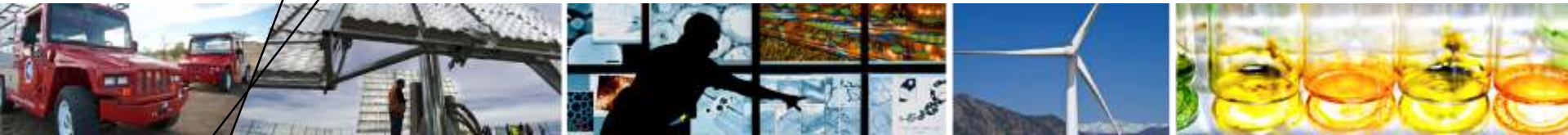


# Lessons Learned in the Army's Net Zero Energy Program



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**2015 RMAEE Energy Forum**

**22 October 2015**

# Outline

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- **Intro to Army's Net Zero Energy Program**
- **Applicable Policies**
- **Pilot Sites and NREL's Role**
- **Implementation and Project Development Frameworks**
- **Lessons Learned**
- **Common Factors for Success**

# Army's Net Zero Energy Program



- Part of a 3-pronged approach to greater self sufficiency, security, and resilience
- Pilot program focused on select Army installations around the world

# Army's Net Zero Energy Program



- **Descending hierarchy of effort focuses resources on most cost effective solutions first**

# Applicable Policies

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- **2009 Executive Order requires all new Federal buildings after 2020 to be Net Zero Energy**
- **2010 Army Policy requires more efficient buildings**
- **2011 & 2014 Presidential Goals for \$4 billion in ESPCs**
- **2012 White House announces each military service to install 1 gigawatt of renewable energy by 2025**
- **2012 Army Policy requires all bases to reduce EUI by 37.5% by 2020**
- **2013 Executive Order requires all Federal agencies to increase resiliency in preparation for climate change**
- **2014 Army Policy requires all bases to pursue Net Zero Energy, Water, and Waste as much as possible**

# Net Zero Energy Program – 9 Pilot Sites

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- **Camp Parks Reserve Forces Training Area, CA**
- **Fort Bliss, TX**
- **Fort Carson, CO**
- **Fort Detrick, MD**
- **Army Garrison Fort Hunter Liggett, CA**
- **Kwajalein Atoll, Marshall Islands**
- **Sierra Army Depot, CA**
- **U.S. Military Academy, West Point, NY**
- **Oregon National Guard (statewide)**

# Army Net Zero Lessons Learned Report



## ARMY NET ZERO

### Lessons Learned in Net Zero Energy

June 2015



- NREL provided technical assistance to 9 pilot sites
- NREL researched and wrote report that assembles lessons learned from Army's Net Zero Energy pilot program and other DOD energy project experience

# Net Zero Implementation Framework





# NREL Project Development Frameworks

## Project Fundamentals

### Baseline

- Energy Market Drivers

### Economics

- Market-Specific Dollars and Cents

### Policy

- Conditions for Success

### Technology

- What, Where, When, How Many

### Consensus

- Defend, Defend, Defend...

## Project Development Framework

### Site

- No Site, No Project

### Resource

- Engineering Assessment

### Off-Take

- Off-Take Contract or Energy User(s)

### Permits

- Anything That Can Stop a Project If Not in Place

### Technology

- Engineered System

### Team

- Professional, Experienced, Diverse

### Capital

- Secure Financing Once All Else is in Place

# Correlating the Frameworks

<b>Army Net Zero Implementation Framework</b>	<b>NREL Project Fundamentals</b>	<b>NREL Project Development Framework</b>
<b>Initiate</b>	<b>Baseline</b>	
<b>Assess</b>	<b>Economics Policy</b>	<b>Site Resource</b>
<b>Plan</b>	<b>Technology Consensus</b>	<b>Off-Take Permits Technology Team</b>
<b>Implement</b>		<b>Capital</b>

# Initiate Phase – Baseline

- **Preliminary audits and analyses**
  - Always required at some level—amount of detail depends on funds available
  - Identifies opportunities and priorities
  - More detailed studies will be required later
- **Integrated planning**
  - Designate specific sites
  - Include projects in master plans
  - Planning stakeholders adopt energy as priority



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Implement		Capital

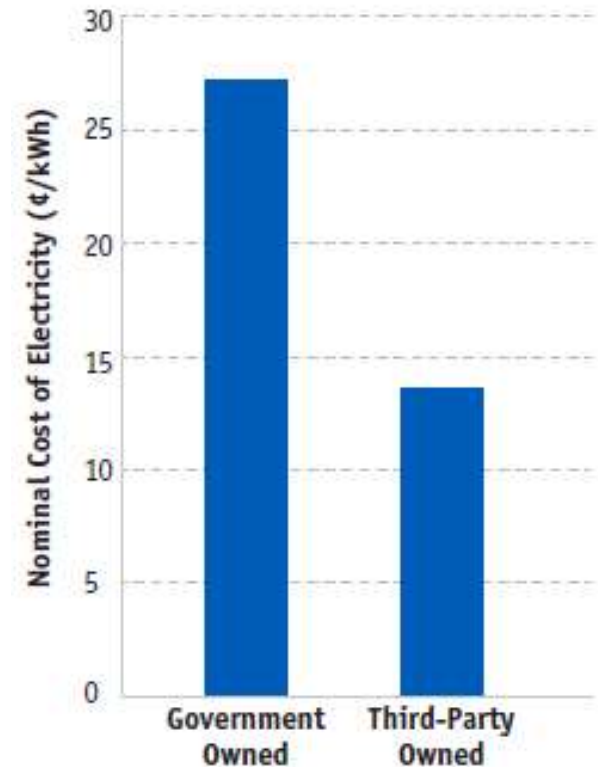
# Initiate Phase – Baseline

- **Understand the local market**
  - Location, location, location...and timing

Physical Landscape	Market Landscape
What is the geography and topography of the installation's location?	Is the installation located in a regulated or unregulated energy market?
Is the installation in a region that favors particular renewable resources or requires high levels of air conditioning or heating?	Are the installation's energy prices high or low?
Is land available for large renewable energy projects?	What are state policies requiring the installation's local utility to do in terms of renewable energy?
Is the installation on an island where energy projects may have larger impacts on the electrical grid?	Is the installation a primary customer of the local energy utility or just one among many industrial consumers?

# Assess Phase – Economics

- **Third-party ownership**
- **Island sites present unique opportunities**
  - Higher energy costs
  - Different technologies
- **Carefully evaluate alternatives**
- **Be wary of RECs**



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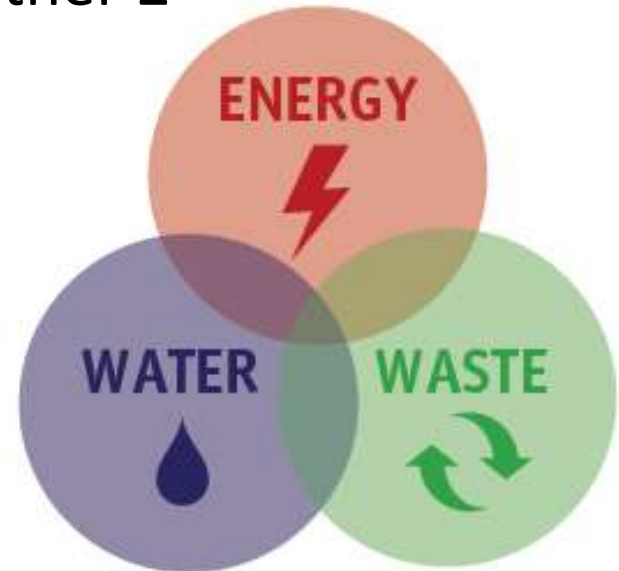
# Assess Phase – Policy

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- **Coordinate with utility early and often**
  - Renewable projects almost always require interconnection
  - Large conservation projects should also be coordinated with utility
    - Peak shaving may impact rate schedule
    - Standby charges may be an issue

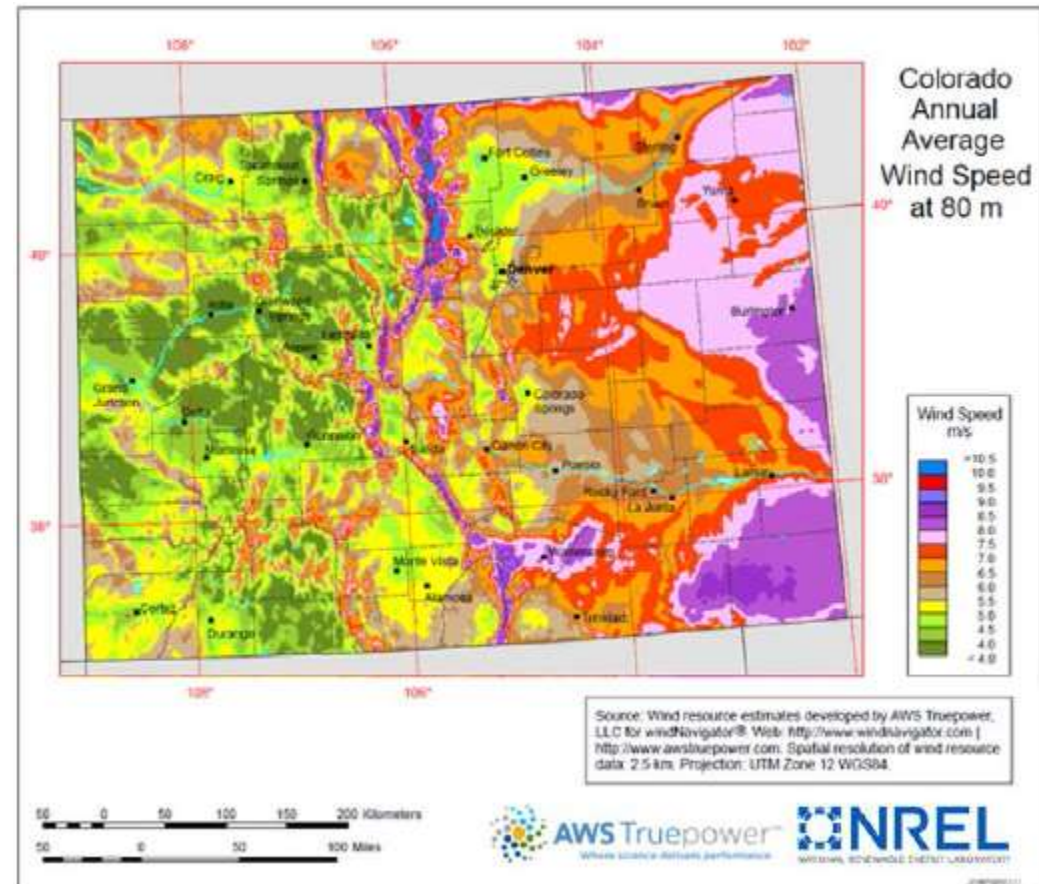
# Assess Phase – Site

- **Holistic assessments and site planning**
  - Plan specific sites
  - Ensure renewables are considered for both site-wide and building-level
  - Site is a network of interconnected systems
  - Integration of Net Zero Energy, Water, and Waste—a project in one prong may affect the other 2
- **Terms of site access should be negotiated early**
- **Army may be liable for energy issues with privatized facilities and tenants**



# Assess Phase – Resource

- Understand resource or performance of ECM at detail commensurate with stage of project development





# Plan Phase – Off-Take

- **Army may be able to offer land for renewable projects at lower cost than alternatives**
- **This can attract developers and utilities in markets right for large projects**

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# Plan Phase – Permits

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- **NEPA compliance is usually biggest permitting requirement—and universally required**
- **Interconnection almost as universal**
- **When interconnection size ceilings limit projects, they may be broken into smaller sizes**

# Plan Phase – Technology

- **Energy Conservation Measures**

- Pursue lower cost, simpler measures first
- Projects should be integrated between each other and with other systems
- Building occupant education efforts alone are not enough
- Recommissioning can be a good low-cost measure
- Centralization of energy systems can increase efficiency—but not always
- Centralizing systems in historic architecture can be less disruptive



# Plan Phase – Technology

- **Renewable Energy – General Considerations**

- Many renewable energy projects will require grants or tax incentives
- Resource studies should be holistic and fair

- **Solar**

- Canopy-mounted PV allows for multi-function use of sites
- Structural evaluations for roof-top PV should be done early



# Plan Phase – Technology

- **Wind**

- Wind turbines are not always incompatible with aviation missions
- Aesthetic concerns require wind projects to be socialized early

- **Biomass and Waste to Energy**

- Educate leadership and community about these projects early
- Unique concerns of logistics and security—siting near base perimeter may be best
- These projects require extensive knowledge of and reliance on surrounding market
- Combined heat and power offers greater efficiency, but are more complicated—heat only projects are usually straightforward



# Plan Phase – Technology

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- **Integration Issues and Microgrids**

- Understand existing infrastructure and how projects will interact with it and each other
- Energy security requires additional equipment
- Power quality and balancing variable generation sources can be concerns on islands and security microgrids
- Advanced controls, inverters, and cyber security measures may need to be specified in procurement documents
- Energy storage is valuable but hard to value

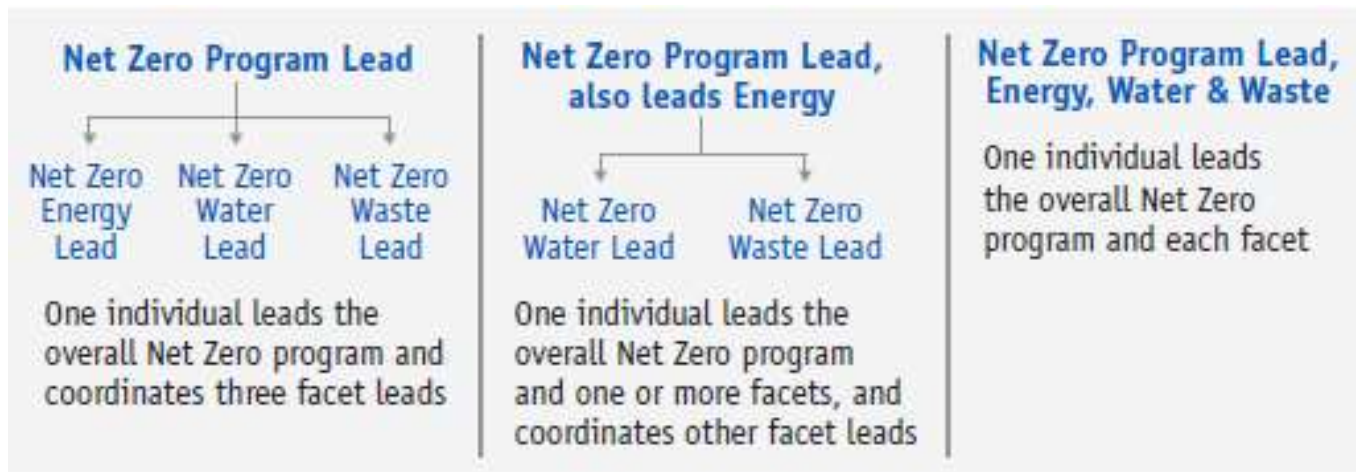
# Plan Phase – Consensus

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- **Leadership support is essential for:**
  - Securing adequate resources
  - Incentivizing stakeholders
  - Overcoming obstacles
- **Net Zero Energy: Aspiration vs. Reality**
- **Coordination and Communication**

# Plan Phase – Team

- **Traits of a successful Net Zero Energy Program Lead:**
  - Meets regularly with leadership and keeps them engaged
  - Promotes the program to community
  - Integrates stakeholders into a Net Zero implementation team
  - Empowers stakeholders to feel ownership
  - Builds and accesses a network of external support
  - Uses the successes of the program to strengthen support





# Plan Phase – Team

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- **Common members of a Net Zero Energy team:**
  - Engineers
  - Architects
  - Master Planners
  - Energy and utilities managers
  - Financial analysts
  - Contracting officers
  - Attorneys
  - Communications and cyber security personnel
  - Environmental and permitting specialists
  - Operations and maintenance personnel
- **Leaders as team members**
- **Leverage available resources**
  - DOE FEMP
  - USACE CERL
  - USACE Huntsville Center
  - National labs

# Implement Phase – Capital

- **General Procurement Considerations**

- Maintain list of “shovel ready” projects
- Stay flexible and persistent about procurement approach—if at first you don’t succeed...
- Proposal and selection should be tailored and current
- Deliberate and holistic investment methodology alongside integrated planning

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# Implement Phase – Capital

	Alternative Financing	Government Financed
<b>Options</b>	<ul style="list-style-type: none"> <li>• Energy savings performance contracts (ESPCs)</li> <li>• Power purchase agreements (PPAs)</li> <li>• Utility energy service contracts (UESCs)</li> <li>• General Services Administration (GSA) Areawide contracts</li> <li>• Long-term land lease agreements</li> </ul>	<ul style="list-style-type: none"> <li>• Appropriated funds</li> <li>• Demonstration programs</li> </ul>
<b>Advantages</b>	<ul style="list-style-type: none"> <li>• Third-party owner bears risk</li> <li>• Can offer lower energy costs due to tax incentives</li> <li>• Can be flexible and responsive to changes mid-procurement</li> </ul>	<ul style="list-style-type: none"> <li>• Greater return on investment may be available with immediate ownership</li> <li>• Can offer greater control of project characteristics</li> </ul>
<b>Challenges</b>	<ul style="list-style-type: none"> <li>• Contracting authorities may be complicated</li> <li>• Difficult for Government to realize full value of projects (ownership may not be an option until later, if at all)</li> </ul>	<ul style="list-style-type: none"> <li>• Government bears risk</li> <li>• Appropriation process can be lengthy and inflexible</li> <li>• Large up-front investment takes time to recoup</li> </ul>

# Implement Phase – Capital

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- **Energy Savings Performance Contracts**
  - Good vehicle to get things done
  - Has limits and may need experienced contracting staff
  - Consider appropriated funds as down-payment
  - Don't shorten contract length
- **Power Purchase Agreements**
  - 30-year DOD authority—40-year WAPA authority
- **GSA Areawide Contract**
  - 10-year authority to purchase energy from utility
- **Utility Energy Service Contracts**
  - One-stop shopping with utility
- **Long-Term Land Lease Agreements**
  - May be required for site access for any of the above
- **Appropriated Funding**
- **Demonstration Programs**

# Common Factors for Success

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- **Leadership support and engagement critical**
- **Implementation approach must be holistic and well integrated**
- **Plan in advance for projects and incorporate energy into designs**
- **Understand integration issues of energy projects—between each other, with other systems, and with water and waste projects**
- **Capable, motivated, and dedicated energy program lead with adequate capacity is key**
- **Implementers and team members need training and skills and should utilize all available resources**
- **Maintain flexibility in projects and procurement approaches**



# Questions