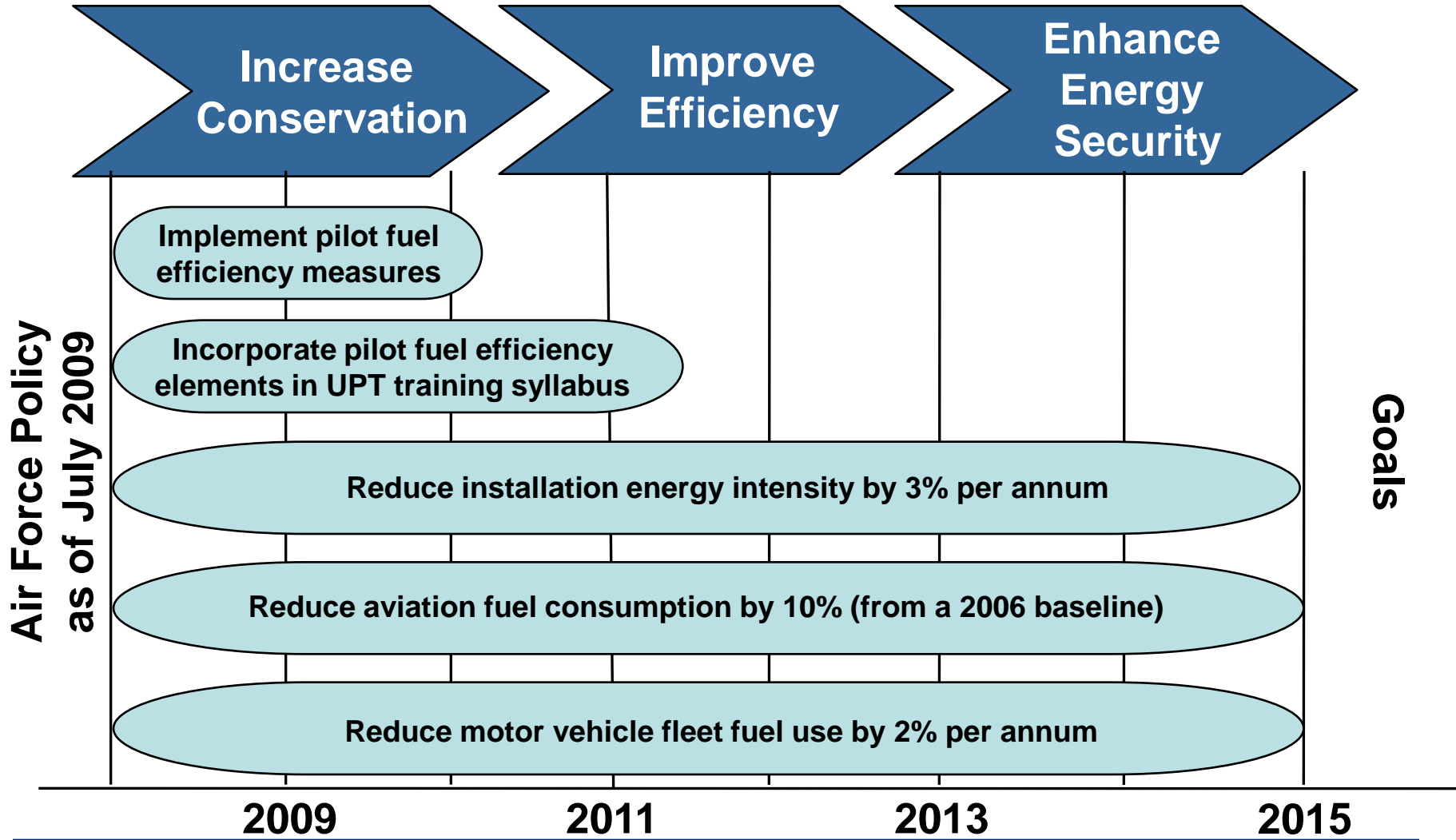
Sites Under Construction

Demonstration Sites





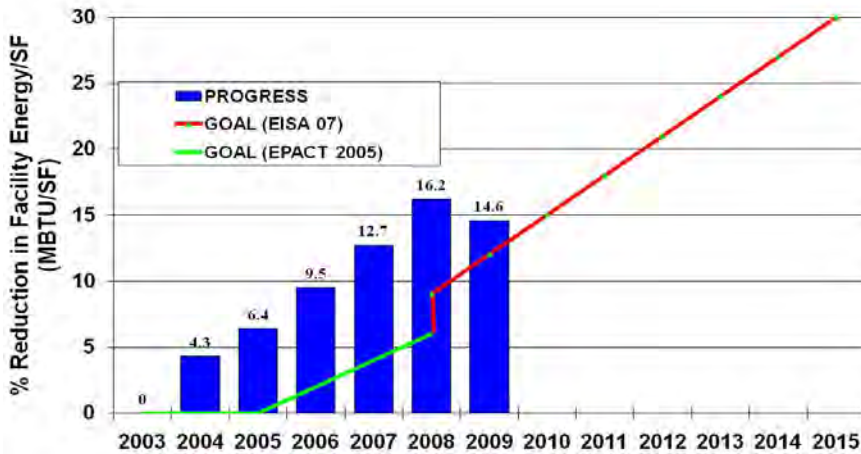
Air Force Energy Program: “Reduce Demand” Goals





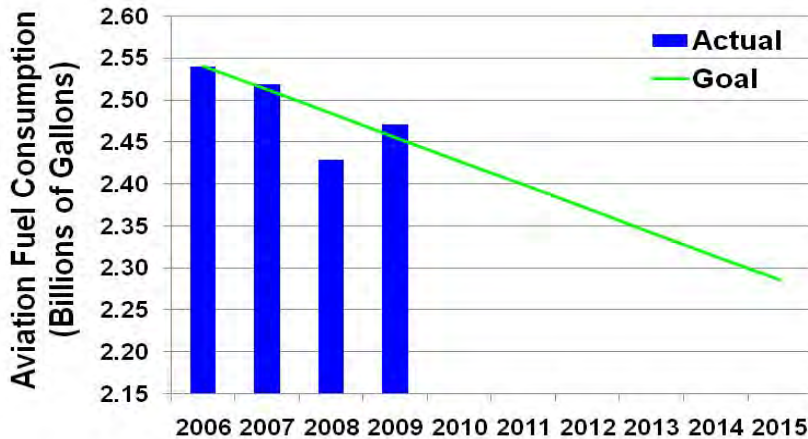
Reduce Demand Metrics Through FY09

Goal: Reduce Installation Energy Intensity

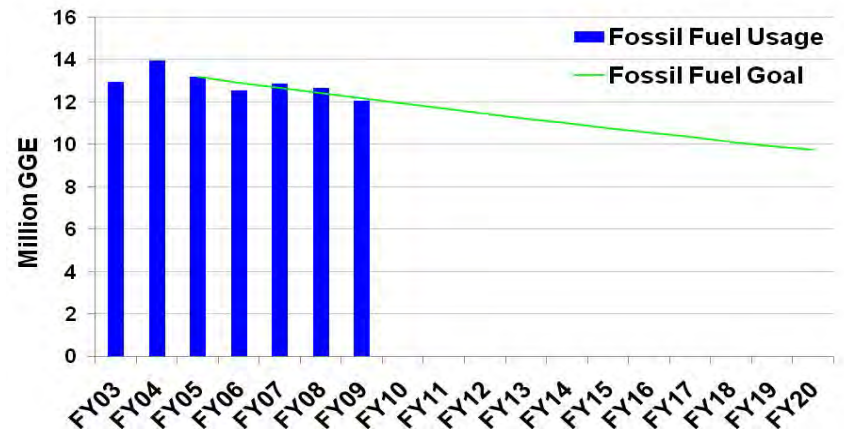


- Reduced installation energy intensity nearly 15% since FY03
- Reduced aviation fuel consumption 3% since FY06
- Reduced fossil fuel usage by almost 9% from FY05-FY09

Goal: Reduce Aviation Fuel Consumption

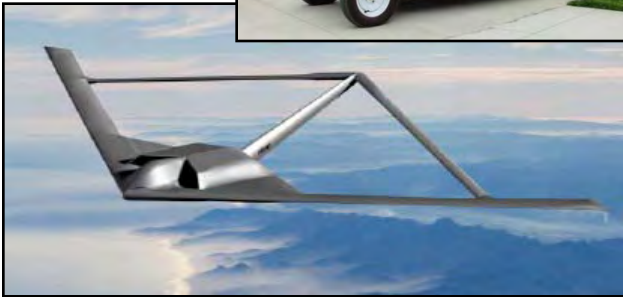


Goal: Reduce Motor Vehicle Fleet Fuel Use





Reduce Demand: Focus Area Initiatives



Aviation

- Reducing aircraft weight
- Optimizing flight routes
- Evaluating training fuel loads

Infrastructure

- Decreasing energy use
- Purchasing energy efficient supplies and low-speed vehicles
- Reducing vehicle fossil fuel use

Acquisition & Technology

- Designing more efficient and adaptive engines
- Pursuing more energy efficient aircraft



Reduce Demand: AMC Aviation Ops Fuel Demand

- Aviation operations fuel use has been reduced 2.7% from 2006 to 2009
 - Changed C-17 H₂O engine wash, which resulted in increased fuel efficiency and \$3.5M savings
 - Conducted successful Altus AFB test of KC-135 radar pattern 'clean configuration', resulting in a 3.5% fuel savings during pattern operations
 - Reduced C-17, C-5, C-130 and KC-135 ramp loads to capture potential fuel savings
- Emission reduction is over 800,000 metric tons CO₂ – equivalent to removing nearly 150,000 cars from U.S. highways for 1 year



**2015 Goal: Reduce aviation ops fuel demand by 10%
from 2006 baseline**

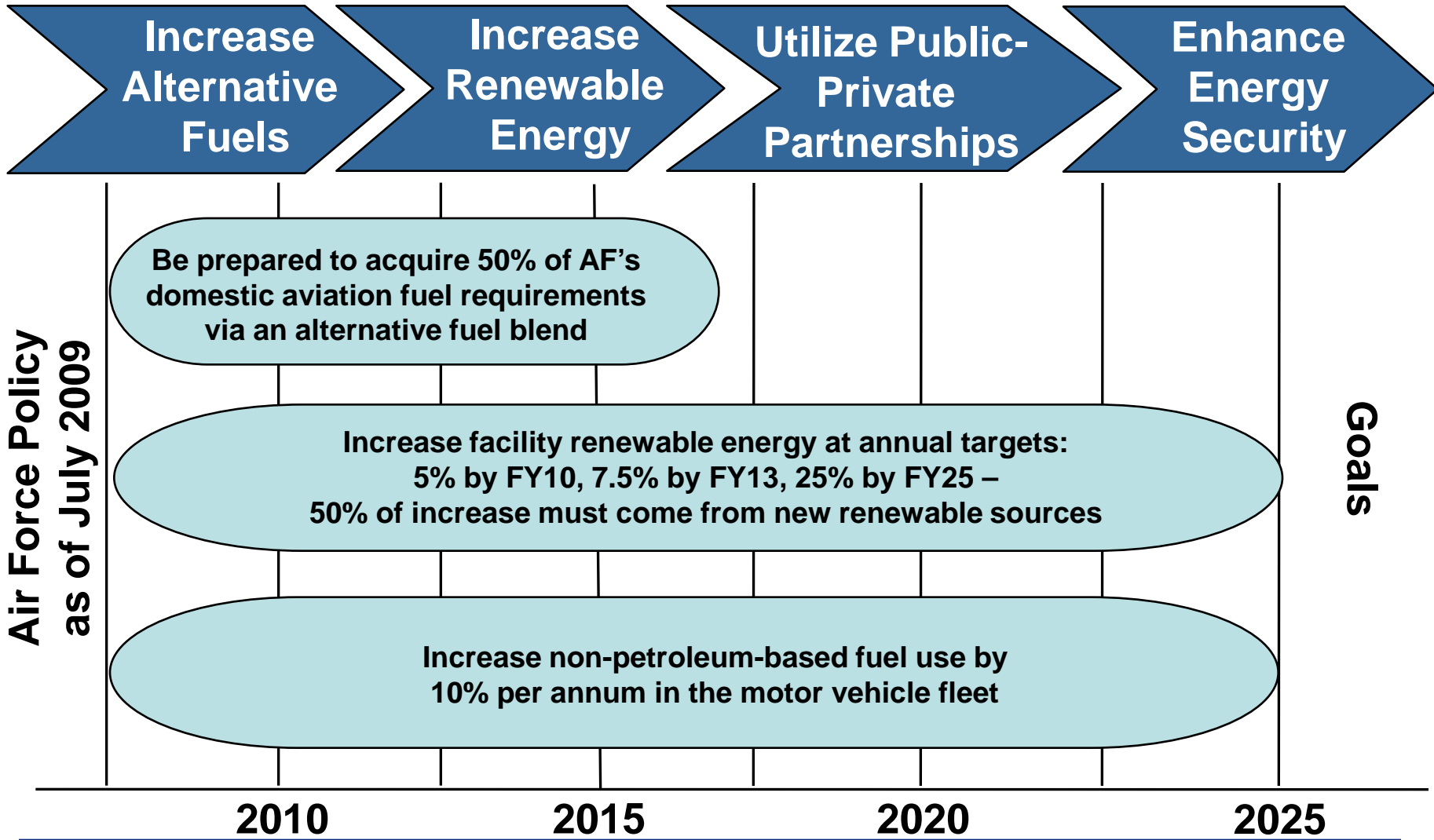


Reduce Demand: Fully Burdened Cost of Fuel

- **FY09 NDAA requires DoD to implement within 3 years (Oct 2011)**
- **Air Force is taking preliminary actions**
 - **Established Operational Energy Planning team**
 - **Developed model to estimate FBCF**
 - **AFROC requires energy KPP or documented rationale for not selecting KPP**
 - **Identifying possible insertion points through acquisition process and need for guidance**
 - **Incorporated energy logistics footprint into Unified Engagement and Future Capabilities war games**
- **Anticipate Director of Operational Energy Plans and Programs to integrate variations in Service approaches**



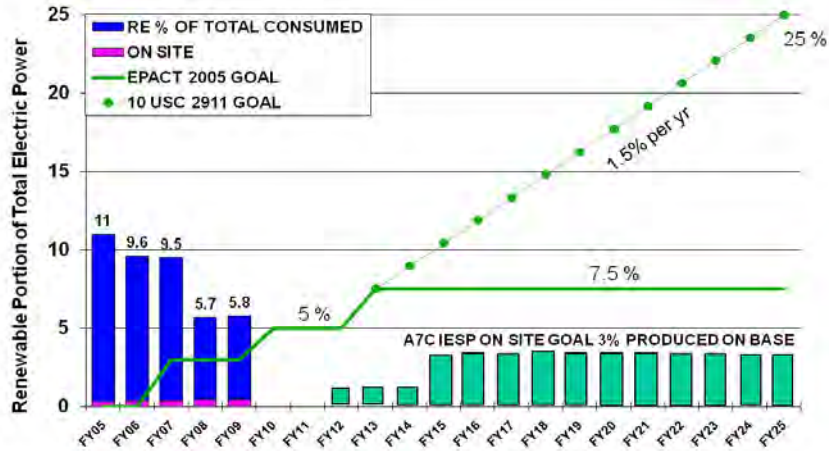
Air Force Energy Program: “Increase Supply” Goals



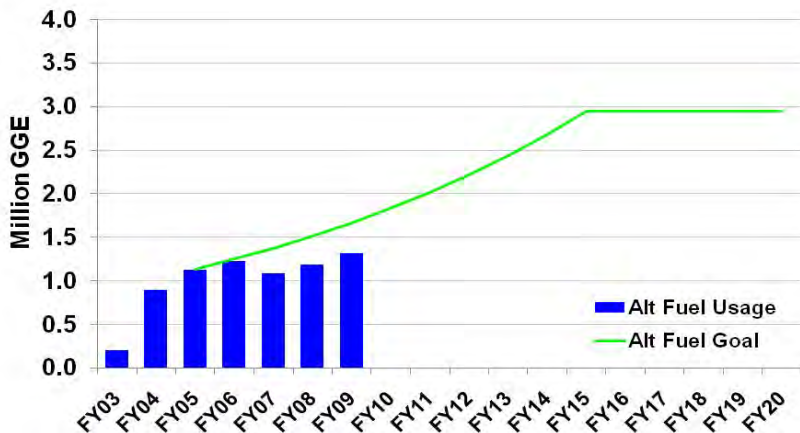


Increase Supply Metrics Through FY09

Goal: Increase Facility Renewable Energy



Goal: Increase Non-Petroleum Fuel Use



- AF #1 purchaser in federal government of “green” (renewable) energy
- Renewable energy represented 5.8% of total electric power consumption (0.4% site generated, 5.4% REC/purchase)
- Increased total alternative fuel use by 150,000 gallons (15% between FY08 to 09)
- Maintain over 7,000 flex fuel and hybrid vehicles, and over 1,800 low-speed vehicles as part of ground vehicle fleet



Increase Supply: Focus Area Initiatives



Infrastructure

- Purchasing green power for facility consumption
- Exploring commercial-scale energy projects
- Using ethanol and biodiesel flex-fuel vehicles
- Testing deployable alternative fuel stations

Acquisition & Technology

- Testing and certifying alternative aviation fuels
- Design energy conversion systems to be fuel-flexible



Increase Supply: Alternative Aviation Fuel Initiative

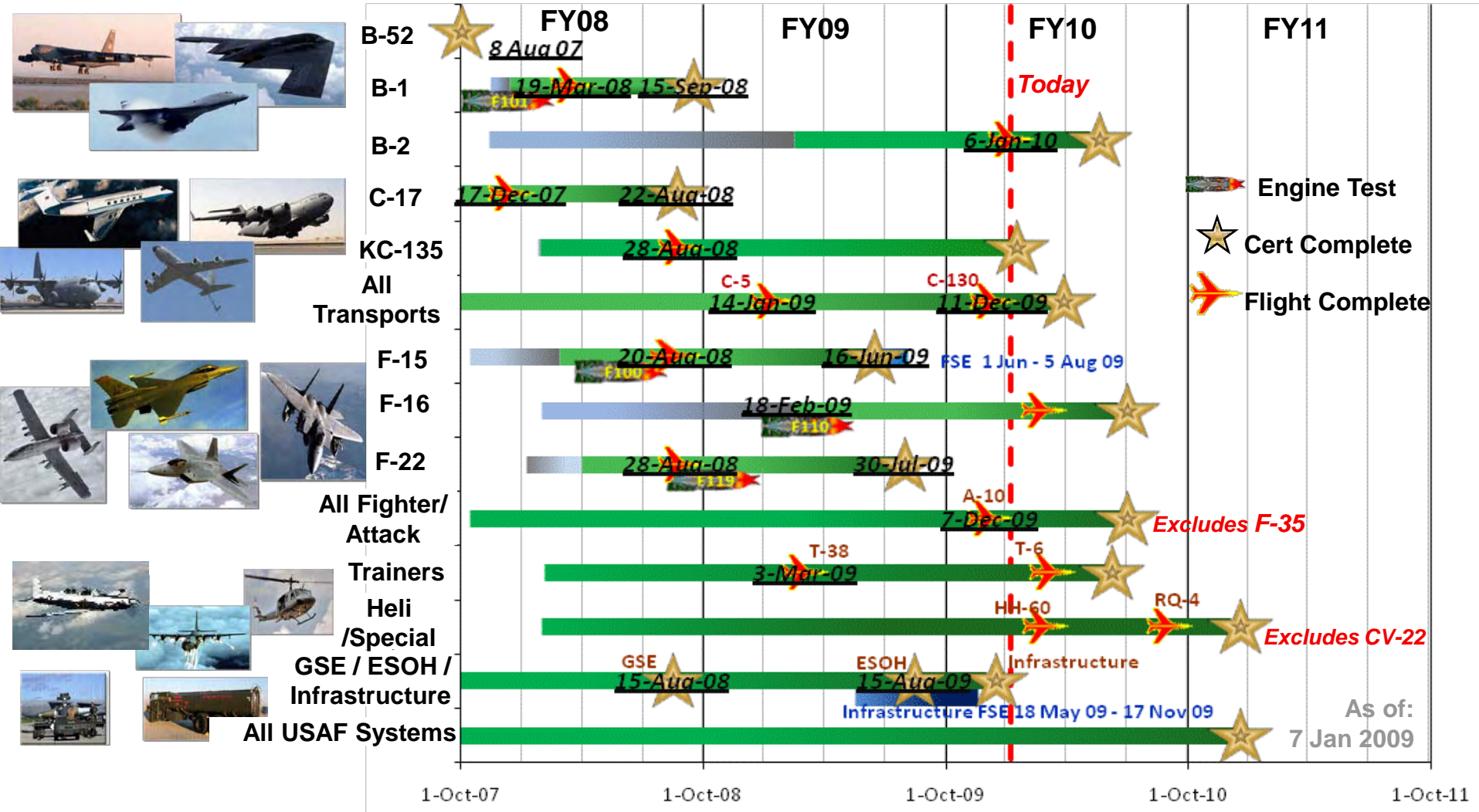
- By 2016, USAF will be prepared to cost competitively acquire 50% of its domestic aviation fuel requirement via an alternative blend
 - Alternative fuel component will be produced in a manner **greener** than fuel produced from petroleum
 - USAF depends on commercial suppliers for actual fuel production and availability
- USAF is on track to complete by early 2011 certifying aircraft, infrastructure, support equipment and vehicles for unrestricted operational use of Fischer-Tropsch-derived synthetic fuel blend



*USAF recently began the biomass-derived fuel
blend certification initiative*



Increase Supply: Synthetic Fuel Certification Schedule



Gap Analysis | Cert. Completion | FSE (Field Service Eval)

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Increase Supply: *Investigating Biomass-Derived Fuel Blends*

- **“Hydrotreated Renewable Jet” (HRJ) Fuel Blend**
 - **Similar to Fischer-Tropsch (FT) -derived synthetic fuel; consists mainly of paraffins from triglycerides and fatty acids derived from plant, algae, or tallow**
 - **Promises to reduce lifecycle greenhouse gasses (joint FAA/DoE/EPA studies underway)**
 - **AF is evaluating DARPA and Syntroleum/ Tyson HRJ candidates**
- **Other biomass-derived fuels**
 - **Near term: Beef tallow and non-food seed oils, e.g. Camelina, Jatropha**
 - **Far term: Halophytes (sea grasses), algae, cellulosic materials**



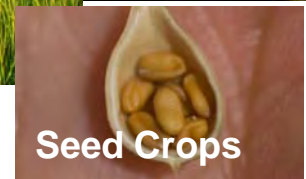
Jatropha



Algae



Halophytes

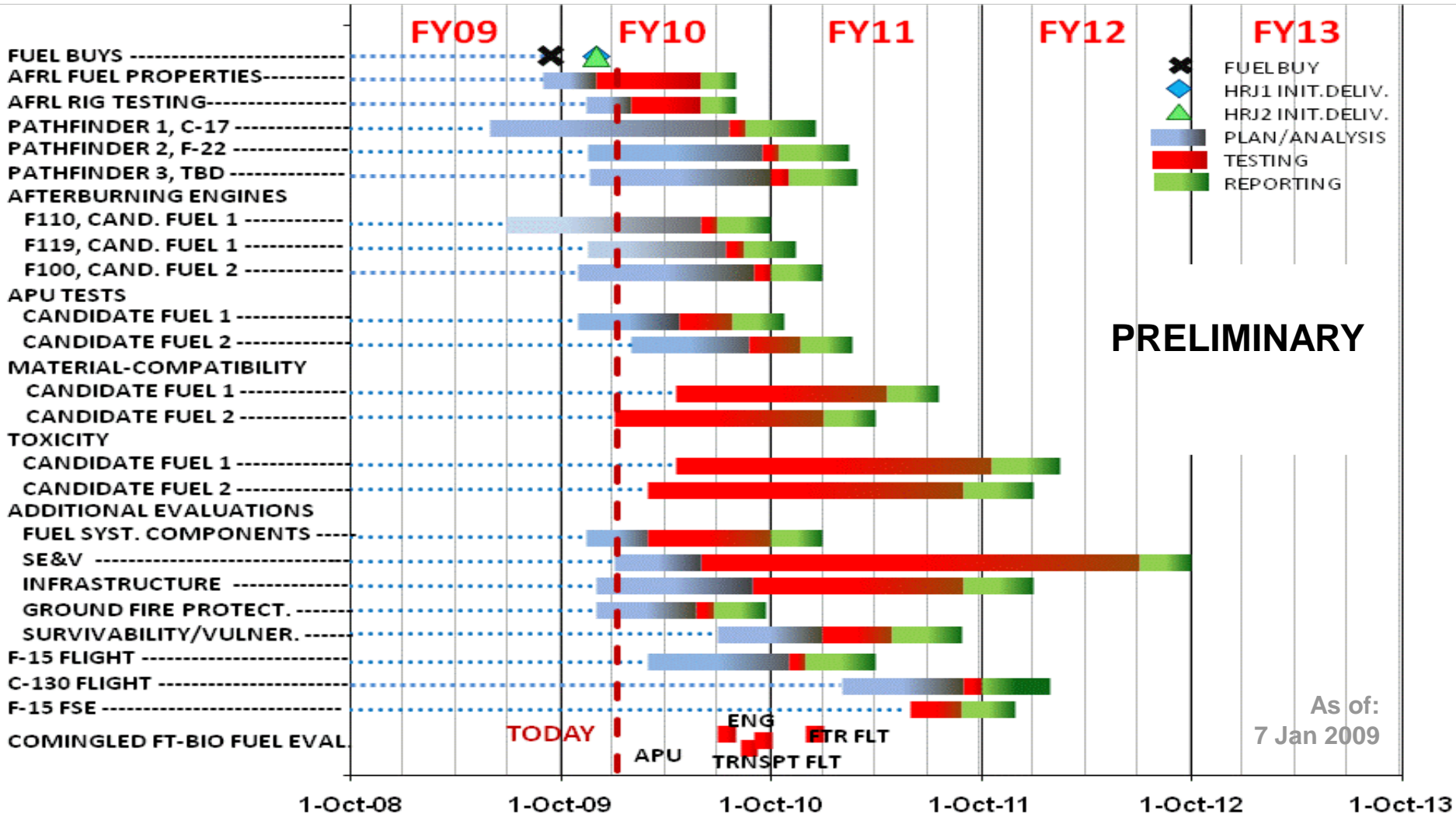


Seed Crops



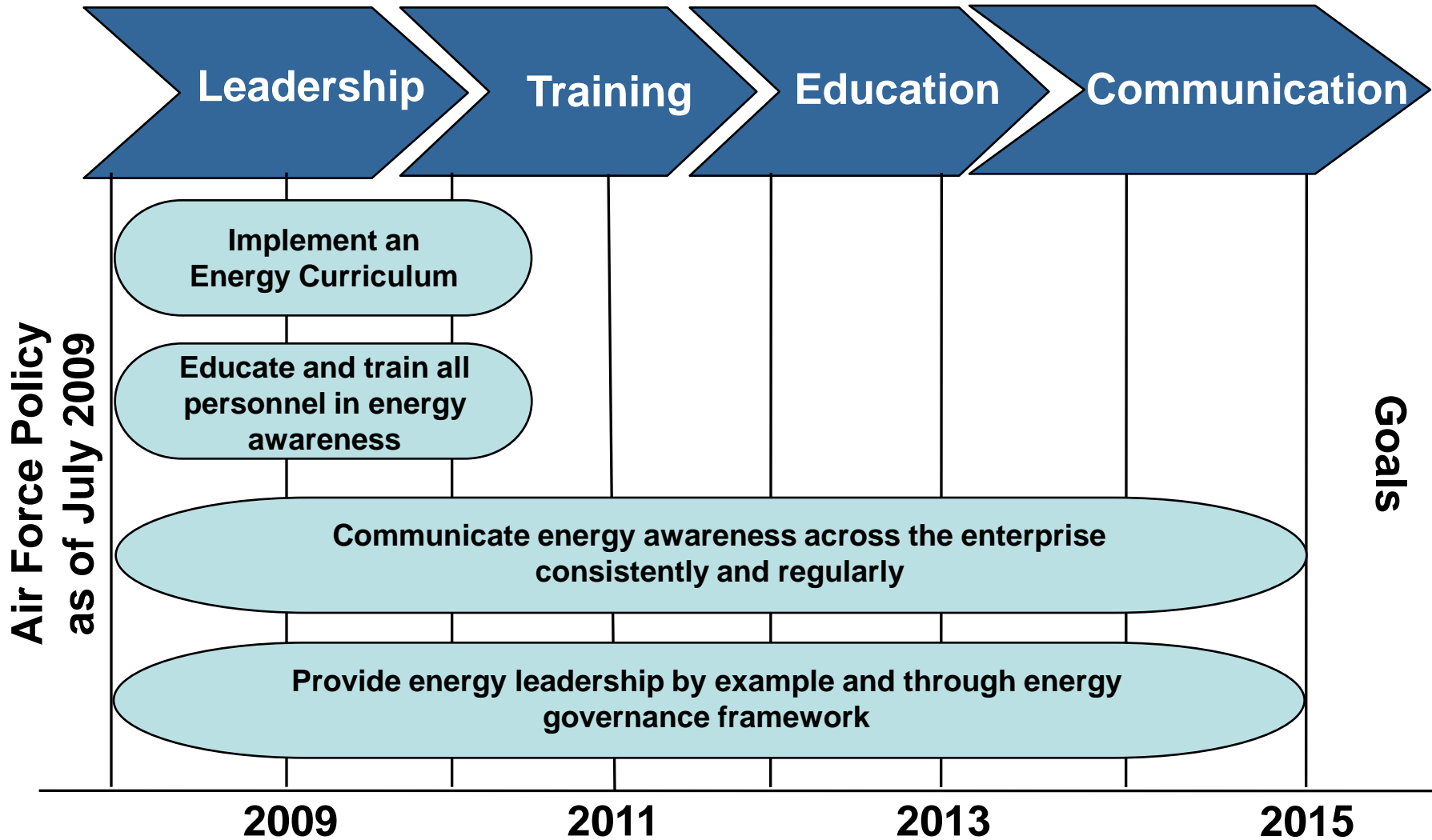


Increase Supply: Biomass-Derived Certification Schedule





Air Force Energy Program: “Change the Culture” Goals

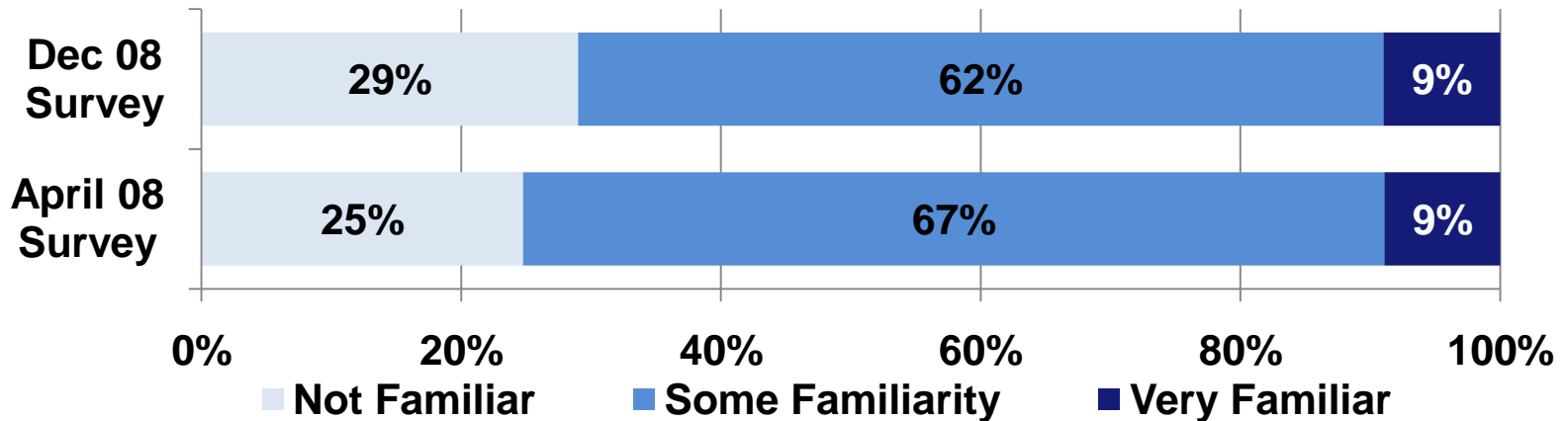




Culture Change Metrics Through FY09

- Airmen recognize the overall importance of energy
 - 65% say that energy affects their daily lives
 - 91% employ energy saving strategies
- 71% of Airmen indicated some familiarity with energy vision
 - Enlisted personnel are more familiar
- All MAJCOMs have FY10 Energy Awareness Campaign Plans to improve awareness

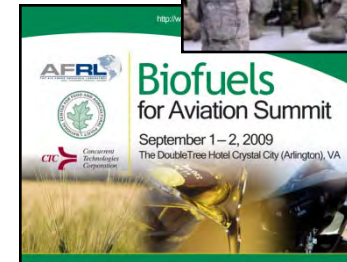
Goal: Educate and train all personnel in energy awareness





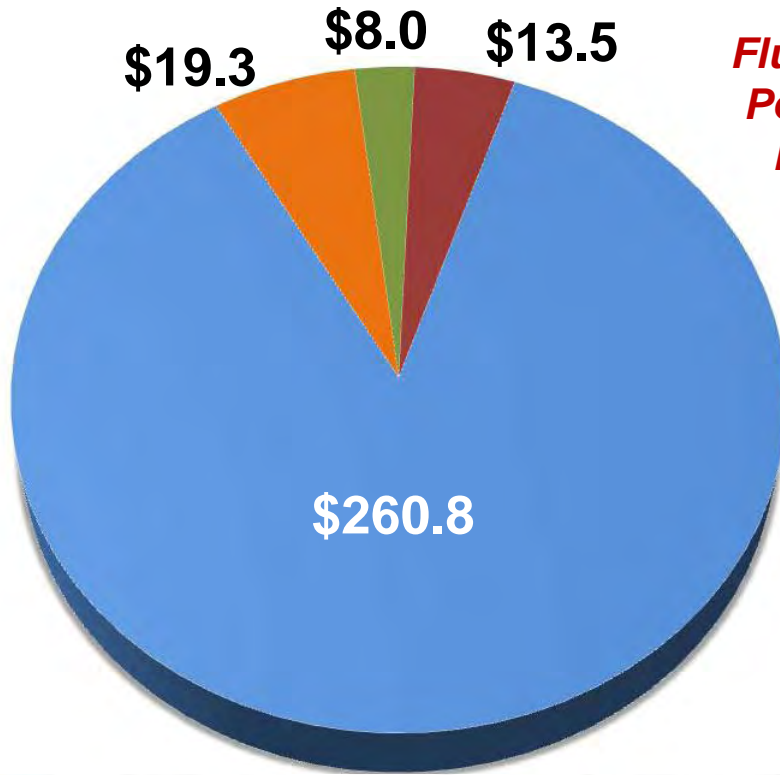
Change the Culture: Focus Area Initiatives

- Conducted Air Force Energy Forums to provide venue for industry, sister services, and other stakeholders to share energy best practices
 - Previous Events: March 2007 and March 2008
 - Next Forum anticipated early 2010
- Included energy awareness education in curricula at Air University and USAFA
- Conducted Biofuels for Aviation Summit in Sept 2009 to discuss best practices and future direction with multiple stakeholders
- Incorporating energy as a more realistic element in war games
 - Past: GovEnergy's Energy Security game (Aug 09); Air Force Title X Futures Game (Oct 09)
 - Future: Unified Engagement Game (2010)

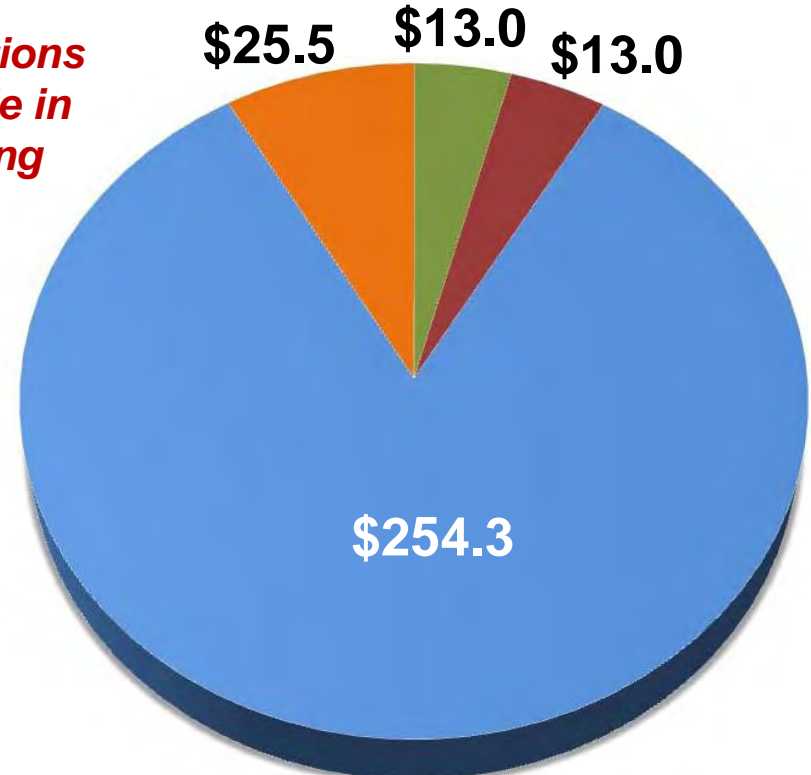




Future Energy Investments: Installation Funding



*Fluctuations
Possible in
Funding*



■ Water Conservation ■ Renewables ■ Design ■ Energy Conservation

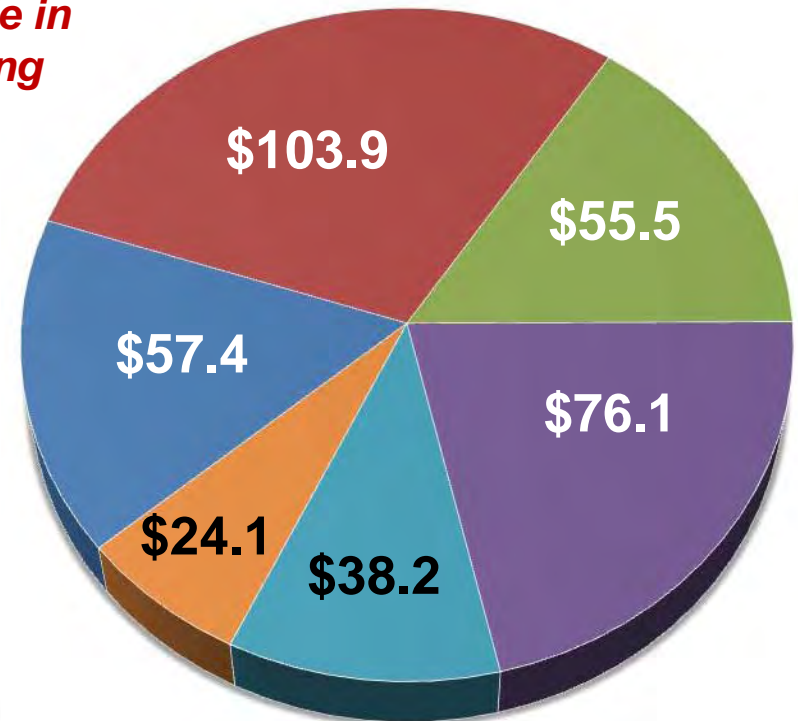
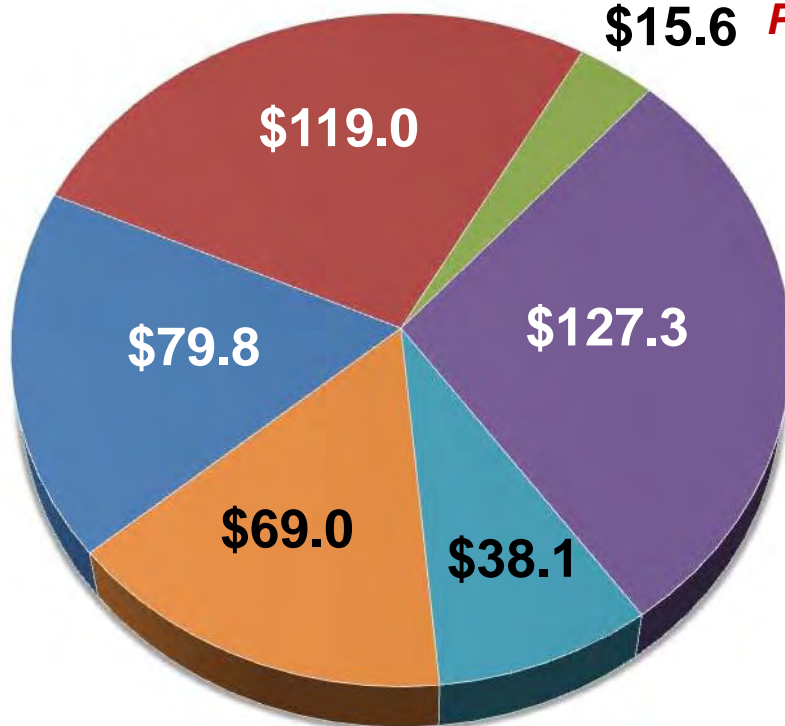
FY 10 Energy Investments
\$302M Funding

FY 11 Energy Investments
\$306M Funding



Future Energy Investments: Core RDT&E Funding

*Fluctuations
Possible in
Funding*



■ Flight Simulators & High Fidelity Trainers ■ Other ■ HEETE ■ ADVENT ■ Energy Power & Thermal ■ AFCO

FY 10 Energy Investments
\$449M Core RDT&E Funding

FY 11 Energy Investments
\$355M Core RDT&E Funding



- **Energy is a force multiplier**
- **Implementing multiple technical and procedural efforts to reduce the demand for energy**
- **Expanding our ability to use alternative aviation fuel to reduce demand on foreign oil and ensure the availability of supply, while remaining good environmental stewards**
- **Working to change the mindsets of all Airmen to ensure energy is a consideration in everything they do**

***Senior Leader Focus and Commitment
is Imperative***



U.S. AIR FORCE

<http://www.safie.hq.af.mil/>

