

Headquarters U.S. Air Force

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Air Force Renewable Energy Enhanced Use Lease Opportunities



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AFRPA/COO-BL
EUL Chief
26 September 2007**



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Renewable Energy Enhanced Use Lease

- **Air Force Priorities**
- **AFRPA Renewable Energy EUL Opportunity Study**
- **Market Based Approach & Renewable Energy Opportunities**
- **Top Near-Term Projects**
 - **Edwards AFB**
 - **Kirtland AFB**
 - **Luke AFB – Barry M. Goldwater Range**
 - **Vandenberg AFB**



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Renewable Energy EULs Background

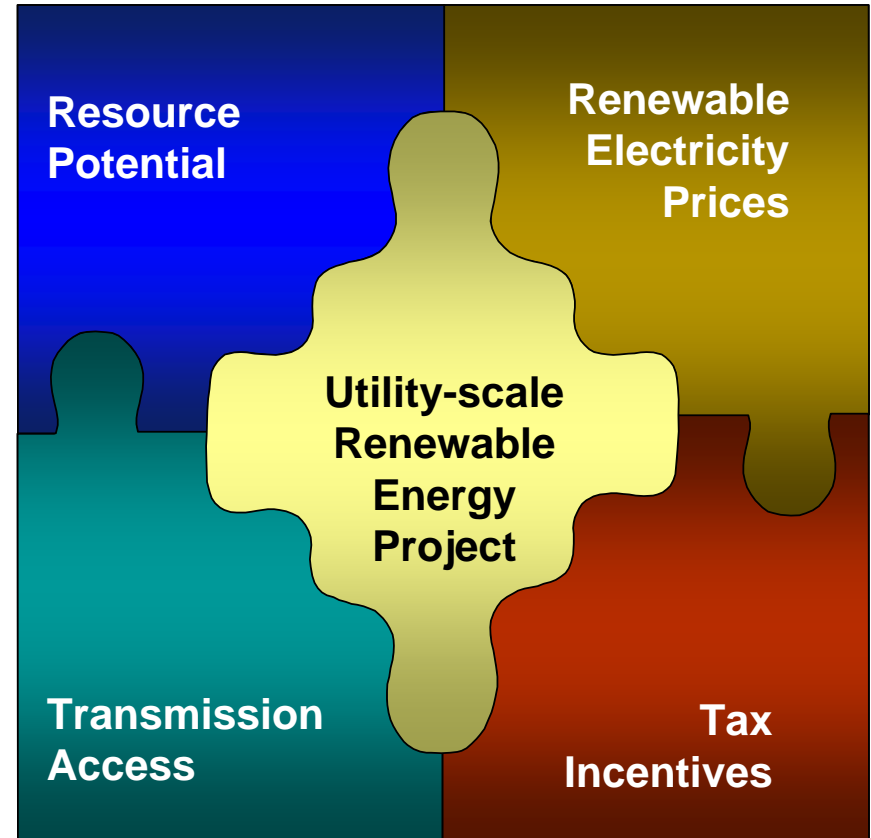
- **Renewable Energy**
 - Meet President's Renewable Energy Goal, EO 13423
 - Energy Policy Act of 2005
- **Enhanced use lease**
 - Leverages assets to generate revenue or in-kind services
 - Use proceeds to sustain, restore, and modernize AF infrastructure, obtain renewable energy
- **Offers win-win benefits for AF installations, developers, and the local communities**
 - Builds partnerships between the military and private industry



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Utility-Scale Renewable Energy Projects

- Feasibility of renewable power projects depends on:
 - Renewable resource potential (solar, wind, biomass, biofuels, geothermal)
 - Federal renewable energy policy
 - Production Tax Credit
 - Accelerated Depreciation
 - State renewable energy policies
 - Renewable Portfolio Standard (RPS) mandates
 - State Production Tax Credits and other financial incentives
 - Transmission policies
 - Transmission
 - Physical access to sufficient transmission
 - Interconnection and transmission costs
 - Electricity price
 - Electricity demand growth and demand for renewable energy specifically
 - Consumer-choice green power market expected to grow
 - 90% of today's renewable power market is wind





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Renewable Energy EUL Study

Aug 07

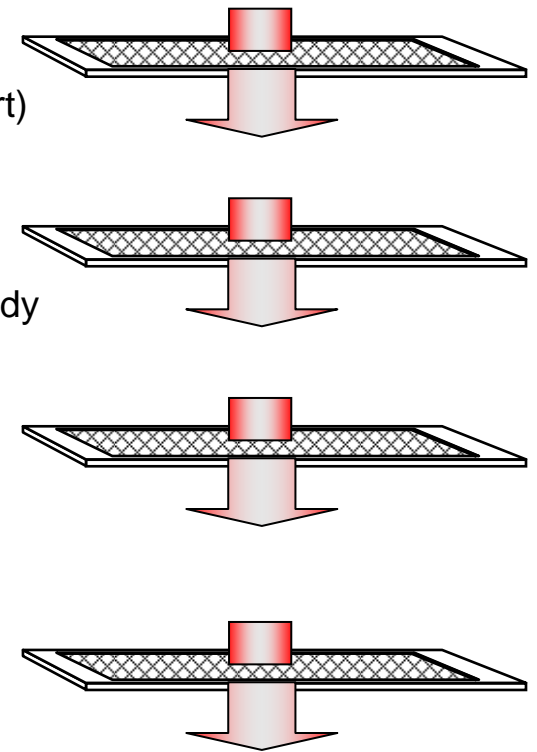
- **Focused on maximizing ROI and identifying opportunities with off-base market for power/fuel**
 - Near-term opportunities for commercial utility-scale projects
 - Considered: wind, solar, biomass, biofuels, and geothermal sources
- **Many installations eliminated**
 - Insufficient underutilized land or height constraints that precluded large-scale development
- **Renewable Energy EUL Opportunity Summary Report publicly available**
 - <http://www.safie.hq.af.mil/shared/media/document/AFD-070917-021.doc>



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We used the following methodology for selecting the top-tier opportunities

- Developed a list of AF properties including: Installations, Air National Guard Stations, Military Airport facilities
- Evaluated the renewable energy market in the area which is based on the following factors
 - State renewable energy support (including specific technology support)
 - Gaps between renewable energy supply and future demand
 - State electricity prices
- Incorporated the conclusions of DoD Renewable Energy Working Group study (only large-scale wind opportunities evaluated on Air Force bases) and DoD Geothermal study
- Developed an inventory of renewable energy resources
 - Wind class (Class 3 and above acreage on base)
 - Solar (kwh/m2/day for Solar Thermal and Solar PV)
 - Biomass (local resource availability)
 - Geothermal (geological evidence to support test drilling/further study)
 - Ethanol (local feedstock production and availability)
 - Biodiesel (distance to feedstock supply source)
- Factored the distance to high-voltage transmission lines and/or transportation access

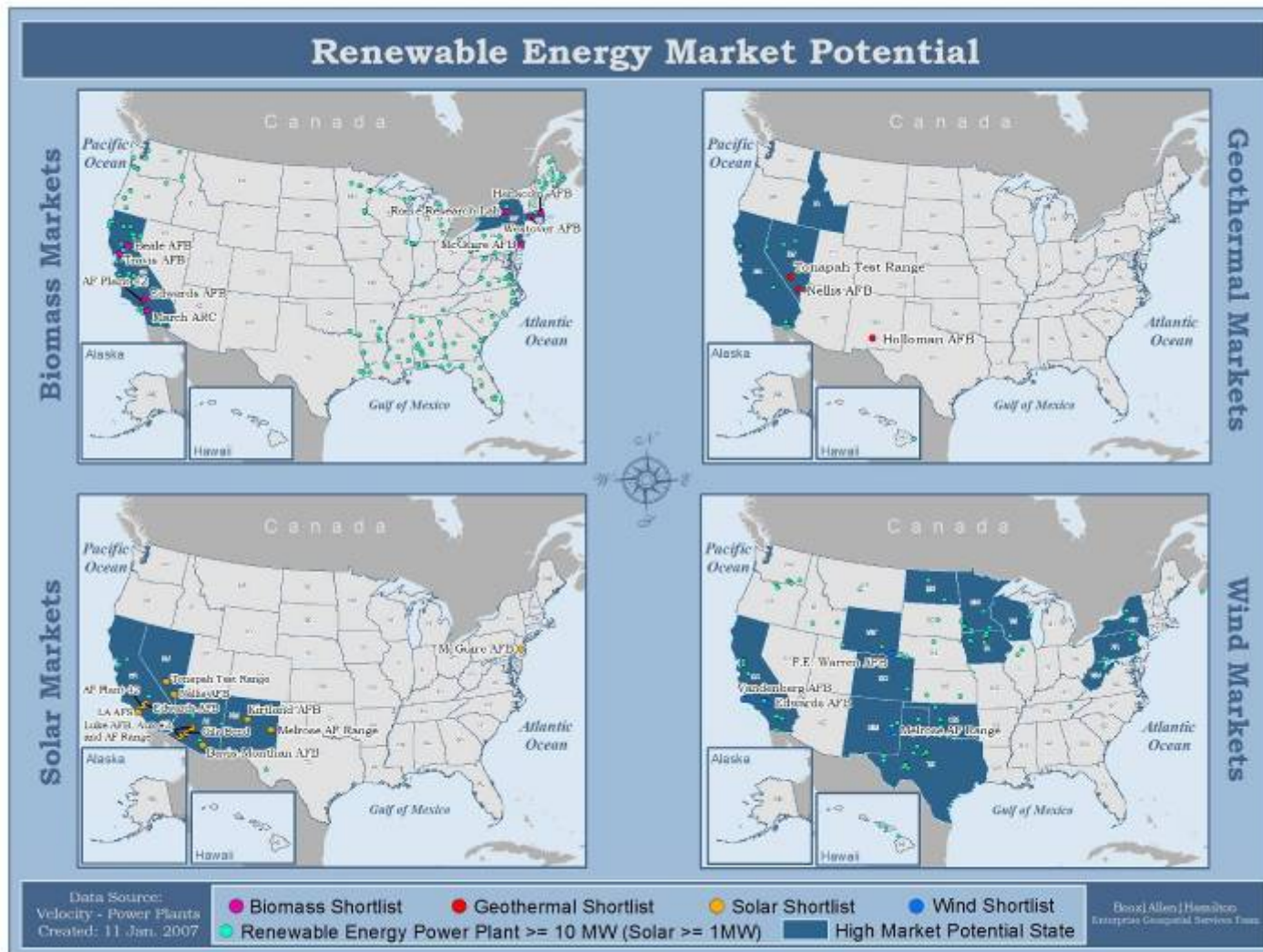


Tier 1 Opportunities



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Market Based Approach



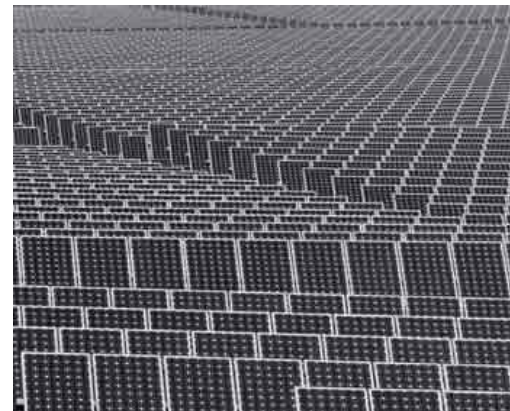
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Top Near-Term Renewable Energy Opportunities

- **Wind energy at Vandenberg AFB**
- **Solar energy at Edwards AFB**
- **Solar energy at Kirtland AFB**
- **Solar energy at Luke AFB, Barry Goldwater Missile Range**



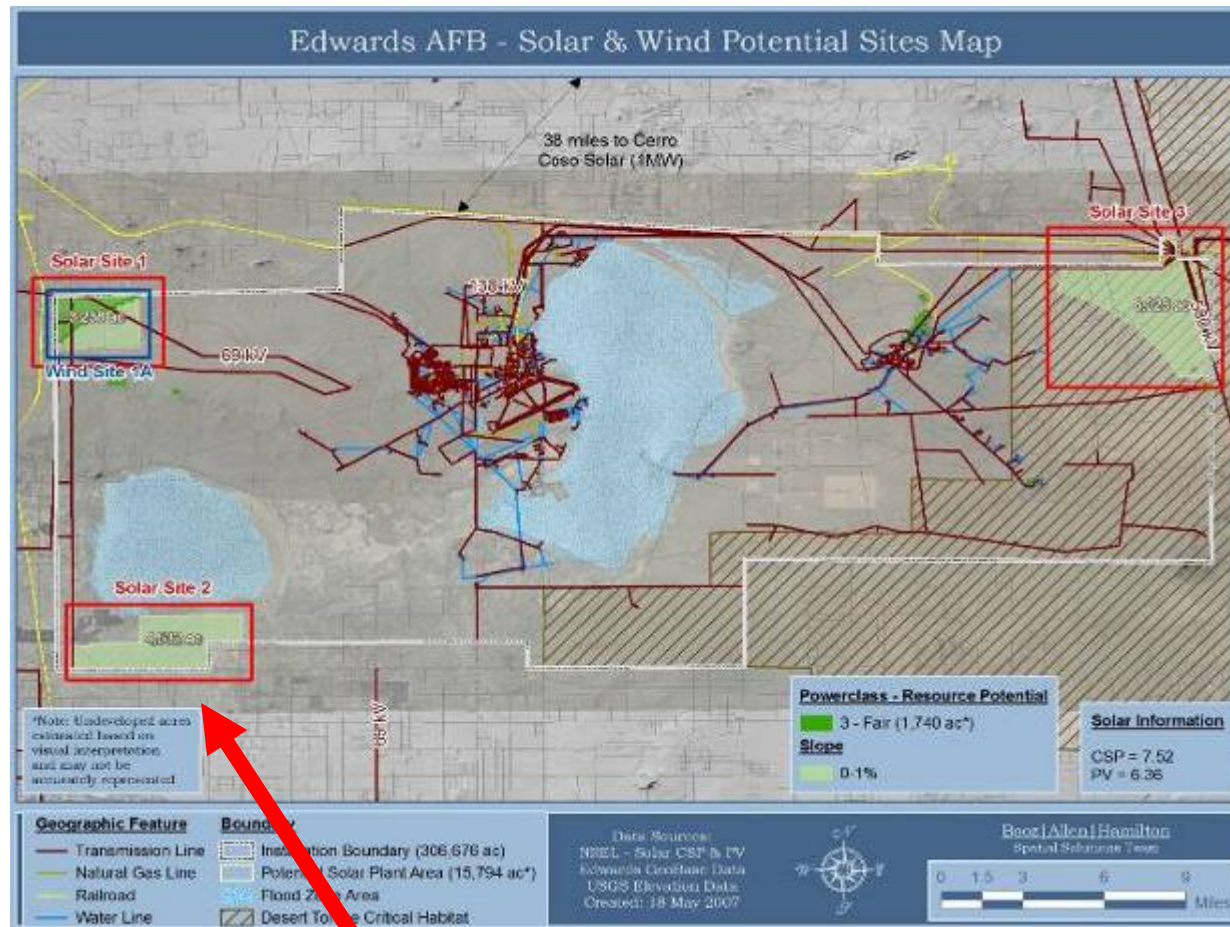
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Edwards AFB, CA

Possible Solar Development Opportunity



Development at Site 2 in the SW corner of the base may be most compatible with mission of Edwards AFB

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Edwards AFB

Site characteristics

- **7.52 kwhr/m²/day potential for Concentrating Solar Power (CSP), 6.36 kWh/m²/day potential for Photovoltaic (PV)**
- **Up to 500 acres available in a 4,532 acre parcel**
- **Less than 1% slope**
- **Potential access to tertiary treated wastewater stream**
- **Proximity to 69 kV transmission**



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Edwards AFB Drivers of Development

- **California has a strong RPS**
 - **20% renewables by 2010**
 - **33% renewables by 2020**
- **Carbon Dioxide emissions reductions targets of 25% by 2020**
- **Edwards AFB is close to load centers and major transmission corridors**



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Edwards AFB Challenges to Development

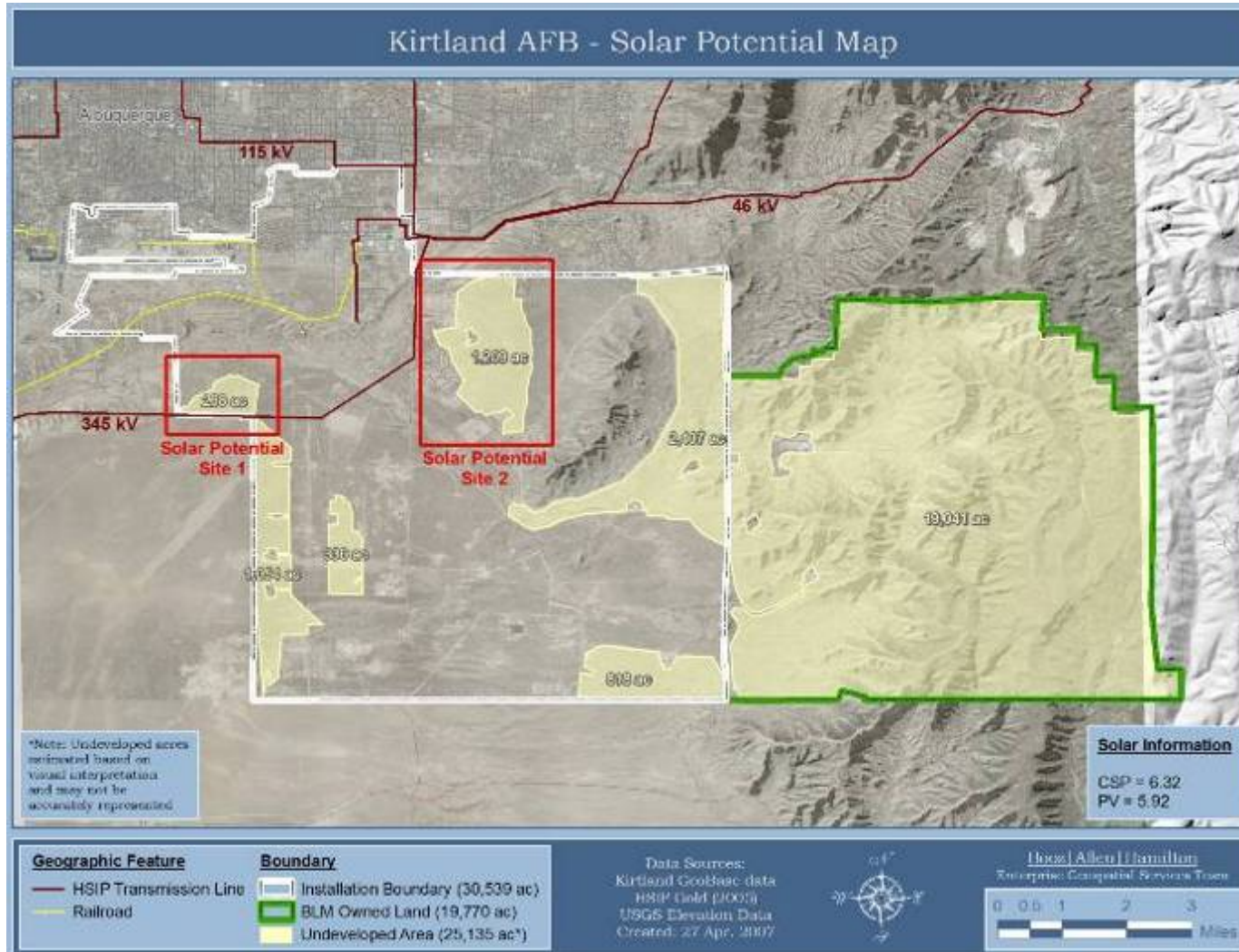
- **Possible impact to mission**
 - **Solar facility could impact targeting operations at a training range**
 - **During design and development, cooperation with base and MAJCOM will be necessary**
- **'Sensitive' species on site**



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Kirtland AFB, NM

Possible Solar Development Opportunity



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Kirtland AFB Site Characteristics

- **6.32 kWh/m²/day Concentrating Solar Power (CSP), 5.92 kWh/m²/day photovoltaic systems**
- **Site 1 is an unutilized 268 acre parcel**
- **Site 2 is 1,209 acres of grassland near the northern edge of the base**
- **Both sites have proximity to high-voltage transmission**
- **Load centers are nearby (ex. Albuquerque)**



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Kirtland AFB Drivers of Development

- **New Mexico has an RPS**
 - **10% renewables by 2011**
- **Solar development will help meet RPS mandates**



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Kirtland AFB Challenges to Development

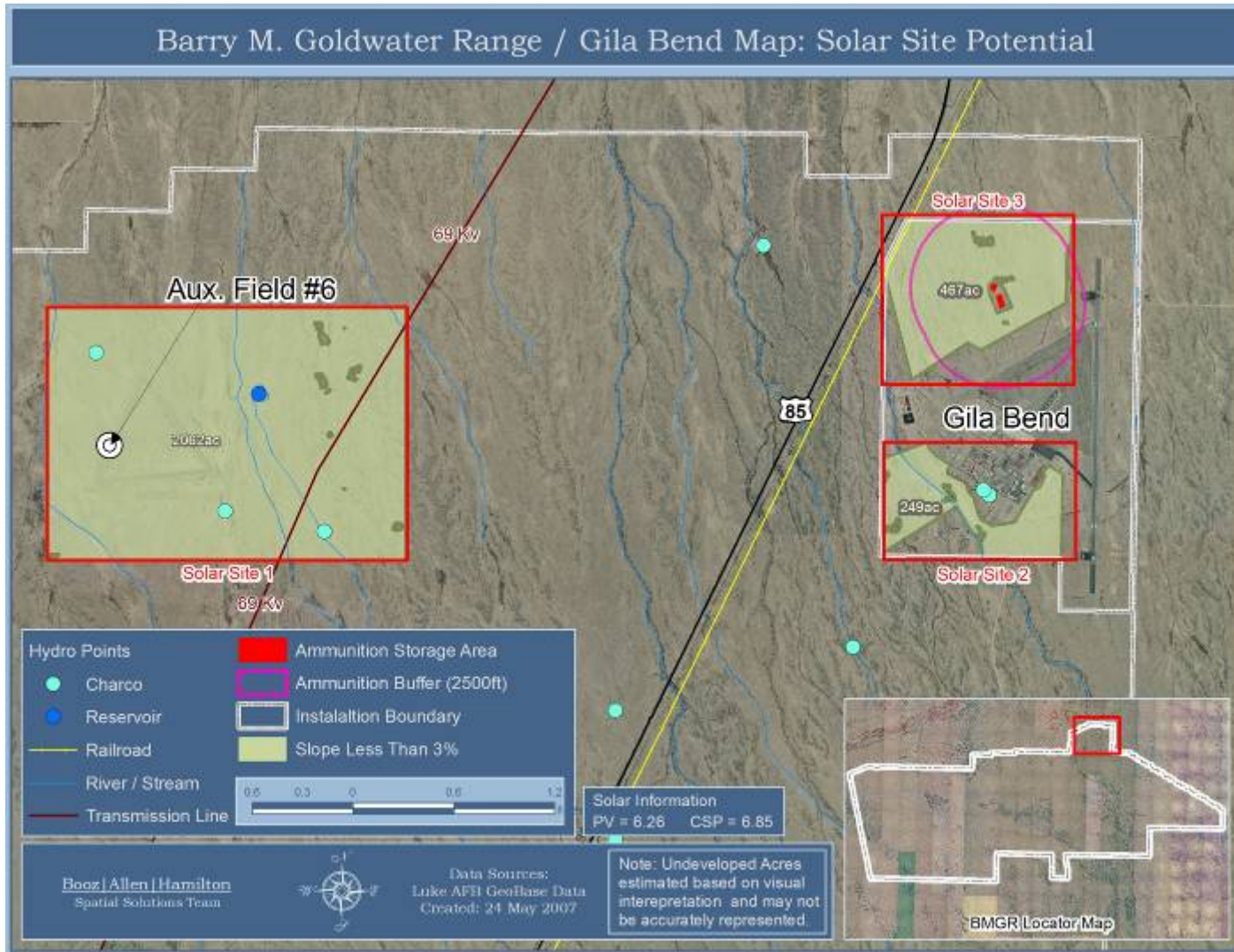
- **Site 1 has a 0-5% slope and Site 2 has a 1-6% slope**
 - **Grading would be required for CSP developments**
- **Site 2 may be more appropriate for utility scale development due to its size**



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Barry M. Goldwater Range

Possible Solar Development Opportunity



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BMGR

Site Characteristics

- **6.85 kWh/m²/day solar radiation for Concentrating Solar Power (CSP), 6.26 kWh/m²/day solar radiation for photo voltaic (PV)**
- **A site of 500 - 1,000 acres may be available in a parcel of over 4,000 acres**
- **Undeveloped land with a slope of less than 3%**
- **Possible access to electricity (69 kV) and natural gas transmission infrastructure**



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BMGR ***Site Characteristics***



Site and transmission line looking south



Site and transmission line looking north



Site looking northwest

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BMGR

Drivers of Development

- **Arizona has an RPS**
 - **15% renewables by 2025**
 - **Power could be sold to neighboring states where RPSs are even more aggressive**
- **Proximity to major transmission corridors**



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BMGR

Challenges to Development

- **BMGR is BLM-owned land withdrawn from public use for military purpose**
 - **Withdrawal subject to renewal by BLM in 2024**
- **Mission compatibility**



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Vandenberg AFB Site Descriptions

- **Large areas of class 4, 5 and 6 wind resource throughout the installation**
- **Northern site is situated on a coastal ridgeline**
 - **Idaho National Lab data confirms adequate wind resource at this location**
- **Wind resource also confirmed near the southern site**
- **Both sites have proximity to transmission**



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Vandenberg AFB Site Descriptions



Northern site (ridgeline in background)



Southern site

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Vandenberg AFB

Drivers of Development

- **California has a strong RPS**
 - **20% renewables by 2010**
 - **33% renewables by 2020**
- **Carbon Dioxide emissions reductions targets of 25% by 2020**



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Vandenberg AFB

Challenges to Development

- **Mission compatibility**
 - **Radar, telemetry, and other operations may be adversely impacted by development**
 - **During design and development, cooperation with base and MAJCOM will be necessary**
- **Impacts to environmental and cultural resources**



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BACKUP

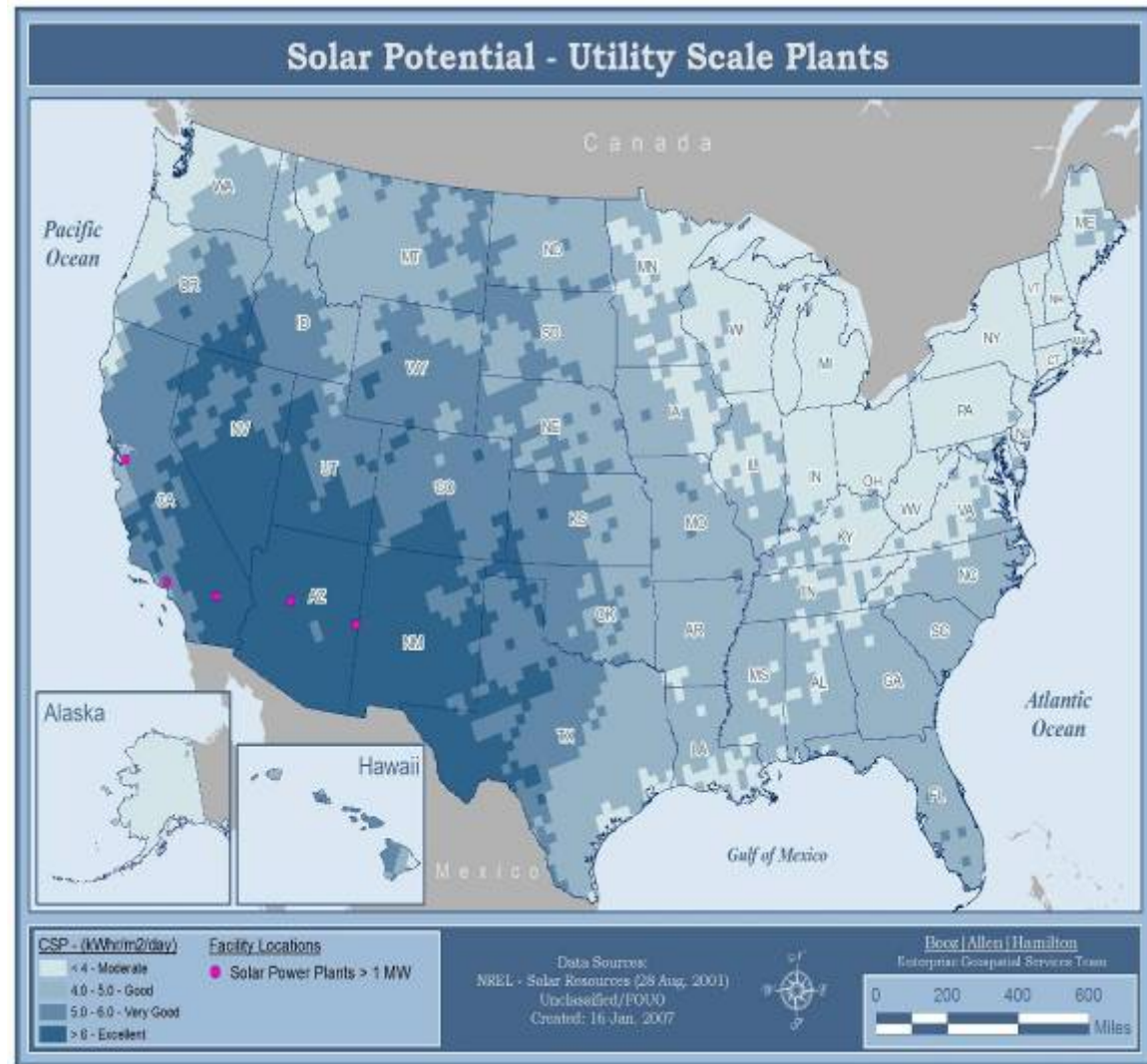
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Utility-scale, grid-connected solar is very expensive and developers are only interested in the highest potential opportunities

- Commercial types of solar power:
 - Photovoltaic (not economically feasible for wholesale power in the U.S.)
 - Concentrating trough and dish solar (feasible for wholesale power)
- Utility-scale plants are just beginning to be developed again (plants built southern CA in the early 80s are operating but were built by a firm that went bankrupt)
- There is significant interest in large scale concentrating solar projects from both the utilities and developers in southwest (i.e., RFP in AZ for 250MW plant, Solargenix interested in developing 100MW plant)



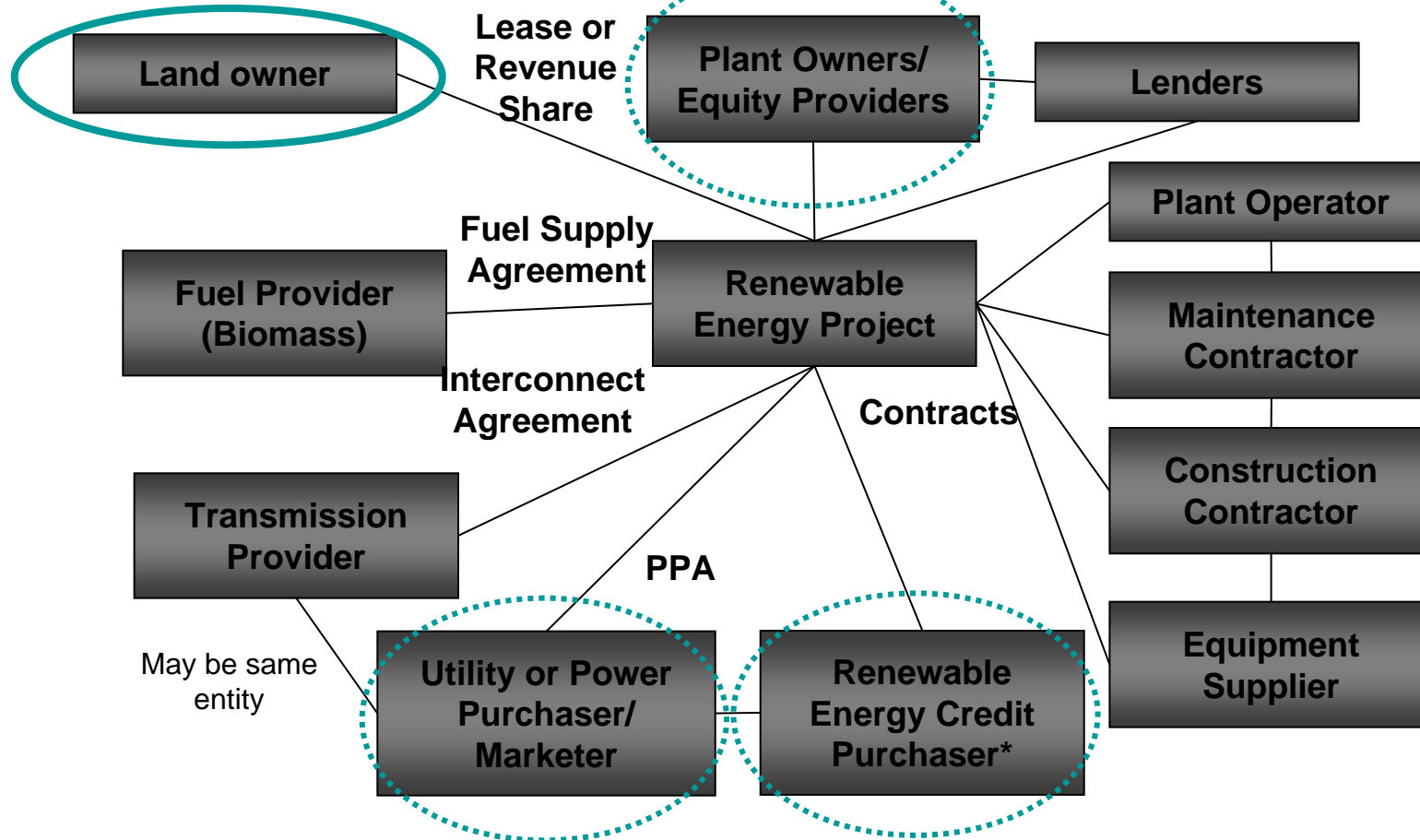


energy power plant is complex, requiring coordination among

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Air Force's Primary Role

~~numerous entities~~
Possible Air Force Role



* Unless RECs are unbundled, they are owned by the power purchaser

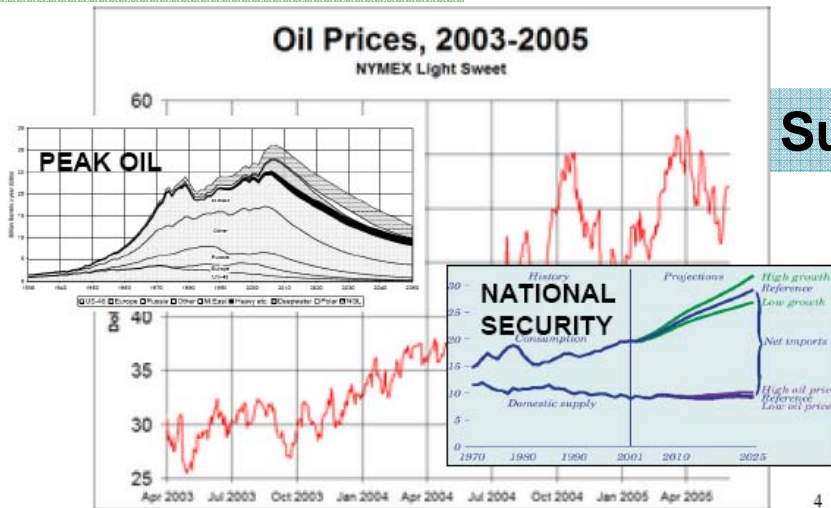
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The growing renewable energy market has four primary drivers

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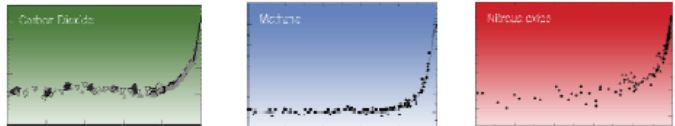
High Energy Costs



Supply Security

Climate Change and Government Regulation

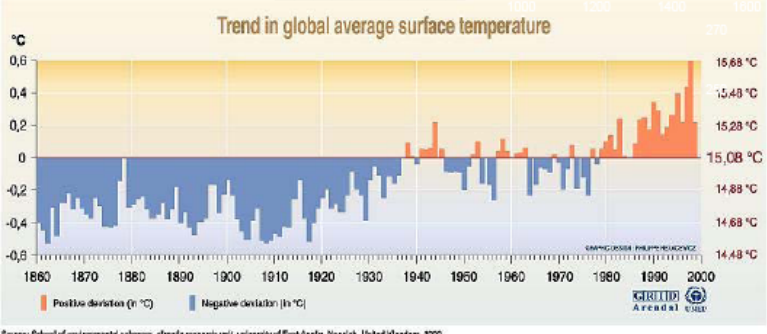
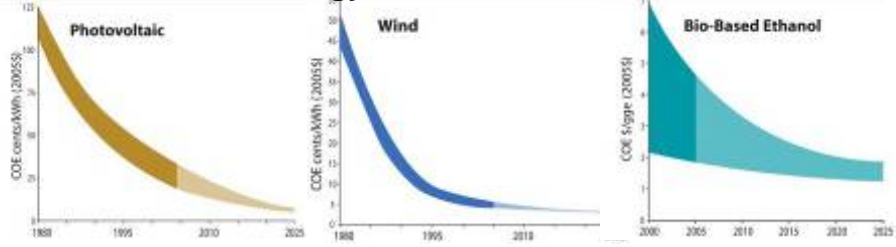
Changes in Atmospheric Concentrations - 1000 Year History



Source: NREL

Declining Costs Of Renewable Technology

Levelized cost of energy in constant 2005\$



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Air Force Priorities

- **Winning the War on Terror**
- **Developing and Caring for our Airmen and their Families**
- **Recapitalizing and Modernizing our Aircraft and Equipment**



Reshaping the Total Force Structure

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Renewable Energy EUL Project

Nellis AFB Photovoltaic Array

- **Lease underutilized AF land or assets, Title 10, USC Section 2667**
 - Consideration may be cash, or in-kind (construction, real estate)
 - A minimum of 50% of cash allocated to installation
 - In-kind consideration could include
 - Reduced price electricity
 - Construction of other projects

- **Example: Nellis AFB photovoltaic array, 140-acres**
 - Lease/power purchase agreement
 - Groundbreaking ceremony Apr 07
 - Completion – early 2008
 - 75,000 solar panels
 - Generate 25 Mkw-hrs of “clean” electricity
 - Save \$1M/year energy costs



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Energy EUL Industry Forum

- **AF will host an Energy EUL Industry Forum**
 - 26 – 27 Sep 07
 - Hilton Ontario Airport Hotel in Ontario CA
- **Opportunity for attendees**
 - To learn how AF intends to use energy projects to support its missions
 - To provide input on potential projects
- **Open to state & local govts, public utilities, real estate developers, equipment manufacturers, private equity firms, lenders and other firms, and the general public**
- **To register: <https://www.enstg.com/Signup>**
- **Conference Code: REN96690**

