

Air Force Civil Engineer Support Agency

Engineering Agile Combat Support Worldwide

Air Force Facility Energy Program



**Col David Reynolds, PE
Commander
February 2012**

U.S. AIR FORCE



U.S. AIR FORCE

Overview



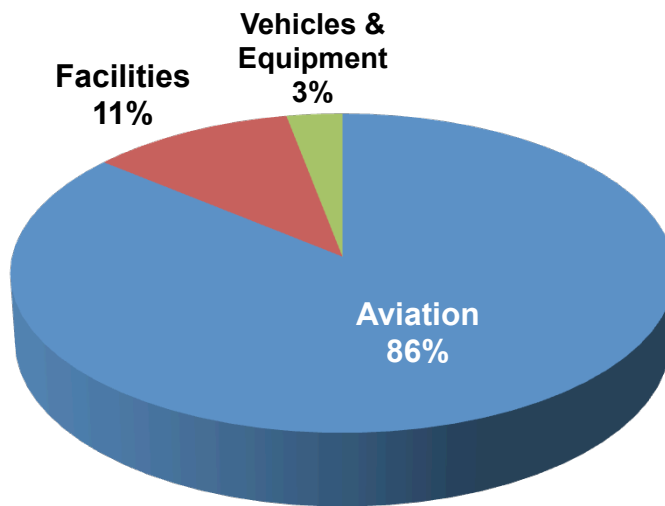
- **Energy Cost and Usage**
- **Air Force Physical Plant and Installations**
- **Goals and Mandates**
- **Strategy**
- **Programs**
- **Renewable Energy**



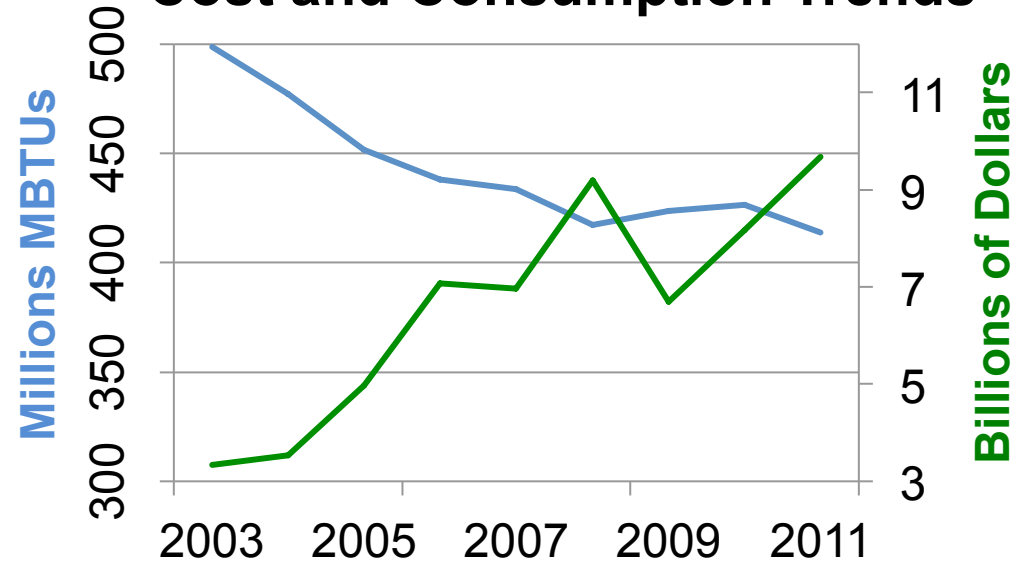
How much did the Air Force spend on energy in FY 2011?



Cost Breakdown



Cost and Consumption Trends



The Air Force spent over \$9 billion for energy in FY2011

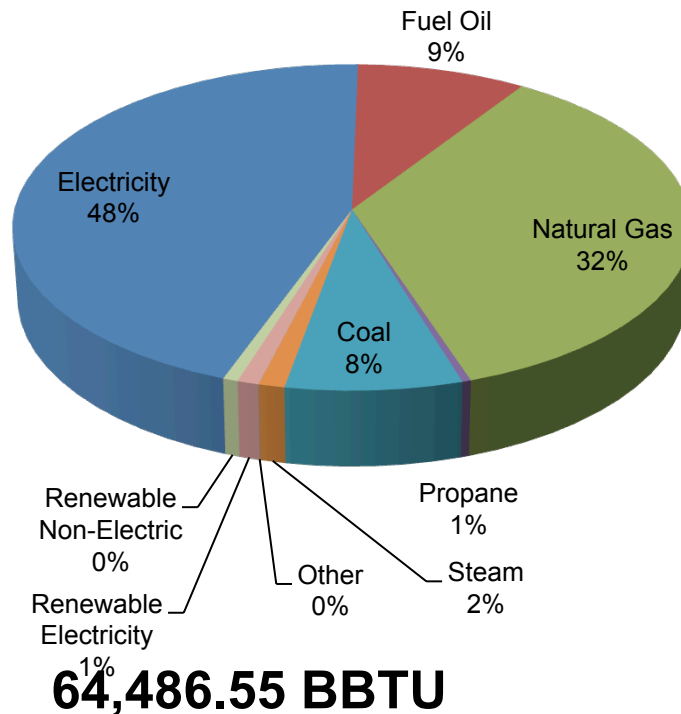


U.S. AIR FORCE

Facility Energy Use/Cost

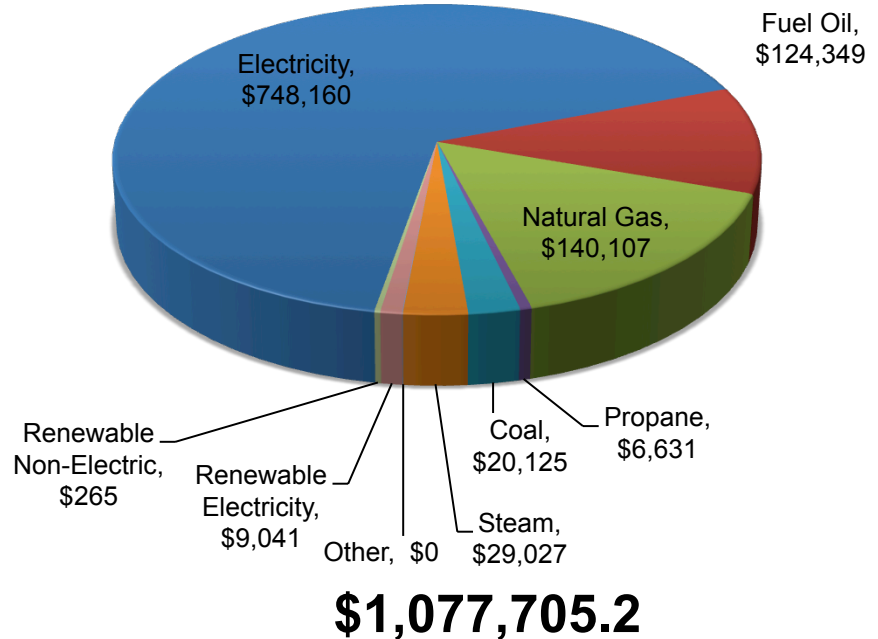


FY11 ENERGY USE



65,880.75 BBTU in FY10
2.1% Decrease From FY10

FY11 ENERGY COST (\$000)



\$1,034,809.96 in FY10
4.1% increase From FY10

SOURCE: FY11 ANNUAL ENERGY MANAGEMENT REPORT TO CONGRESS



U.S. AIR FORCE

Physical Plant Profile



Family Housing



75,800 Homes
1.5 times Savannah

Air Force Installations



10M Acres of Land
**Nearly twice the size of
Metro Atlanta**



Plant Replacement Value

\$255B PRV
Nearly the GDP of Peru

Airfields



154 Million Square Yards
**33 x Hartsfield-Jackson
Atlanta International Airport**

Facilities



634M Sq Ft of Buildings
**65 x Coca Cola's U.S.
Properties**

Dormitories



69,500 Dorm Rooms
**8.7 x Dorm Rooms
at Georgia Tech**

We Must Reinvest in Air Force Installations – A Force Enabler



U.S. AIR FORCE

Air Force Installations



- **Similar to a small city**
 - Roads, buildings, utility infrastructure, housing
 - Personnel and required support facilities/systems
- **Has one or more operational missions**
 - Flying, missile launch/control, training, weapon system maintenance, etc
- **Frequently in less populated areas**
 - Usually the largest employer in the area
- **Nearly all use services from local utility companies**
 - May be considerable distance from generation source
 - May have multiple connection points
 - Backup electrical power generation for critical functions



U.S. AIR FORCE

Goals and Mandates



■ The “Big 3” goals

■ Energy intensity

- BTU used per square foot of facility space
- Reduce intensity 3% per year, 30% by 2015
- Baseline in 2003

■ Water intensity

- Gal used per square foot of facility space
- Reduce intensity 2% per year, 16% by 2016
- Baseline in 2007

■ Renewable energy

- Renewable energy used compared to total electrical energy used
- Escalating scale, 5% goal in 2011, 25% in 2025



U.S. AIR FORCE

AF Facility Energy Strategy



- **Meet energy mandates (statutory, executive orders, AF corporate) and help provide energy security**
- **Improve mission support**
- **Make smart investments in reliable infrastructure to build sustainable installations**
 - **Direct energy project funding; seek best ROI for available \$\$**
 - **Max all funding sources**
- **Mitigate Risk: Leverage third party funding such as Power Purchase Agreements and Energy Saving Performance Contracts**
- **Reduce demand, increase supply and change culture**



Capital Investment Program Management



- **Two goals: Save \$\$ and meet mandates**
 - **Prioritize within each allocation by SIR *BTU or Gal**
 - **Target meeting all AF Infrastructure Energy Strategic Plan goals and Federal mandates**
- **Bases/audits identify investment opportunities (SIR >1)**
- **Projects validated and prioritized (SIR * BIR)**
- **Projects are closely tracked through execution**

SIR = Savings to Investment Ratio (dollar savings)

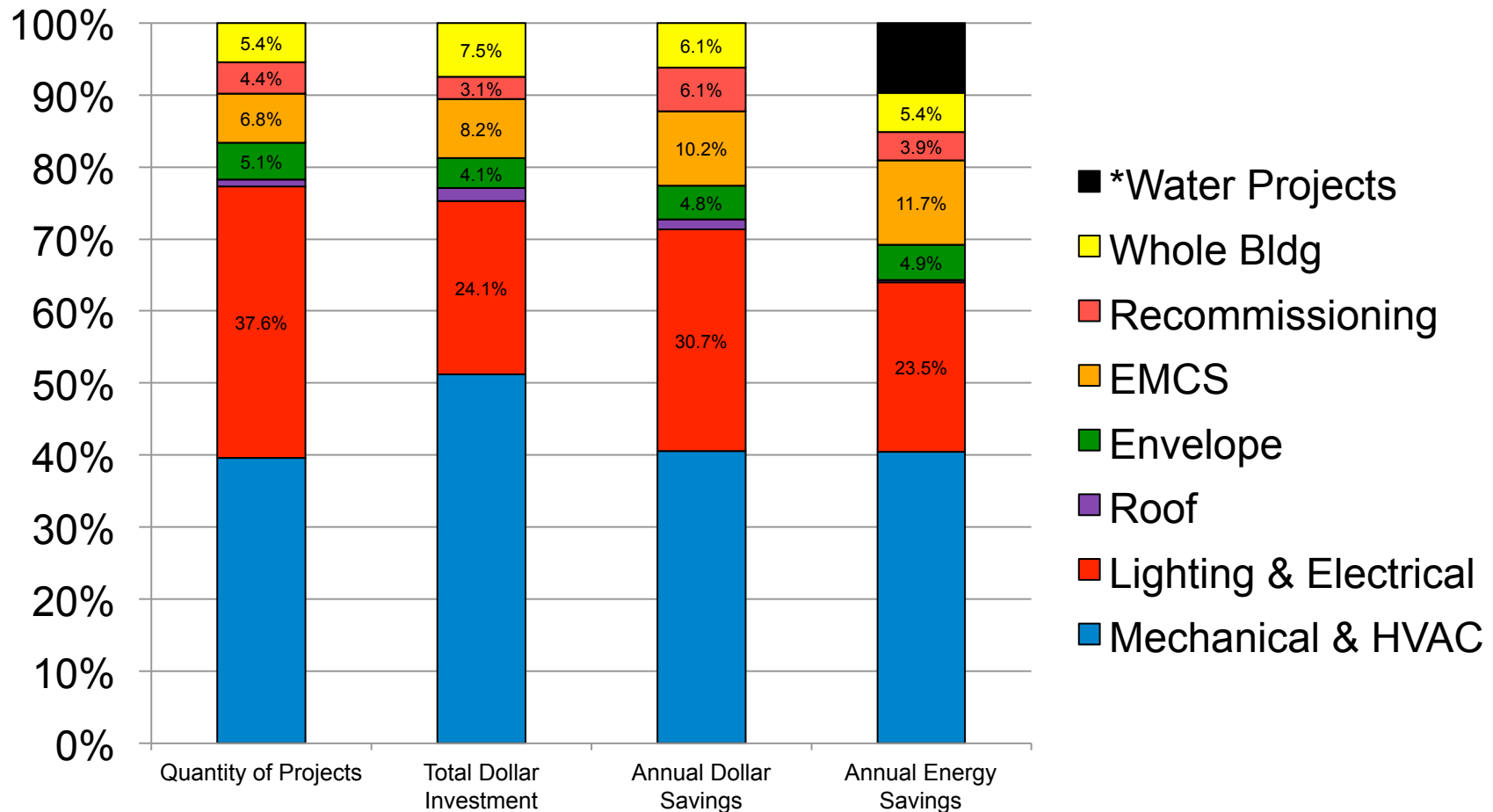
BIR = BTUs to Investment Ratio (energy savings)



Energy Conservation Projects Types FY11



Funded Mix of Energy Conservation Projects





U.S. AIR FORCE

Energy Security



■ Energy Security Definition

- QDR 2010 – “Energy security for the DoD means having assured access to reliable supplies of energy”
- A part of Mission Assurance
 - A multitude of parts to that but boils down to sustaining critical operations
- Future of how AF does business hinges on the proper definition
 - Impact on critical mission backup power systems
 - Impacts on Defense Critical Assets protection
 - Impacts on electrical system resiliency, reliability, and efficiently

■ Economics – Putting a price on risk

- Mission requirements and predicted duration impact assets needed



AF “Smart Grid” – Energy Surety Microgrid



- **Integrates backup generator systems, distributed generation technologies, and energy storage**
 - **Create a controllable, reliable, and secure internal energy grid**
- **Challenge: Integrate renewables into grid to:**
 - **Maximize energy resiliency and redundancy**
 - **Minimize impact to grid power quality and mission impact**
 - **Photovoltaic – harmonic distortion and 60 Hz frequency control**
 - **Wind generators – electromagnetic interference with radar systems**
- **Most Smart Grids focus on complex digital communication technology**
 - **May present security or operational risk**



U.S. AIR FORCE

Energy Security Way Ahead



- **Develop an energy security electrical system model consistent with Energy Security policy definitions**
 - **Propose smaller microgrids (2 or 3 buildings) within base grid with inter connect capability**
 - **Lower cost of failure and optimal use of existing generator inventory**
- **Develop criteria balancing cost and risk**
- **Price tag could be significant**
 - **Must budget for new requirements**



U.S. AIR FORCE

Renewable Technologies



- Solar
- Wind
- Biomass
- Landfill Gas
- Geothermal
- Ocean
- Hydropower
- Waste to Energy
- Ground Source Heat Pumps





Renewable Project Development



- **Feasibility Study:**
 - Looks at RE types e.g. wind, solar, biomass, etc.
 - No base specific info- land available, mission, siting
- **Opportunity Assessment: IDs Base requirements e.g. mission impact, environmental, land availability, incentives, how much power can be used...**
- **Business Case Analysis: crunch the numbers of project details e.g. costs, method of execution, simple payback...**
- **Program on track to meet/exceed all RE goals**



Renewable Energy Goals and Strategy



- **First Priority: Develop on-site renewable resources**
 - Renewable Energy Purchase Agreements (REPAs) or Enhanced Use Lease (EUL)
 - Utility/Third Party Funded
 - Direct AF investment (limited)
- **Second Priority: Procure power from off-site renewable resources delivered over the power grid**
- **Third Priority: Purchase Renewable Energy Certificates (RECs)**
 - Replacement RECs
 - Goal Attainment (phasing out in 2013)

PROGRAM ON TRACK TO ATTAIN ALL RENEWABLE GOALS



U.S. AIR FORCE

Operational On-Base (Top 10) RE Electric Generation



Location	Source	Generation MWH
Nellis AFB, NV	Solar Photovoltaic	31,477
Hill AFB, UT	Landfill Gas	14,949
F E Warren AFB, WY	Wind	8,725
Ascension	Wind	7,095
US AF Academy, CO	Solar Photovoltaic	6,631
Buckley AFB, CO	Solar Photovoltaic	1,545
Cape Cod AFS, MA	Wind	1,472
Toledo ANG, OH	Solar Photovoltaic	1,203
Fresno ANG, CA	Solar Photovoltaic	942
JB McGuire/Dix/Lakehurst	Solar Photovoltaic	738

Air Force Totals

56 Bases

131 RE Projects

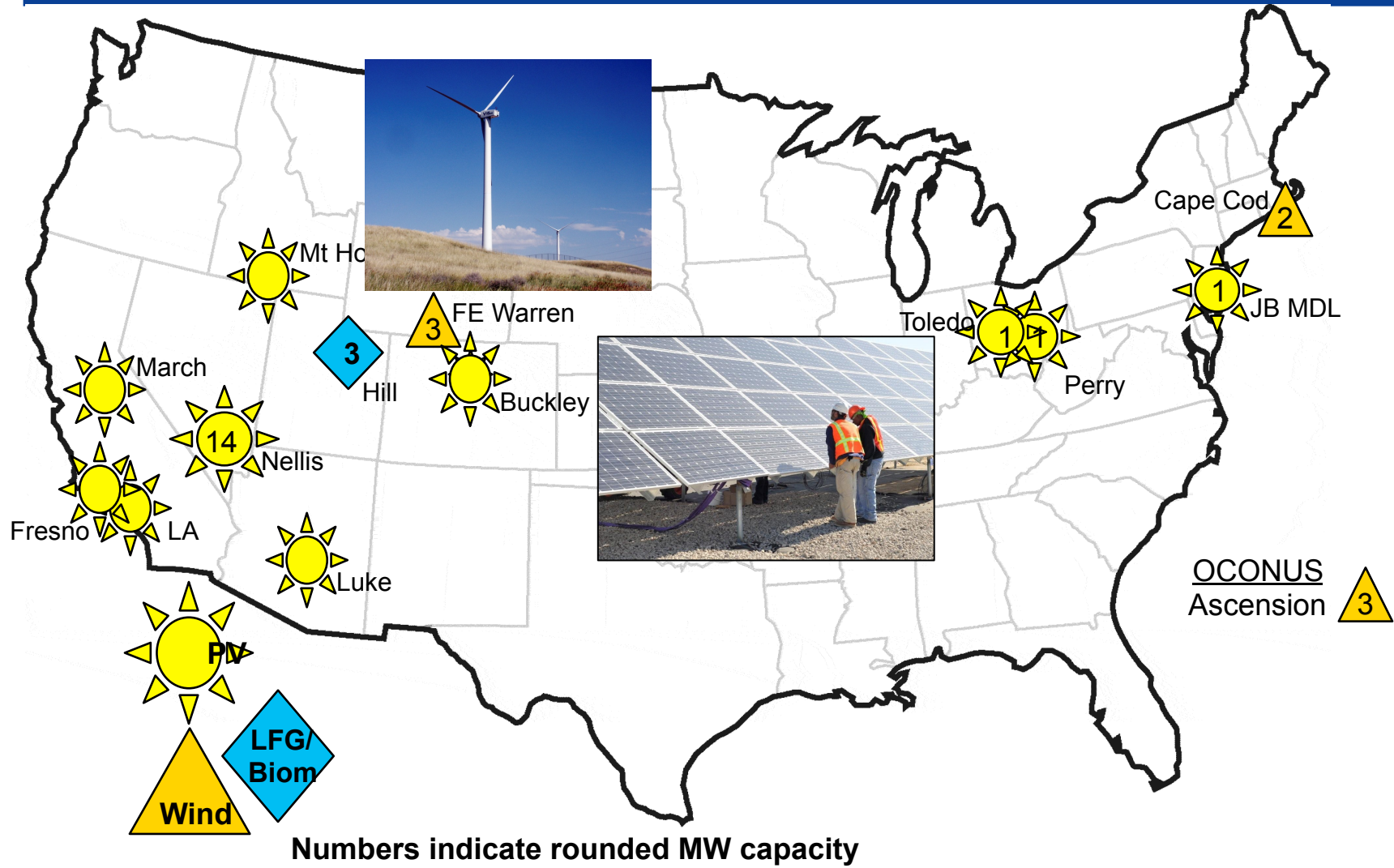
79,106 MWH

**The Air Force supported 79,106 MWH of renewable energy in FY 11.
This is the equivalent to removing 10,700 cars from the road or
enough energy to power Ellsworth AFB for 1 year**



U.S. AIR FORCE

Operational Renewable Electrical Energy Projects

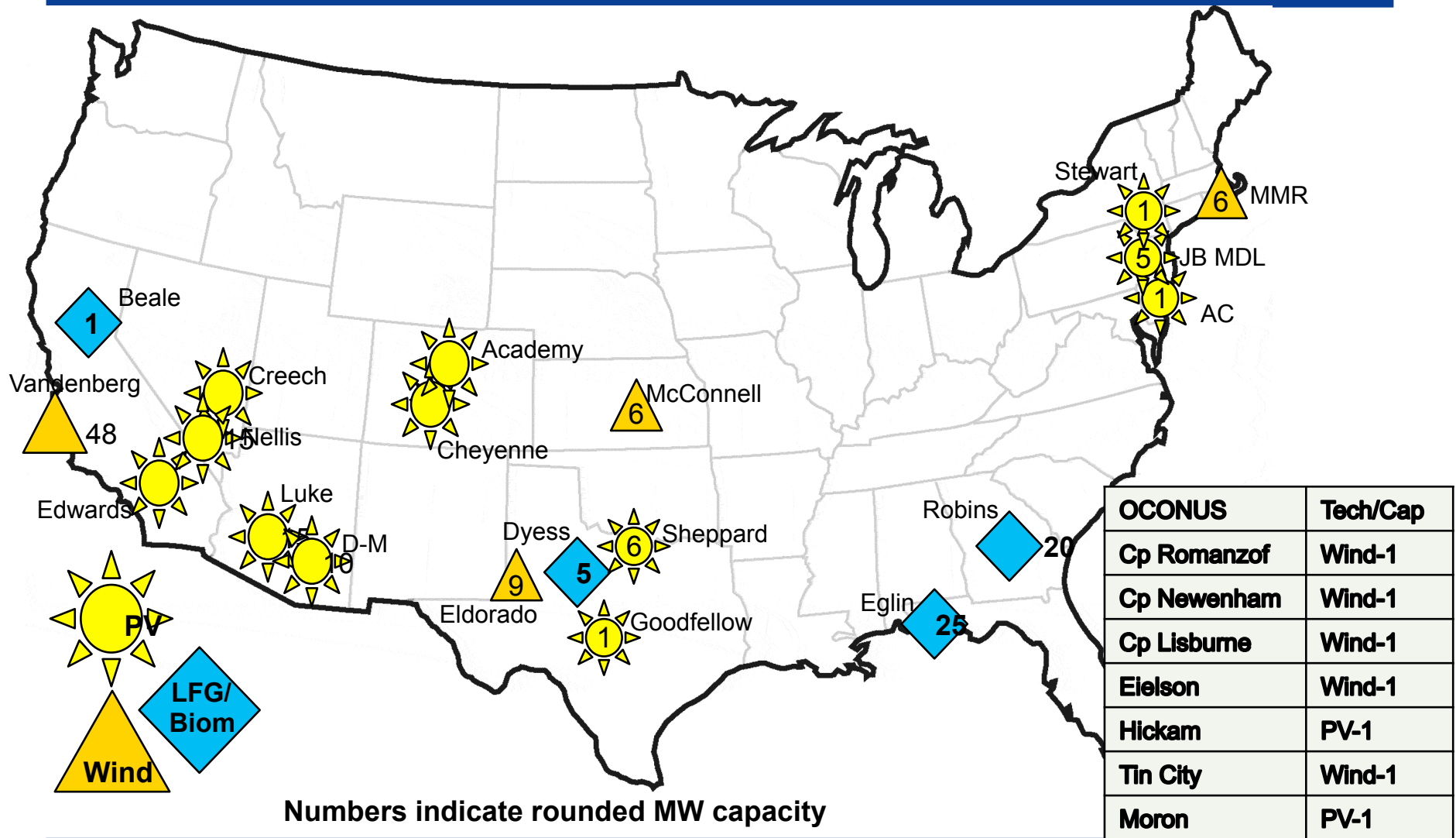


Engineering Agile Combat Support Worldwide



U.S. AIR FORCE

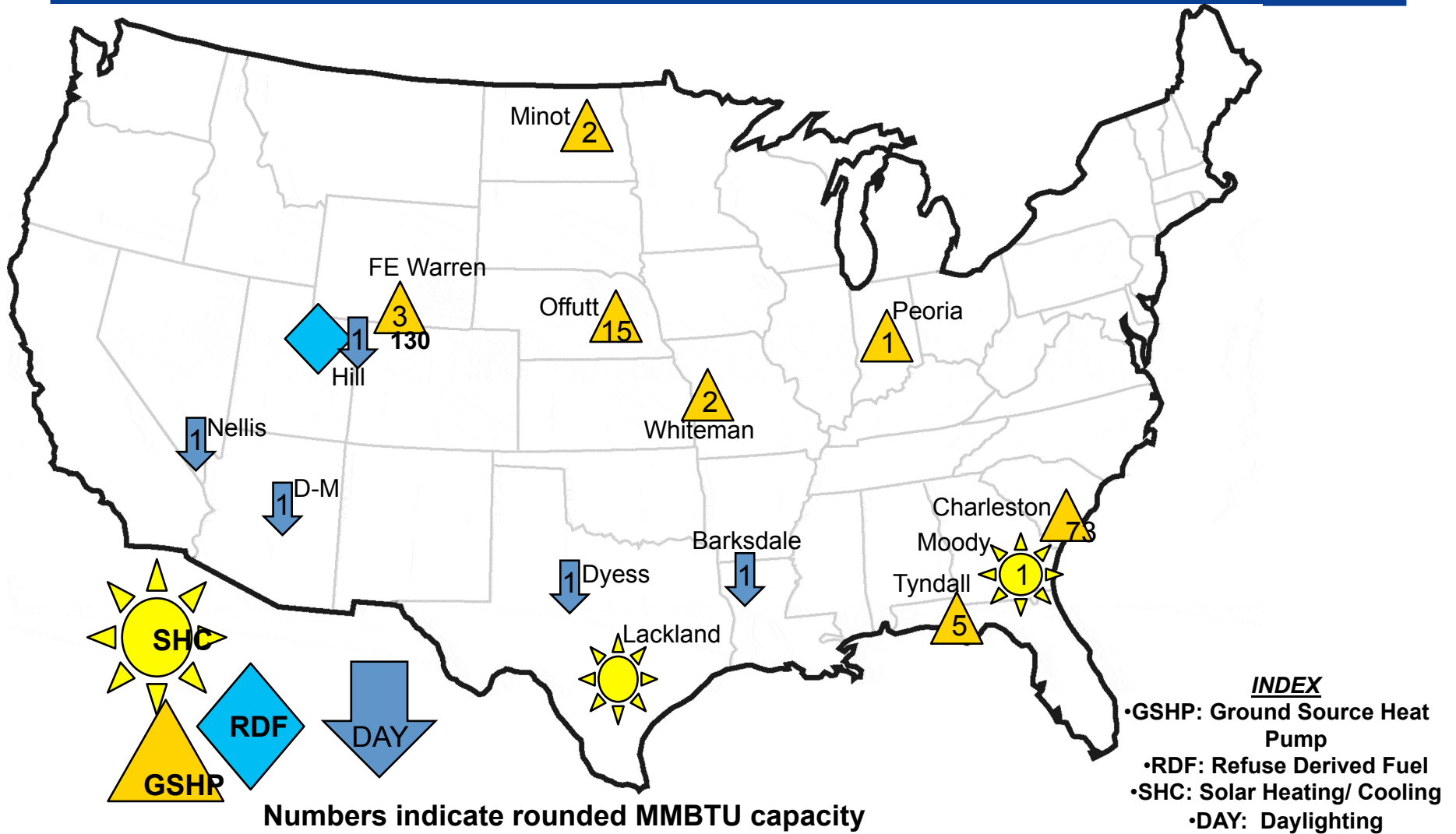
FY10-13 Renewable Electrical Energy Projects





U.S. AIR FORCE

Operational Renewable Thermal Energy Projects

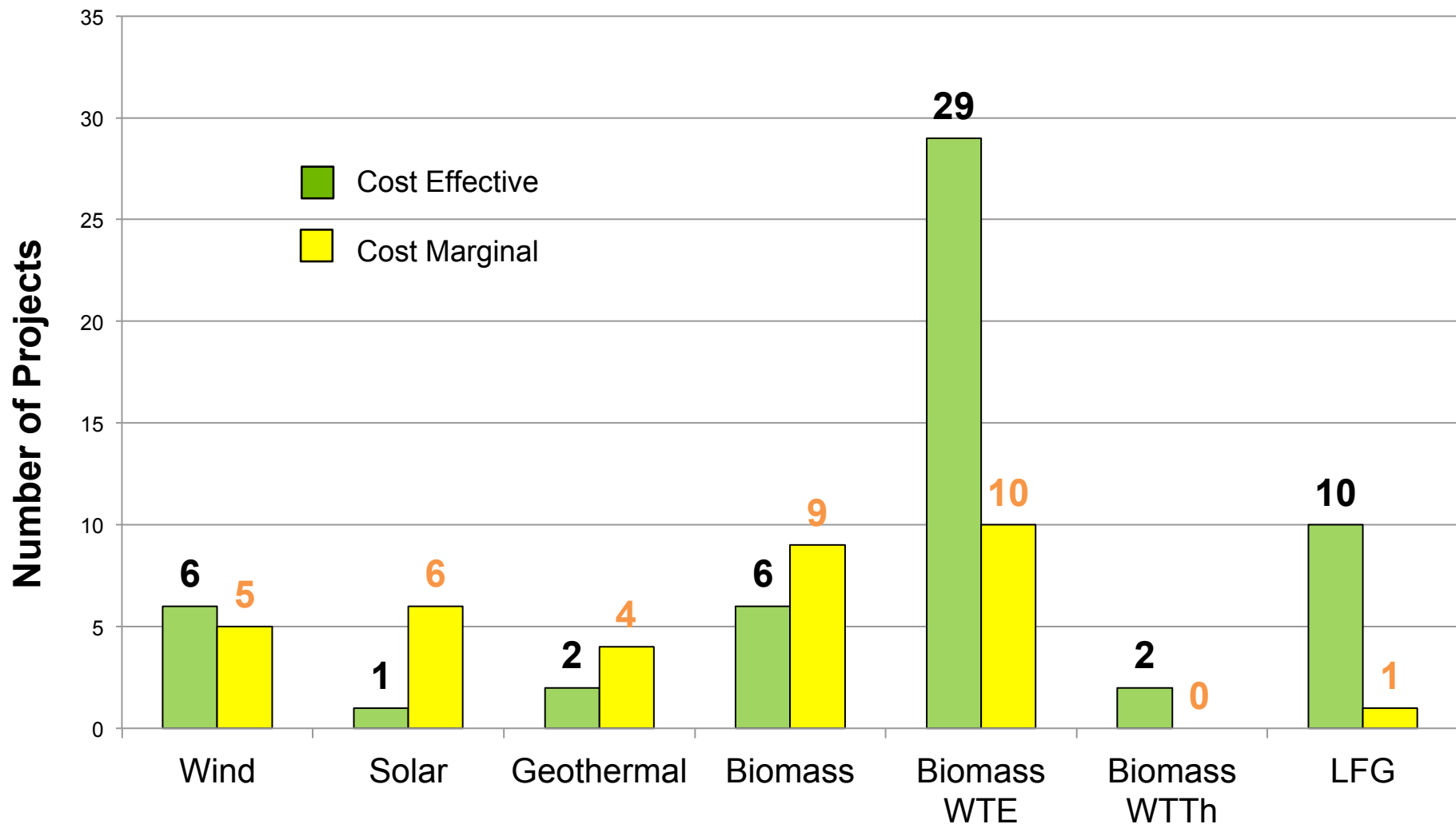




U.S. AIR FORCE

DOE Labs Feasibility Study

RE Opportunity by Technology



Engineering Agile Combat Support Worldwide



U.S. AIR FORCE

Waste to Energy Way Ahead



- Brief/review with AF Senior Leaders
- Develop Dyess AFB, TX Waste To Energy as Initial Project
- Establish best practices with AFRL
- New Waste To Energy Opportunity Assessments in FY11

Luke AFB	Los Angeles AFB	Cape Canaveral AFS*	Kirtland AFB*
Tinker AFB	Goodfellow AFB	Travis AFB*	Andrews AFB*
Wright-Patt AFB	Laughlin AFB	Tyndall AFB*	Homestead ARB*
Buckley AFB	Sheppard AFB	Scott AFB*	Westover ARB*
Keesler AFB	Maxwell AFB	Patrick AFB*	McGuire AFB*
Elmendorf AFB	Tonopah Annex		

***OA Potential Validated**



U.S. AIR FORCE

Eglin AFB 25 MW Biomass



- **Project under development**
- **25 MW woody biomass plant**
 - **Wood products from Eglin and surrounding areas**
- **Would provide continuous 24/7 electric power**
- **Engineering and environmental work nearly complete**
 - **Working economic analysis, site issues, etc**



U.S. AIR FORCE

Summary



- **Comprehensive strategy**
 - Meet legislative mandates, avoid future costs
 - Enhance energy security
- **Fiscally responsible balanced portfolio**
 - Fund projects with solid business case...Savings to Inv Ratio
 - Mitigate risk with cost effective strategies
- **Highly dynamic program**
 - Energy surfacing at all levels of DOD and Fed Govt
 - Must adapt to evolving requirements and new technologies
 - Must focus resources to best support Air Force needs