Installation Energy Reduction Initiatives: Service Panel

Sponsored by

Alpha
BLACK & VEATCH
FSB
Kimley-Horn and Associates, Inc.
**Moderator:** Ralph Kaneshiro, P.E., CEM, Director of Navy Programs, Aerostar SES LLC

**Speakers:**
- David Bek, P.E., Director, Energy Directorate, AFCEC
- Capt. John Kliem, P.E., CEC, USN, Director, Base Operating Support Programs, CNIC
- Kristine Kingery, EIT, Director, Army Sustainability Policy, ODASA (E&S)
- David Williams, Program Manager, Energy, HQ USACE
AF Facility Energy Perspective

David J. Bek, P.E.
Energy Director
AFCEC/CN
Overview

- AFCEC Organization
- Facility Energy Vision
- Energy Savings Performance Contracts/
  Utility Energy Service Contracts
- Renewable Energy
- Utility Privatization
- Energy Conservation Investment Program
- O&M Program
- Meter Data Management Plan
 Facilities Energy Vision

- **Improve Resiliency**
  - Ends: Quantified Vulnerabilities, Mitigated Risks, Response Plans
  - Means: Risk Prioritization (Probability & Consequence), Mission Dependency, Scaled Redundancy

- **Reduce Demand**
  - Ends: Effective Mission Support -- Fly, Fight, & Win… while conserving energy

- **Assure Supply**
  - Ends: Diversity, Reliability, Increased Flexibility/Sustainability
  - Means: Service Agreements, Renewable/clean PPA, UP

- **Foster Culture Change**
  - Ends: Energy Awareness… Cost, Mission, Personal Accountability
  - Means: Policy, Technical Standards, Formal/OJT Training, PA

- **Foundation: Asset & Energy Visibility**
  - How does asset enable mission > how does energy impact asset
  - We will invest in technology! Meters, Controls…
  - Key missions, high cost/consumers are a good place to start
Facility Energy Cost Trend

Updated 14 Apr 14

Over the last 19 years:

AF Utility Costs creep upward:

- 36% consumption reduction does not overcome 100% unit cost increase
- 36% consumption reduction translates to $620M cost avoidance in FY13 utility bill

Usage & costs include goal-subject, excluded, & purchased RE*
Energy Program Focus

- Shift to Asset Mgt, Risk based funding decisions
- Build focused approach on energy, resiliency & mission
- Continue growth in use of 3rd Party Funding Projects
  - ESPC / UESC
  - RE – PPA and EUL
  - UP
- Continue with ECIP and O&M funded projects
- Look for P4 opportunities

AF committed to executing $416M worth of ESPC and UESC opportunities during 2014-2016

<table>
<thead>
<tr>
<th>Base</th>
<th>Ktr Type</th>
<th>Energy Type</th>
<th>MBTUs</th>
<th>PA  ($M)</th>
<th>LCC ($M)</th>
<th>SPB (Yrs)</th>
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<td>Edwards ESPC Data Center</td>
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<td>14.3</td>
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<td>188,348</td>
<td>11.7</td>
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## Renewable Energy

### Power Purchase Agreements

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<th>Source</th>
<th>Capacity MW</th>
<th>Phase</th>
<th>Award</th>
<th>Est. On-line</th>
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<tr>
<td>Vandenberg AFB, CA</td>
<td>Solar PV</td>
<td>10.0 – 20.0</td>
<td>1</td>
<td>2014</td>
<td>2015</td>
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<td>JB McGuire/Dix/Lakehurst, NJ</td>
<td>Solar PV</td>
<td>10.0</td>
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<td>Laughlin AFB, TX</td>
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<td>Dyess AFB, TX</td>
<td>WTE</td>
<td>5.4</td>
<td>2</td>
<td>2014</td>
<td>2016</td>
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<tr>
<td>Hanscom AFB, MA</td>
<td>Solar PV</td>
<td>10.0</td>
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<td>2015</td>
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<tr>
<td>Sheppard/Goodfellow AFBs, TX</td>
<td>Solar PV</td>
<td>4.5 – 6.0</td>
<td>0</td>
<td>2015</td>
<td>2016</td>
</tr>
</tbody>
</table>

### Images:

- **Cape Cod Wind**
- **Davis-Monthan Solar**
- **JBER Landfill Gas**

### Phases:

- **Phase 0** Opportunity
- **Phase 1** Project Development
- **Phase 2** Project Acquisition
- **Phase 3** Project Execution
- **Phase 4** Design/Construction
- **Phase 5** Management
## Renewable Energy

### Enhanced Use Lease

<table>
<thead>
<tr>
<th>Installation</th>
<th>Source</th>
<th>Capacity MW</th>
<th>Award</th>
<th>Est. On-line</th>
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<tr>
<td>JB San Antonio, TX</td>
<td>PV</td>
<td>4.5</td>
<td>2014</td>
<td>2014</td>
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<tr>
<td>Luke AFB, AZ</td>
<td>PV</td>
<td>10.0</td>
<td>2014</td>
<td>2015</td>
</tr>
<tr>
<td>Robins AFB, GA</td>
<td>PV</td>
<td>10.0</td>
<td>2014</td>
<td>2015</td>
</tr>
<tr>
<td>Hill AFB, UT</td>
<td>Geothermal</td>
<td>30.0</td>
<td>2015</td>
<td>2016</td>
</tr>
<tr>
<td>Patrick Ramey AB, PR</td>
<td>Solar PV</td>
<td>7.5</td>
<td>2015</td>
<td>2016</td>
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<tr>
<td>JB McGuire/Dix/Lakehurst, NJ</td>
<td>Solar PV</td>
<td>18.0</td>
<td>2015</td>
<td>2017</td>
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<td>JB McGuire/Dix/Lakehurst, NJ</td>
<td>WTE-Biomass</td>
<td>30.0</td>
<td>2015</td>
<td>2018</td>
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<tr>
<td>Edwards AFB, CA</td>
<td>Solar PV</td>
<td>175.0</td>
<td>2016</td>
<td>2017</td>
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</tbody>
</table>
Utilities Privatization

- Includes electric, gas, sewer, and water utilities
- FY14: 12 Active Duty bases with 21 Systems
  - 12 Air National Guard bases with 16 Systems
- Competitive RFPs to be released by DLA Energy
  - FY15: 9 AD bases with 22 Systems

Minot AFB
Sewer/Waste Water
awarded Aug. 2013
Utility Privatization (UP) Program

**FY14**
- Academy (S,W)
- Barksdale (E,G,S,W)
- Davis Monthan (E)
- Dyess (E)
- Hill (E)
- Little Rock (S,W)
- Mt Home (E)
- Vandenberg (G, S, W)

**FY15**
- Arnold (E)
- Keesler (E,G,S,W)
- Beale (G)
- Cape/Patrick (E,S,W)
- Malmstrom (E,G)
- Moody (E,G)
- Robins (E,G,S,W)
- Schriever (E,G,S,W)
- Vandenberg (E)

Key: E = Electric; G = Natural Gas, S = Sewer; W = Water
Energy Conservation Investment Program (ECIP)

- FY13 projects are awarded or in solicitation
  - 6 Projects worth $32M
- FY14 projects have design funds
  - Anticipate construction funds soon
  - 12 Projects worth $35M
- FY15 projects selected by OSD
  - 14 Projects worth $41M

- EMCS
- Plant decentralization
- Solar

LED Lights
## FY14 Energy Conservation Investment Program (ECIP)

<table>
<thead>
<tr>
<th>BASE</th>
<th>TITLE</th>
<th>PA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mountain Home</td>
<td>Install Efficient Irrigation &amp; Landscaping</td>
<td>$1M-$5M</td>
</tr>
<tr>
<td>JB Pearl Harbor-Hickam</td>
<td>Solar PV system</td>
<td>$1M-$5M</td>
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<tr>
<td>Yokota</td>
<td>Decentralize heating w/gas</td>
<td>$5M-$10M</td>
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<tr>
<td>JB Pearl Harbor-Hickam</td>
<td>Solar PV system</td>
<td>$1M-$5M</td>
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<tr>
<td>Arnold</td>
<td>Install Steam Trap Monitors</td>
<td>$.5M - $1M</td>
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<tr>
<td>Sheppard</td>
<td>LED Lighting Retrofit Street and Parking Lights</td>
<td>$1M-$5M</td>
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<tr>
<td>Thule</td>
<td>Install M-Plant Cooling system</td>
<td>$5M-$10M</td>
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<tr>
<td>Ramstein</td>
<td>EMCS</td>
<td>$1M-$5M</td>
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<tr>
<td>JB San Antonio-Randolph</td>
<td>District CW Plant B496 Thermal Storage Tank</td>
<td>$1M-$5M</td>
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<tr>
<td>Laughlin</td>
<td>Install Basewide Xeriscape Phase 2</td>
<td>$1M-$5M</td>
</tr>
<tr>
<td>Shaw</td>
<td>Convert Oil Fired Boilers To Gas</td>
<td>$1M-$5M</td>
</tr>
<tr>
<td>Seymour-Johnson</td>
<td>Basewide LED Lights</td>
<td>$1M-$5M</td>
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</table>
## FY15 Energy Conservation Investment Program (ECIP)

<table>
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<tr>
<th>BASE</th>
<th>TITLE</th>
<th>PA</th>
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<tbody>
<tr>
<td>Spangdahlem</td>
<td>Install EMCS 53 Buildings</td>
<td>$1M-$5M</td>
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<tr>
<td>Atlantic City Airport</td>
<td>Boiler Decentralization &amp; Multiple ECMs</td>
<td>$1M-$5M</td>
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<tr>
<td>Little Rock</td>
<td>Energy Upgrades</td>
<td>$1M-$5M</td>
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<tr>
<td>Tinker</td>
<td>Install Paint Hangar Heat Recovery &amp; Controls</td>
<td>$1M-$5M</td>
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<tr>
<td>Mountain Home</td>
<td>Replace Street Lights w/LED</td>
<td>$1M-$5M</td>
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<tr>
<td>JB Andrews</td>
<td>Upgrade Exterior Lights to LED</td>
<td>$1M-$5M</td>
</tr>
<tr>
<td>Edwards</td>
<td>Retrofit Lights Multi Bldgs Ph 1</td>
<td>$1M-$5M</td>
</tr>
<tr>
<td>Vandenberg</td>
<td>Upgrade Lighting 80 Buildings</td>
<td>$1M-$5M</td>
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<tr>
<td>Offutt</td>
<td>Geothermal B-160, 499, 565, 803, 809</td>
<td>$1M-$5M</td>
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<tr>
<td>AF Space Command-Wide</td>
<td>Command Wide Turf &amp; Irrigation Reduction</td>
<td>$5M-$10M</td>
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<tr>
<td>Los Angeles</td>
<td>Replace Irrigation &amp; Controls</td>
<td>$.5M-$1M</td>
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<td>Tinker</td>
<td>Replace Control Valves 5 Tanks</td>
<td>$1M-$5M</td>
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<td>Eglin</td>
<td>Replace HVAC &amp; Lights at Bldg 8640</td>
<td>$1M-$5M</td>
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<tr>
<td>Moody</td>
<td>Replace Exterior Lighting Basewide</td>
<td>$1M-$5M</td>
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</table>
O&M Funded Energy Projects

- FY10-13: $552M invested for $1.13B gross savings
- FY14 projects
  - Up to $130M investment; $10M awarded to date
  - 7 year avg payback with 15 year avg economic life
- FY15+
  - Risk-based scoring model
  - Energy projects to be included based on savings
FY15 AMRS Installations

- Tinker AFB, OK
- Hill AFB, UT
- Nellis & Creech AFB, NV
- Peterson AFB, CO
- Offutt AFB, NE

Installation Requirements:
- CE VLAN
- Completed AMRS Site Report
- Top 1/3 of Energy Consuming Bases
All Briefings will be available at www.afcec.af.mil under “Library” > “Presentations”
DISCUSSION

AFCEC Front Office (210) 395-8000
Facility Engineering (210) 395-8312
Installations (210) 395-9440
Energy (850) 283-6470
Operations (850) 283-6370
Planning and Integration (210) 395-8016
Readiness (850) 283-6124
Environmental (210) 395-8362
AFCEC Public Affairs (866) 725-7617

www.afcec.af.mil
www.facebook.com/AirForceCE
Questions?
Navy Shore Energy Program

CAPT John Kliem, P.E.
Director, Base Operating Support Programs
Commander, Navy Installations Command

Presentation to SAME
May 2014
Navy Shore Energy Strategy

Transform Navy From Culture of Consumption to Culture of Conservation Through Transparency and Accountability

Energy Security:
- Redundancy
- Resiliency
- Reliability

“Compliance” is unique to the Shore

The Right Technology at the Right Time
- Watch
- Partner
- Lead

Establishing an Ethos of Energy Conservation
Energy Focus Areas

• POM 15 Funding for shore energy—supports compliance with mandates and increases energy security

<table>
<thead>
<tr>
<th>($M)</th>
<th>FY15</th>
<th>FY16</th>
<th>FY17</th>
<th>FY18</th>
<th>FY19</th>
<th>FYDP</th>
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<tr>
<td>Navy Shore Energy</td>
<td>286</td>
<td>301</td>
<td>326</td>
<td>331</td>
<td>338</td>
<td>1,582</td>
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</table>

• Accelerate development of renewable energy generation

• Increased Focus on Financed Energy Projects—improve facility efficiency.
  – Presidential Challenge requires the Navy to award $430M in finance projects by the end of CY 2016

• Energy Management Systems—technology to promote efficiency

• Social media—to drive culture and behavior change
  – Refocused enterprise efforts to increase frequency of public affairs messaging include the re-release of the Navy Shore Energy Mascot BRITE
    • Navy Live Blogs
    • Navy Times Articles
    • Facebook, Twitter, LinkedIn
All Navy Energy Efficiency Progress

**includes SRM, ECIP, ESPC/UESC, and eMILCON investments

- **Baseline**
- **CNO Goal**
- **Actual**
- **Programmed**

<table>
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<tr>
<th>Year</th>
<th>Projects</th>
<th>Budget</th>
<th>MBTU's</th>
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<td>FY12</td>
<td>143</td>
<td>$449M</td>
<td>2,630,000</td>
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<td>FY13</td>
<td>255</td>
<td>$428M</td>
<td>1,960,000</td>
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<td>FY14</td>
<td>154</td>
<td>$347M</td>
<td>1,513,000</td>
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<td>FY15</td>
<td>146</td>
<td>$354M</td>
<td>1,661,000</td>
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<td>FY16</td>
<td>141</td>
<td>$342M</td>
<td>1,000,000</td>
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<tr>
<td>FY17-19</td>
<td><strong>435</strong></td>
<td>$935M</td>
<td>3,740,000</td>
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Energy Intensity and Efficiency

Review of time of use energy load profiles lead to a shift in start time for lighting and air handlers.

NEX Study Energy Audit

Night Audits

Real-time Data from AMI – Accountability that Gains Buy-In

Daylighting

$33,000 annual cost reduced to $5,000
ESPC/UESC Investments

**FY13 Investments**
- 4 projects
- $30M

**FY14 Investments**
- 9 projects
- $100M

**FY15 Investments**
- 12 projects
- $170M

**FY16 Investments**
- $100M
- Projects due 30 Sept 14
Steam Decentralization – Naval Base Coronado

ESPC preliminary proposal received at end of March 2014. Expected annual savings of 346,000 MBTU.

$143,097,259 NPV
(30 Year Projection)
Navy Shore Geospatial Energy Module
Tenant Level Mock Billing

### Installation Tenant CO Report

**Region:** MA  
**Tenant:** NETC

#### Monthly Consumption Reduction Progress

<table>
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<tr>
<th>FY 2013</th>
<th>Month/Name</th>
<th>FY 2014</th>
<th>Delta</th>
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<td>7,948.54</td>
<td>Oct</td>
<td>5,540.97</td>
<td>-30.36</td>
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<tr>
<td>5,470.70</td>
<td>Nov</td>
<td>7,266.01</td>
<td>-32.85</td>
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<td>7,209.73</td>
<td>Dec</td>
<td>4,394.33</td>
<td>-29.60</td>
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<td>7,657.44</td>
<td>Jan</td>
<td>5,300.21</td>
<td>-29.86</td>
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<td>7,246.04</td>
<td>Feb</td>
<td>7,351.83</td>
<td>-1.79</td>
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</table>

**Cumulative Consumption Progress YTD:** 55,534.44 to 29,853.35  
**-16%**

#### Consumption By Commodity

- Electricity MBTU: 4381.0 (59.6%)
- Steam MBTU: 1900.5 (20.3%)
- Chilled Water MBTU: 0 (0.0%)
- Gas MBTU: 1043.3 (14.2%)
- Fuel Oil MBTU: 0 (0.0%)

**Total Consumption:** 7351.8 (100.0%)

#### Top 5 Facilities With Largest Increase In Energy Intensity

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Previous EI</th>
<th>Current EI</th>
<th>Delta</th>
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<tbody>
<tr>
<td>SP256</td>
<td>NAMTD TRAINING BLDG</td>
<td>58.10</td>
<td>78.20</td>
<td>20.9%</td>
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<tr>
<td>CEP97</td>
<td>ADMIN NAVY COLLEGE BUILDING</td>
<td>93.00</td>
<td>113.00</td>
<td>21.5%</td>
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<tr>
<td>SP381</td>
<td>TRAINING FACILITY</td>
<td>106.10</td>
<td>127.20</td>
<td>19.8%</td>
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<tr>
<td>SP254</td>
<td>CNETU TRAIN. BLDG</td>
<td>71.40</td>
<td>81.50</td>
<td>14.0%</td>
</tr>
<tr>
<td>IE</td>
<td>NAVY COLLEGE / CONCORD HALL</td>
<td>59.80</td>
<td>63.30</td>
<td>5.8%</td>
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</table>

#### Top 5 Facilities With Largest Decrease In Energy Intensity

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Previous EI</th>
<th>Current EI</th>
<th>Delta</th>
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<tr>
<td>N19A</td>
<td>MAIN TRAINING BLDG</td>
<td>57.20</td>
<td>45.20</td>
<td>-20.9%</td>
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<tr>
<td>N30</td>
<td>TSCHR. TRNG / AUDITORIUM</td>
<td>111.00</td>
<td>92.00</td>
<td>-16.3%</td>
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<tr>
<td>CEP171</td>
<td>FIREFIGHTING/TRNG FAC.</td>
<td>156.40</td>
<td>133.70</td>
<td>-14.5%</td>
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<tr>
<td>O25</td>
<td>ENGINEERING APPLIED INSTRCTR</td>
<td>108.40</td>
<td>95.50</td>
<td>-11.9%</td>
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<tr>
<td>N25A</td>
<td>ELECTRONICS TRNG FAC</td>
<td>132.50</td>
<td>119.50</td>
<td>-8.6%</td>
</tr>
</tbody>
</table>

#### Fiscal Year Cost Comparison

![Bar chart showing fiscal year cost comparison between previous and current years](chart.png)
Social Media

BRITE HAS A FACEBOOK PAGE

BRITE in NAS Pensacola Earth Fair and Farmer's Market held at Corry Station
DON Shore-based Power Portfolio

Total shore energy consumed (2013):
- 9.2 million MWh

RE Generated by DON (2013):
- 1.8 million MWh

DON RE Capacity Brought Online (2009-2014):
- 93 MW

Brown Power
- 42%

RPS FY20
- 13%

RPS FY13
- 16%

Hydro
- 4%

PV
- 5%

Waste to Energy
- 4%

Geothermal
- 16%

Brown Power Consumption*

DON RE Production/Consumption*

* In MW equivalent
6 primary acquisition authorities for development and procurement of renewable energy:

- Interagency Agreements (16 USC 670c-1)
- Power Purchase Agreement (10 USC 2922a)
- Out Lease (10 USC 2667)
- Energy Savings Performance Contracts (ESPC) (42 USC 8287)
- Utility Service Contracts (40 U.S.C. 501(b))
- Geothermal Development (10 USC 2917)

Each authority has advantages and disadvantages
## Summary by Acquisition Authority

### USN Only

<table>
<thead>
<tr>
<th>Acquisition Authority</th>
<th>USN Projects &gt;10 MW</th>
<th>USN Projects &lt;10 MW</th>
<th>USN All Projects</th>
<th>USN Projects in High Electricity Price States/Regions</th>
</tr>
</thead>
<tbody>
<tr>
<td>IA</td>
<td>100 (1)</td>
<td>-</td>
<td>100 (1)</td>
<td>100 (1)</td>
</tr>
<tr>
<td>2667</td>
<td>410 (6)</td>
<td>6 (2)</td>
<td>416 (8)</td>
<td>416 (8)</td>
</tr>
<tr>
<td>2922a</td>
<td>202 (14)</td>
<td>74 (23)</td>
<td>276 (37)</td>
<td>209 (27)</td>
</tr>
<tr>
<td>Geothermal</td>
<td>25 (1)</td>
<td>2 (1)</td>
<td>27 (2)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>ECIP/MILCON</td>
<td>-</td>
<td>19 (6)</td>
<td>19 (6)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>ESPC</td>
<td>15 (1)</td>
<td>1 (1)</td>
<td>16 (2)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>USC</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0 (0)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>752 (22)</strong></td>
<td><strong>102 (33)</strong></td>
<td><strong>854 (55)</strong></td>
<td><strong>726 (36)</strong></td>
</tr>
</tbody>
</table>
Planned USN RE Projects– MW (Projects)

U.S. Avg Electricity Retail Prices (March 2013)
(cents per kWh)

- 6.50 to 8.00
- 8.01 to 9.50
- 9.51 to 12.00
- 12.01 to 14.00
- 14.01 to 35.00
- 35.01 to 37.00

Electricity Price Source: EIA
Renewable Energy

PMRF – 800KW and Energy Management System

Guantanamo Bay
12MW Solar PV

Hawaii Solar MAC
17MW PV Array
Non-Tactical Vehicle Progress

Non-Tactical Vehicle Petroleum Consumption Reduction (2005 Baseline)

- Actual - 2005 baseline
- Projection - 2005 Baseline
- E.O Goal (2005 Baseline)
- SECNAV Goal (50% by 2015)
Summary

- ENERGY STRATEGY → Energy security and resiliency through efficiency, renewables & conservation culture
- EFFICIENCY → Focused investments on consumption & cost reductions = Reduce Vulnerability
- PERFORMANCE → Planned investments enable achievement of goals and mandates
- RENEWABLE ENERGY → 3rd Party Financing for cost effective renewable energy projects
- PROCESS IMPROVEMENT → Revising ESPC/UESC acquisition process for more efficient delivery
- NON-TACTICAL VEHICLES → Grow alternative fuel fleet & increase consumption of alt fuels
Enhancing Army Mission Effectiveness through Net Zero (NZ)

Ms. Kristine Kingery
Director, Army Sustainability Policy

Joint Engineer Training Conference and Expo (JETC)
22 May 2014
Drivers of Change

Risk factors and competing priorities include:

- Energy security, surety, and reliability
- Water scarcity
- Risk reduction
- Improved operational capabilities
- Foreign energy sources
- Energy prices / Fully burdened cost of fuel
- Federal and DoD mandates
- Environmental concerns

Drivers for Change Resulted in Creation of Net Zero Programs for Energy, Water, and Waste

Power Outages

Note: * NERC equivalent data estimated based on the trends seen in the Eaton Blackout Tracker for number of outages affecting over 50,000 people
Source: NERC, Eaton Blackout Tracker, Goldman Sachs Research estimates

<table>
<thead>
<tr>
<th>Federal Mandate</th>
<th>Focus Area</th>
<th>Performance Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Policy Act of 2005</td>
<td>Electricity use for federal government from renewable sources</td>
<td>• At least 3% of total electricity consumption (FY07-09), 5% (FY10-12), 7.5% (FY13+)</td>
</tr>
<tr>
<td>Executive Order 13423</td>
<td>Energy use in Federal buildings</td>
<td>• Reduce 3% per year to total by 30% by FY2015 (FY2003 baseline)</td>
</tr>
<tr>
<td>Executive Order 13423</td>
<td>Total consumption from renewable sources</td>
<td>• At least 50% of renewable energy consumed from &quot;new&quot; renewable sources</td>
</tr>
<tr>
<td>Executive Order 13514</td>
<td>Fleet use of alternative fuel use</td>
<td>• Increase by 2% annually to reach 100% (FY2005 baseline)</td>
</tr>
<tr>
<td>Energy Independence &amp; Security Act of 2007</td>
<td>Total consumption from renewable sources</td>
<td>• Increase by 2% annually to reach 100% (FY2005 baseline)</td>
</tr>
<tr>
<td>Energy Independence &amp; Security Act of 2007</td>
<td>National energy targets</td>
<td>• Reduce consumption by 2% annually for 26% total by FY2020 (FY2007 baseline)</td>
</tr>
<tr>
<td>Energy Independence &amp; Security Act of 2007</td>
<td>Waste minimization</td>
<td>• Divert at least 50% of solid waste &amp; 50% of C&amp;D waste by FY2015</td>
</tr>
<tr>
<td>National Defense Authorization Act, 2010</td>
<td>Renewable fuels use</td>
<td>• Directs the Secretary of Defense to consider renewable fuels in aviation, maritime, and ground transportation fleets</td>
</tr>
<tr>
<td>National Defense Authorization Act, 2010</td>
<td>Facility renewable energy use</td>
<td>• Produce or procure 25% of the total quantity of facility energy needs, including thermal energy, from renewable sources starting in FY2020</td>
</tr>
</tbody>
</table>
Evolution of Army Net Zero

17 Net Zero Pilot Installations

Evolution of Net Zero Hierarchies
Net Zero ENERGY:
Reduce overall energy use, maximize efficiency, implement energy recovery and cogeneration opportunities, and then offset the remaining demand with the production of renewable energy from on-site sources.

Holistic Approach Includes:
- Demand-side energy use reduction
- Energy generation technologies and strategies that also increase energy security
- Building clusters served by smaller central utility plants and microgrids
- Flexible implementation strategies
Net Zero Water:

Reduce overall water use, regardless of the source; increase use of technology which uses water more efficiently; recycle and reuse water, shifting from potable water use to non-potable sources as much as possible; and minimize inter-basin transfers of any type of water, potable or non-potable.

Holistic Approach Includes:

- Water conservation and efficiencies
- Water reuse strategies
- Water security and reliability strategies
Net Zero Waste

Net Zero **WASTE:**
Reduce, reuse, recycle/compost, and recover solid waste streams, converting them to resource values, resulting in zero landfill disposal

Holistic Approach Includes:
- Improved purchasing practices
- Recognition that waste is a resource
- Increased recycling and composting
- Energy recovery
Net Zero Army Wide

NZ Implementation Approach: Initiate, Assess, Roadmap and Implement

Net Zero Implementation

Implementation Activities

**Initiate:** Establish a baseline

**Assess:** Determine potential

**Roadmap:** Plan and integrate the results into existing programs

**Implement:** Collaborate and act

---

### Material Flow Analysis

- Compost
- "Challenge" waste stream
- Could be recycled

Diverted through "producer take back"

---

### Water Balance Framework

#### Water Supply
- Municipal
- On-Site Surface Water
- On-Site Ground
- Alternate Water

#### Water Use
- Indoor Building
- Cooling/Process
- Irrigation
- Losses

---

### Load Reduction and Renewable Energy Integration Roadmap

- Baseline Electric & Heat
- Renewable Energy Technology

2011: 0
2011 w/ 25% EE: 25% Reduction from EE

2011: 100K
2012: 150K
2013: 200K
2014: 150K
2015: 100K
2016: 50K
2017: 0
2018: 0
2019: 0
2020: 0

---

"Challenge" waste stream could be recycled.

Could be recycled through "producer take back".
Energy Roadmaps

- Energy Baseline
- Energy Efficiency Assessments
- Renewable Energy Assessments
- Energy Security Assessments
- Energy Project List & Implementation Recommendations

Sierra Army Depot Load Reduction and Renewable Energy Integration Roadmap

[Bar chart showing energy load reduction from 2011 to 2020 with 25% EE assumption and NZEI post-current gas contract.]

- Solar Vent Pre-Heat
- Solar Hot Water
- Daylighting
- Ground Source Heat Pumps
- Solar Photovoltaic
- Geothermal Electric
- Future Solar / Geo (Elec)
- 2011 Baseline (Elec)
- 2011 Baseline (Heat)
Water Roadmaps

- **Water Balance**
  - Identify largest end-users
  - Set priorities

- **Water Efficiency**
  - Perform LCC analysis on measures
  - Rank order projects
  - Include technology and behavioral changes needed

- **Roadmap Workshop**
  - Collaborate with site
  - Set priorities
  - Identify funding
  - Determine acquisition strategy

- **Roadmap and Master Planning**
  - Finalize strategy
  - Incorporate into master planning
Internal Collaboration

- Share and document lessons learned
- Build cross-functional Net Zero teams
- Assist each other with challenges
- Conduct monthly calls and periodic progress meetings
External Collaboration

- Local and regional authorities
- Federal Government
- Public-private partnerships

Puget Sound
Best Practices - Energy

- **Conduct thermal building envelope analysis**
  - IR thermography identifies heat loss & enables targeted repairs

- **Reduce energy use through energy management control systems (EMCS)**
  - Provides ability to control energy-consuming devices (e.g., fans, compressors, boilers, chillers, pumps, lights)
  - Can also be used for demand reduction

- **Hire resource efficiency managers (REMs)**
  - REM’s goal is to reduce consumption & cost of energy
  - Work with existing staff to enhance conservation efforts
Pursue alternative financing mechanisms
- Energy Savings Performance Contracts (ESPCs) & Utility Energy Service Contracts (UESCs)
  - The Energy Services Company (ESCO) or Utility Provider funds energy projects that are paid back with cost savings generated over the contract term or Power Purchase Agreement

Conduct energy master planning
- Integrates energy efficiency & renewable energy goals & planning into the Real Property Master Plan
- Enables renewable energy options that aren’t feasible at a single building (e.g., central utility plants to serve a Brigade complex)
Maximize the use of xeriscaping
- Turf irrigation is one of the most common water demands at Army installations
- Camp Rilea converted turf to native meadows and rain gardens to reduce irrigation needs

Implement leak detection on the potable water distribution system
- Tobyhanna implemented an aggressive metering and leak detection program resulting in 38% reduction in water use intensity
Maximize water recycling
- Matching water quality to intended use

Install purple pipe
- Separating reclaimed water via installation of purple pipe system
- Several pilot developing projects to design, plan, and install

Maximize use of alternate water sources
- Collect and use rain water for industrial cooling tower make up
- Capturing stormwater for use in irrigation
NZ Energy – Fort Hunter Liggett

Jolon, CA
Location
2 million ft\(^2\)
Total building sq. footage
161,900 acres
Installation area

PG&E
Utility provider
$0.11/kWh, $26.11/MMBtu
Avg. energy costs in FY12 (electricity, thermal energy)

60 Mbtu/Ksf
2012 reported energy use

PV, Grid Energy Storage
Current RE projects
Membrane Bio-reactor
Waste Water Treatment Technology
Drivers

- Energy security, surety, and reliability
- Water scarcity
- Increasing energy prices/Fully burdened costs of fuel
- Foreign energy sources
- Environmental concerns
- Federal and DoD mandates
- Improved operational capabilities
- Risk reduction

Drivers for Change Resulted in Creation of Net Zero Programs for Energy, Water, and Waste

17 Pilot Installations

Evolution of the Hierarchy

- ENERGY
  - Reduction
  - Re-Purpose
- WASTE
  - Recycling & Composting
- WATER
  - Efficiency
  - Recovery
Questions?

Army Sustainability Report 2012
http://usarmy.vo.llnwd.net/e2/c/downloads/269536.pdf

Office of the Assistant Secretary of the Army for Installations, Energy and Environment
http://www.army.mil/asaiee

Office of the Deputy Assistant Secretary of the Army, Energy and Sustainability
http://www.asaie.army.mil/Public/ES/

Army Net Zero
USACE Support to the Army’s Energy and Water Programs

- Military Construction Army and Energy Efficiency
  - Energy Efficiency
  - Regional Energy CX’s
  - LEED
- Water Conservation
- Master Planning - UFC 2-100-01
- Research and Development (R&D)
- Energy Programs and Alternative Financing
  - Metering and MDMS
  - ESPC and UESC
  - EEAP
  - ECIP
  - Commercial Utilities (CUP)
  - Operational Energy
- Energy Initiatives Task Force (EITF)

USACE PROVIDES TECHNICAL, CONTRACTUAL, PROGRAMMATIC, AND POLICY DEVELOPMENT SUPPORT TO THE ARMY ENERGY PROGRAM.
Military Construction Army (MCA) & Energy Efficiency

- Continue meeting 30% Energy savings target of Energy Policy Act (EPAct 2005), achieving savings 5-10 percent better on average

- Strive to meet Energy Independence and Security Act (EISA 2007) by designing energy efficient facilities using current industry standards that promote life-cycle cost (LCC) effective Energy Efficient Measures

  - Renewable energy sources integrated into projects only if LCC effective

Developing Energy Use Intensity (EUI) targets for standard facilities to establish a baseline that ties directly into the Army’s metering system (MDMS)

Intent is total accountability, designer, builder and operator
Regional Technical Centers of Expertise for Sustainability, Energy, and LCCA

NAD
- Commissioning
- Low Impact Development
- Solar Thermal
- Microgrids*

NWD
- Building Envelope
- Mirco-Hydro Power
- Waste

SPD
- Life Cycle Cost Analysis
- Solar PV
- Wind

SWD
- O&M Renovations
- Waste to Energy

LRD
- Site Planning Charette
- Ground Source Heat Pumps

POD
- Energy Modeling
- Lighting (Natural & Day Lighting)

SAD
- District Energy
- Water Reuse

TAD
- Contingency Design

HNC
- Metering
- Contracting Vehicles

*HNC support NAD with Technical Expertise in Microgrids

http://mrsi.usace.army.mil/sustain
Microgrid Center of Expertise

Mission: to bring together technical components of USACE with expertise in energy generation, distribution, and grid (cyber) security to produce implementation doctrines that can be used by all USACE Districts and customer activities.

Goals: To share microgrid existing knowledge, identify issues and work to resolve barriers and resolve unknown market impacts. Share questions/concerns/lessons learned with engineering community to address latest successes, develop guidance and address shared challenges.
Army LEED Certified Projects

- Army Projects LEED Certified as of 31 Dec 2013
  - Platinum: 4 projects
  - Gold: 132 projects
  - Silver: 211 projects
  - Certified: 13 projects
  - Total: 360 projects

Wilderness Road Complex
Ft Carson, LEED Platinum
Operational Energy

- We have processes in place to install distribution grids to replace spot generation where practicable.

- We are evolving contingency construction standards (JCMS) to include energy efficient designs.

- We are contributing to the development of doctrine to leverage best practices and provide for life cycle management of contingency bases. This will facilitate the transition from the first boots on the ground to enduring bases (Soldier construction, to LOGCAP, to MILCON to IMCOM management of an enduring base).

USACE is collaborating with the Army team to improve our Operational Energy posture in theater and at home.
Commercial Utility Program (CUP)

- HQUSACE actively working with OACSIM on POM funding for CUP program support for FY16-20
  - Success requires HON Katherine Hammack’s support as critical program due to pushback during II PEG on 4 Feb 14
  - In spite of Mr. Kidd’s FY13 endorsement as a critical need program, POM funding not approved for FY15-19
- Funding essential to move Army from reactive to proactive approach
  - Supports Army mandatory Demand Response Program (Installation Services Focus Area Review Group recommendation 2D)
  - CBA shows Return on Investment for FY13 to be 6 to 1
- Currently supporting rate interventions at: (1) Forts Benning, Gordon and Stewart with anticipated annual cost avoidance of $500K for 3 years and (2) Fort Polk with anticipated annual cost avoidance of $700K for 4 years
- CUP hosts a monthly meeting with its counterparts in Air Force, Navy, DOE, and GSA to share lessons learned and coordinate utility rate intervention effort across the Federal Government.
Energy Programs
Energy Savings Performance Contracting (ESPC)

- In FY13 USACE awarded 16 ESPC contracts that had a capital investment value of $188.6M and an MBTU savings of 385,843.

- In the 1QFY14 USACE awarded 4 ESPC projects with a capital investment of $72M yielding a MBTU savings of 208,831.

- $2.0 Billion Presidents Performance Contracting Challenge: USACE efforts contributed to the Army exceeding its goal of $384M by $114M (29.7%) for a total of $498M, with USACE contributing $422M.

- USACE has robust FY14 pipeline and anticipates awarding 17 ESPC projects.

- Co-chair with DOE/FEMP White House CEQ Working Group to improve ESPC process across federal government.

Pictured above is the solar PV carport installed at WSMR as part of the ESPC project.
Utility Energy Services Contract (UESC)

- In FY13 USACE awarded one UESC project at DLA Susquehanna, PA for $27.7M. This project contributed to DoD’s contribution to the Presidents Performance Contracting Challenge (PPCC).

- In 2QFY14 USACE awarded one UESC project at DIA-Bethesda with a total capital investment of $15M.

- The UESC program has a robust FY14 pipeline and anticipates awarding 3 projects with a capital investment of approximately $40M.

- USACE gained approval for a $240M UESC Programmatic Acquisition Strategy which will help streamline the acquisition process.

- UESC awards were not a major contributor to meeting the first PPCC but will be essential to meet second PPCC. USACE capabilities and expertise can be leveraged by installations to hasten execution to meet second PPCC.
# Army Metering Program Status

(AS OF 22 JAN 2014)

<table>
<thead>
<tr>
<th>MACOM</th>
<th>GOOD</th>
<th>BETTER</th>
<th>BEST</th>
<th>GOAL</th>
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<tbody>
<tr>
<td>IMCOM</td>
<td>5,876 (93%)</td>
<td>3,034 (48%)</td>
<td>585** (9%)</td>
<td>6,289</td>
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<tr>
<td>MEDCOM</td>
<td>200 (80%)</td>
<td>146 (58%)</td>
<td>146 (58%)</td>
<td>250</td>
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<tr>
<td>ARNG</td>
<td>764 (91%)</td>
<td>168 (20%)</td>
<td>22 (3%)</td>
<td>840</td>
</tr>
<tr>
<td>USAR</td>
<td>173 (39%)</td>
<td>94 (21%)</td>
<td>94 (21%)</td>
<td>442</td>
</tr>
<tr>
<td>AMC</td>
<td>586 (70%)</td>
<td>261 (31%)</td>
<td>----</td>
<td>842</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>7,599 (88%)</strong></td>
<td><strong>3,703 (43%)</strong></td>
<td><strong>847 (10%)</strong></td>
<td><strong>8,663</strong></td>
</tr>
</tbody>
</table>

**Explanation of Terms:**

**GOOD:** Describes the electric meters which have been installed and are reporting locally at the building in which they are installed.

**BETTER:** Describes the electric meters which have been installed and are reporting to a front end server at the installation, allowing the Energy Manager to view all energy data from a central location.

**BEST:** Describes the electric meters which have been installed and are reporting in an automated fashion to the MDMS Enterprise servers.

**GOAL:** Total electric meters planned for completion at each MACOM in Phase I

* *NOTE: Additional 3,531 electric meters are also reporting to MDMS Enterprise through File Transfer*
Energy Engineering Analysis Program (EEAP)

- Resulting DD1391’s created from Net Zero pilot installation energy audits were included in FY15 ECIP budget submission to OSD.
- During FY13 USACE performed 28 energy audits for the US Army Corps of Engineers and the US Army Reserve which identified 285 viable ECMs.
- USACE robust efforts with energy audits will result in development of a comprehensive enterprise level energy Capital Investment Strategy (CIS) that accounts for 80% of top energy consuming facilities.
  - USACE appears to have the predominance of the Army’s investment in energy audits.
  - A similar emphasis is needed throughout the Army – Energy audits are foundational to developing effective energy management strategies, capital investment plans, and projects to meet reduction, net zero and renewable energy goals.
Support to Energy Initiatives Task Force (EITF)

- USACE-HNC awarded $7B Power Purchase Agreement (PPA) MATOC in FY13. Fifty-nine companies awarded technology specific base contracts: 23 solar; 17 wind; 13 biomass and 6 geothermal
  - Critical tool for support of the Army’s large scale renewable energy goals.
- Current Acquisitions:
  - Redstone Arsenal – 15MW Solar PV (PPA MATOC)
  - Redstone Arsenal 25+MW Cogeneration Heat and Power facility (Standalone)
  - Fort Campbell – 4.1MW Solar PV (Not yet submitted to RGB)
- USACE-HNC provides total funds management services, third party financed contract development (PPA), program management and technical support by HNC and Corps Districts
Examples of Completed Deep Energy Retrofit Projects and a New Start

One of 30 VOLARM barracks renovated at Ft Polk: 45% energy use reduction + mold prevention technologies application.

Current pilot project at Ft Carson (Bldg 1117) – joint effort between Ft Carson, DASA, CERL, HNC and DOE FEMP. Expected results: 10kBTU/ft² per yr - site energy (> 80% reduction), 52.4 kBTU/ft² per yr - source energy (~50% reduction).
The objective of this project is to integrate the Comprehensive Army Master Planning System (CAMPS) Dashboard with the Net Zero Installation Tool (NZI Tool) and demonstrate its effectiveness and DoD-wide applicability.
USACE-SWF CAMPS

CAMPS has powerful data integration and visualization capabilities for installation management, but lacks energy analysis and forecasting abilities.
The NZI Tool excels in the integration of energy analysis and optimization that generates optimal life-cycle effective system configurations, but currently lacks automated import and compilation of data, and an intuitive visualization interface.